Government of Maharashtra

The Working Plan

for

Nagpur Forest Division

(NAGPUR DISTRICT)

2004

For the period

(2004-05 to 2013-14)

VOLUME - I

(Part I and II)

By

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&

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Office of the Conservator of Forests
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VOLUME - II

(Appendices)

By

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Preface

The present working plan of Nagpur Forest Division as revised by Shri Jarnail Singh, IFS and Shri S. S. Mishra, IFS envisages scientific management to the forest areas in charge of Deputy Conservator of Forests, Nagpur and hence it excludes the area transferred to Wildlife wing and FDCM. This working plan also includes Zudapi Jungle area, which has been transferred to forest department as compensatory land. However, no Silvicultural treatment has been prescribed for these areas because they contain crop, which is too young to respond to any such system and further authentic field data in regard to zudapi jungles is yet to be collected.

Whole forest area has been divided into 6 area specific and 3 overlapping working circles. The six area specific working circles are-

- Selection cum Improvement,
- Improvement,
- Old Teak Plantations,
- Rootstock Management and Afforestation,
- Protection and Catchment Area Management and
- Grass and Fodder Resource Management.

Yield has been prescribed both in SCI and P&CAM working circles because forests put under these working circles are fit for commercial production but yield prescribed under P&CAM working circle is on very conservative side. Planting of teak by canopy removal followed with artificial regeneration (within the SCI coupes), as already being done in FDCM areas, has also been prescribed on a limited scale. This is because, being strong light demander, teak can be successfully regenerated artificially only after creating sufficient openings in the forests. SCI areas (also some IMP areas) have therefore been considered for plantation of of about 250 ha. of teak annually.

Maps have been generated in Geo-media cell. Village maps for each village were registered for generating maps of protected forests and, in case of reserve forests, survey of India sheets were used. Thus digitized maps are stored permanently with the CF, Working Plans, Nagpur and requisite number of sets have been provided to the division.

I congratulate Shri Jarnail Singh, IFS and Shri S S Mishra, IFS and their highly motivated team for accomplishing this assignment.

(Shailendra Bahadur)
Conservator of Forests,
Working Plan Circle,
Nagpur.

Introduction

The Working Plan 2004 for Nagpur Forest Division is the combined plan for Reserve and Protected forests in charge of Nagpur Forest division i.e. 1721.268 sq km of forest area. Jwala Prasad's plan, 1990-91 to1999-2000 (extended upto 2003-2004) has been revised in the form of present plan. This plan will be in force from 2004-05 to 2013-2014.

The preliminary working plan was prepared by Shri A. Ashraf and Shri V. K. Sinha and was approved by the state level committee on 22.08.2000. On the basis of the preliminary working plan approved, the draft plan was prepared by Shri Jarnail Singh.

Major changes which have been affected in the present working plan are:

- Shift from CWR working to Selection working in major areas because the coppicing vigor has drastically reduced due to 3-4 coppice rotations in the past.
- Shelter-wood system, which was introduced for the first time in the previous plan in some well stocked areas capable of producing large sized commercial timber, has been discontinued because of its unsuitability for the area and complexity of the prescriptions.
- The plantation area has been drastically reduced because of past poor results of plantations and more emphasis is now laid on natural regeneration which will include rootstock management.
- The condition of grasslands (pasture areas and grass birs) is not encouraging. Yet the area under grass birs has been retained and, that under pasture, increased because of increase in local demands.
- This plan particularly lays emphasis on evolving site specific mechanisms for protection and development of forests through Joint Forest Management.

Afterwards, following changes have been incorporated in the draft by the undersigned.

1. Growth statistics of 26 miscellaneous species which included 11 species that do not form in annual rings and local volume table for teak as well as 13 miscellaneous species has been given in chapter 6.
2. A separate chapter on management of Old Teak Plantations.
3. Artificial plantation of teak after removal of over-wood in suitable patches for maximization of commercial productivity of forests.

The computerized inventory management system as evolved by the then Conservator of Forests Shri J S Grewal has been extensively used in analyzing the enumeration data obtained from the field by SOFR team, Amravati. The digitized maps have been generated in the Geomedia cell in the office of the Conservator of Forests, Working Plans, Nagpur and partly in the office of the Deputy conservator of Forests, Working Plans Division, Nagpur. The inventory management system has been linked to the digitized maps for easy accessibility of the data.

The introduction of teak plantation after creating gaps in the canopy by removing over-wood has been a matter of much discussion during the finalization of this plan. Besides the Govt of India having allowed the FDCM to take up such activity in their area, it is a common knowledge that teak does not grow in shade. Past efforts of gap plantation of teak have resulted in failures. On the other hand, its plantation after creation of gaps in the canopy is a time tested technique. Considering the pros and cons of this aspect and the issue in regard to bio-diversity conservation vis-a-vis mono-culture plantations, it has been thought to be prudent to have a conservative target of teak plantation in Nagpur forests division after putting a few safeguards in place. Those safeguards will be in the form of patches not being more than 20 ha at a place and learning sufficiently vide strips of forests in between.

I express my deep sense of gratitude for the valuable guidance and advice provided by Shri J S Grewal and Shri S Bahadur, Conservators of Forests, Working Plans , Nagpur. This plan is a combined output due to the efforts made by them. The inventory management system developed by Shri J S Grewal has been very handy and user friendly in analyzing the enumeration data. Shri S Bahadur as personally guided in all the analytical works involving long and cumbersome mathematical calculations and has been a source of inspiration in finalization of this plan. It was only because of incessant efforts made by the above senior officers as Conservators of Forests, Working Plans, Nagpur that this task could be completed satisfactorily.

A large number of other officials have made valuable contribution during the preparation of this plan but it will not be possible to name each and every person associated. List of officials formally associated with work is enclosed. However, I shall be failing in my duty if I do not make special mention of a few of them. Shri A N Dhote, RFO and Shri B T More, Ranger Surveyor deserve special appreciation for their untiring work in analysis of data, digitization of maps and in guiding others in various related activities. My special appreciation is also due to Shri A C Gondane, Clerk in typing, printing, binding and other related works.

(S S Mishra)
Deputy conservator of Forests
Working Plans Division

Nagpur

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Executive Summary

Nagpur Working Plan, 2004 is the 7th working plan for the Nagpur division. Jwala Prasad's plan was under implementation in the division from 1990-2000, which was extended upto 2003-2004. Hence, Nagpur Working Plan, 2004 comes into force from 2004-05 and shall remain in force upto 2013-14. It is written for 1721.268 sq.km. of forest area of Nagpur district, which comprises –

i. 878.529 sq. of RF 417 comptt.
ii. 700.426 sq. of PF of 596 villages. 501 comptt.
iii. 145.170 sq. of Zudapi Jungle 621 villages.
iv. 2.935 sq. of of non-forest land
(made available in 3 ranges as compensatory land)

Jwala Prasad's plan was for 2218.913 sq.km., from which forest area that has been finally transferred to wildlife wing and FDCM has been subtracted and remaining area (1721.268 sq.km.) is covered under this plan.

2. Two types of rock formations are distinguishable in the district. These are metamorphic rocks in Deolapar, Ramtek, Parseoni, Khapa, Kuhi and parts of Kondhali range and deccan trap zone in rest of the area. Soils found in the first category are generally deep and support good quality forests, both teak and mixed. Trap zone in Narkhed, Kondhali, Hingna, Umred ranges is categorized by shallow and refractory soils and hence this region contains poor quality forests. However, in the sheltered low lying areas of these regions like southern parts of South Umred range deep black cotton soils are formed from softer basaltic rocks. Such areas support good quality teak forests.

3. The 417 compartments in 48 blocks are numbered as 1-38, 60-96, 276-313 and 331-799. These include comptt. 715 of Seminary Hills, 716-789 New RF formed in 1977 and newly assigned comptt. Nos. 790-799 of Ambazari and Gorewada.

PF areas are serially divided into 486 comptt. and there a total of 501 comptt. (some of the comptts having parts A, B etc). To have a distinction from RF comptts., a new series starting from 1001 is proposed to be given to these comptts. Under this series, distinct patches under the same comptt. are proposed to be numbered as 1001/11 1001/2 etc.

The division has also recently acquired a total of 15974.03 ha of non-forest and zudapi jungle lands. Not much of information about most of these lands is available as yet but proposals to notify zudapi jungles under section 4 of Indian Forest Act, 1927 have been sent in 2003-04. Non-forest land admeasuring 2640.45 ha has already been notified under section 4 in 1990 but remaining non-forest land (293.48 ha) is yet to be notified.

4. The villages adjoining the forests are chiefly dependant on these forests for grazing, firewood and small timber. The admissible grazing incidence is summarized as follows:

Functional category of forests	Area	Grazing incidence (areas per cattle unit)	Carrying capacity (max. cattle units allowed)
Protection forests	3102.89	0.0	0.0
Grass birs	10748.92	0.0	0.0
Tree forests	42300.00	1.214	34843
Minor forests	78561.44	0.607	129426
Pasture forests	30131.5	0.404	75582
		Total	**239851 unit**

Grazing incidence is to be decided annually after deducting areas, which are to be closed to grazing. Certain areas like grass birs and protection areas are closed to grazing permanently and others like current coupes for a fixed period of 3-7 years. The division contain 10748.92 ha of grass birs and 28051.75 ha of forests have been put in under pastures where rotational grazing has been prescribed. Besides, the remaining forest are of the division after deducting current coupes has also been constituted into grazing units. There are 125 grazing units that are prescribed to accommodate cattle of 995 villages (219828 cattle heads).

4. Past working :

Scientific working in the forests under Nagpur division started in 1895 when first working plan was sanctioned. Initial working was generally improvement fellings to get regular supply of straight and sound poles of valuable species. Second plan in 1912 incorporated coppice with standard system (which was actually introduced in these forests in the year 1906-07) in which minimum of 30 promising trees per acre were to be retained as standard. Also during the course of implementation of the 2nd plan, 1912-34, thinning as a silvicultural measure in a 10 year thinning cycle was introduced in some of the forests which were too dense.

Sagreiya's plan 1935-47 was the first plan after stock mapping of the forests. It introduced CWR system. Hence, Nagpur forests were one of the tree areas where CWR was practiced for the first time. While good quality forests were kept under improvement working circle (removal of unsound and malformed trees interfering with valuable species) and conversion working circle (with rotation of 72 years), quality IV forests suitable for the production of firewood and poles were allotted to CWR. B R Mishra's Plan, 1947-64 allotted good quality teak forests into Pench High Forests and General High Forest working circle and

continued to keep quality IV areas capable of producing firewood and poles into CWR working circle. These systems were also continued in the Thosare;s Plan, 1965-80.

The PF in the division were brought under regular and scientific working in the year 1970 when working scheme prepared by Shri S S Parasnis was approved. Sizable area of PF (21615.38 ha) was kept under Pasture working circle under this scheme. The current plan for the year 1990-2003, which is under revision has combined RF and PF under one plan.

6. Brief Review of the plan under Revision, that is, Jwala Prasad's Plan for 1990 to 2003-04.

i. ***Selection-cum-Improvement Working Circle***

It was introduced for the first time in one FS. Hence, it is premature to judge system's suitability particularly because-

- marking rules are seen to have not been adhered to scrupulously,
- CBO were not done due to paucity of funds,
- Artificial regeneration failed because of wrong choice of species and biotic pressures.

ii. ***Shelterwood system:*** It was found to be unsuitable due to-

- complex nature of prescriptions which resulted in large scale deviations,
- teak being light demander was not found to be suitable for the system,
- subsidiary operations could not be done due to lack of funds,
- forests lacked sufficient natural regeneration of valuable species, that is, teak, due to biotic pressures.

iii. ***Coppice with Reserve working circle:*** It was found that trees have lost their coppicing vigor. To compensate this, planting 4 years prior to main felling was prescribed but it has not been done.

iv. ***Re-afforestation and Soil Conservation working circle***

The performance of the plantations has not been encouraging because of wrong choice of species, problems of protection and grazing pressure.

v. ***Pasture and Grass Bir working circles.***

Grazing pressure on all forests including Pastures and Grass birs is very high.

7. Following criteria have been developed for the future management:

i. Plan is to be based on primacy of environmental concerns and biodiversity conservation.

ii. Achieving the Selection forests, in the ultimate analysis, has to be the objective of management (in the good quality forests) and other systems are basically intermediary ones.

iii. Poor quality forests are incapable of producing commercial timber and, on the other hand, they are progressively getting degraded due to unregulated grazing and other biotic factors.

This has resulted in large-scale failures of plantation schemes in the past. Such forests are therefore generally proposed for rotational grazing regulations and conservative exploitation to meet the firewood and small timber requirements of the local people.

iv. JFM arrangements are proposed to be put in place extensively.

v. The working plan prescribed implementation of Wildlife (Protection) 1972 in letter and spirit and efforts to have certain inputs of wildlife conservation in managed forests as wildlife management has become synonymous with biodiversity conservation.

8. Accordingly following working circles have been proposed.

Area specific	***Overlapping***
1. SCI	1. Bamboo
2. IMP	2. NWFP
3. Old Teak Plantation	3. Wildlife
4. Rootstock Management & Afforestation	
5. Protection and Catchment Area Management	
7. Grass and Fodder Resource Management	

9. Selection and Improvement working circle

i. The areas allotted to this working circle are

- Good quality forests containing mature crop. All site quality III and major portion of quality IV.
- Those previously under SCI, shelterwood and CWR.
- Compartments having B.A. more than 10.

ii. Silvicultural system is the felling of trees that have attained harvestable girth.

A. Species	**Site Quality**	**Harvestable girth**
Teak	II	135
	III	120
	IV	105
Group 2	Ain, Bija, Haldu, Karam	135
Group 3	Tiwas, Dhawra, Sivan etc.	105
Group 4	Garari, Lendia, Khair	60

B. No fellings of those species which are less than 1% in their stocking. e.g. Kulu, Shisham, Semal.

iii. Number of felling series are 24 and average size of the coupe is 115 ha.

iv. Average Regeneration status is as follows:

Per ha seedlings of size	**Number**
0.3m – 1m	154
1m- 3m	222.91
> 3m	103.91
Total	**481.7**

v. General treatment type –

A – Protection areas,
B – Understocked areas,
C – Pole crop,
D – Well stock areas,
E – Blank area,

have been proposed and D type areas are prescribed to be further classified as D-1 and D-2 in identified felling series. D-1 areas will be the patches (20 ha at one place) of deep, well drained soil capable of supporting good teak growth and hence are fit for creating gaps in the canopy for plantation of teak. The system proposed is 'Coversion to Uniform with Supplemental Artificial Regeneration of Genetically Superior Stock'.

10. Improvement working circle

i. Forests are of generally good quality and fit in the criteria of SCI but they contain young crop.
Average basal area is 7.

ii. Improvement fellings (hygienic operations) to provide adequate growing space to valuable species. Dense patches are proposed to be worked on the basis of selection criteria.

iii. Number of felling series are 14 and average size of the coupe is 100 ha.

iv. Regeneration status in terms of per ha seedlings/saplings is as follows:

Per ha seedlings of size	Number
0.3m – 1m	133.61
1m- 3m	225.66
> 3m	94.34
Total	**453.61**

v. General treatment type –

A – Protection areas,
B – Understocked areas,
C – Pole crop,
D – Well stock areas,
E – Blank area,

have been proposed and D type areas are prescribed to be further classified as D-1 and D-2 in identified felling series. D-1 areas will be the patches (20 ha at one place) of deep, well drained soil capable of supporting good teak growth and hence are fit for creating gaps in the canopy for plantation of teak. The system proposed is 'Coversion to Uniform with Supplemental Artificial Regeneration of Genetically Superior Stock'.

11. Old Teak Plantation working circle

i. 159 old plantations of teak with an area of 4934.24 ha in 8 ranges have been listed.

ii. Treatment prescribed is-

A. 10^{th} year mechanical thinning in which one of the three diagonally located poles shall be removed. (in plantations raised in 1993 and afterwards)

B. Silvicultural thinnings in 15^{th}, 25^{th}, 35^{th}, 45^{th} year etc.

iii. As plantations (prior to 1993) have not been thinned in the past, first thinning will be of B grade only.

iv. For the silvicultural thinning, the criteria will be to compare the actual basal area and stocking of the plantation with that given in the yield and stand table.

v. Actual mapping of all plantations during the currency of this plan with the help of GPS has been proposed.

12. Rootstock Management and Afforestation working circle

i. 13465.29 ha of understocked areas are prescribed under afforestation programme and they are proposed to be covered in 20 years. Rootstock management will be given priority over plantations.

ii. Average basal area of the forests under this working circle is 4 or less.

iii. 9 felling series with an average coupe size of 75 ha have been formed.

iv. Ecological index for Nagpur division indicates planting of 900 seedlings per ha.

v. Choice of species will be for the locally valuable ones and those which are fit for the particular soil type.

vi. Rootstock Management

- Well distributed 400 established seedlings/saplings per ha will be identified.
- Healthy and promising coppice shoots (one per stump) will also be s\retained.
- Mulching, weeding and soil working of the above seedlings and coppice shoots is proposed.

vii. Two stage planting technique – poorer areas consisting of refractory soils have been proposed. It is –

A. Restorative Phase from 1st to 4th year

Year 1 : SMC and Protection measures.

Year 2 : Seed sowing and planting average, Khus

B. Planting place

Year 4 : PPO/Pyo

Year 5 : Planting

The 2nd and 6th year cleaning are prescribed to be undertaken in the 5th and 11th year of coupe working.

13. Protection and Catchment Area Management Working Circle

i. Compartment with more than half of their area as steep slopes and streams. Compartments forming catchments of medium and major dams.

ii. Generally good quality forests with average basal area 11.84.

iii. Regeneration status

Per ha seedlings of size	**Number**
0.3m – 1m	214.66
1m- 3m	278.38
> 3m	156.22
Total	**644.62**

iv. The areas not in the steep slopes, that is, those forming catchments are proposed to be worked on conservative harvesting basis, which is removal of 2 trees of harvestable size per ha.

However, this harvesting will be done in indirect catchment only so as not to lead to increase in soil erosion. Therefore, coupes are laid only in indirect catchment.

v. Catchment areas are proposed to be given special attention for soil and moisture conservation work and under plantation programme.

Plantation of species suitable for soil and water conservation has been prescribed.

vi. Water body may be included under eco-tourism programme as well.

14. Grass and Fodder Resource Management working circle

i. Working circle includes 12 treatment series of Grass birs with an area of 10210.73 ha which are to be permanently closed. (37 Grass birs)

16 pasture series with an average coupe size of 480 ha and total area of 30131.5.

ii. Average basal area is 3.6.

iii. Rotational grazing in a 4 years cycle has been proposed in pasture series.

iv. Grass improvement works in grass birs by way of removal of woody growth and weeds as well as seed sowing of improved grasses has been proposed.

v. The tree crop is proposed to be worked under coppice selection system, in which 1 out of 3 stems available silviculturally (those above 45 cm. GBH, 30 cm in case of Garari) and malformed and over-mature trees shall be removed and in which regeneration in mostly of coppice origin.

The material removed as above is intended to meet the local requirements of firewood and small timber.

15. Bamboo (overlapping)

Previous plans show bamboo in 80 compartments but major bamboo area having gone to wildlife (Pench tiger reserve) & FDCM, bamboo working is not very significant now in Nagpur division. It occurs occasionally scattered in 10527.25 ha in 39 compartments of three ranges viz Deolapar, Ramtek and Parseoni and in some of old bamboo plantations throughout the division. Hence, such areas are kept under this working circle.

16 cutting series, each having 3 coupes – A, B and C.

16. NWFP

- Official NWFP collection figures which are mostly for gum (Dhawada) are not very encouraging.
- Kullu gum collection (illegal) needs to be strictly controlled and stopped completely.
- NWFP species like Dhawada (even if their % is high) need reservation against felling.
- Identification of non-traditional NWFP species needs attention.
- Regeneration NWFP trees through their inclusion in plantation programme and manipulating NR (root suckers).

- There is a need to improve tapping technique for gum. FRI method of gum tapping has been proposed and only 50% of mature trees are prescribed to be tapped.
- Proposed to link it with JFM programme to increase stocking of NWFP trees, methods of collection as well as exploration of non-traditional NWFPs.
- NWFPs other than tendu, and those reserved for TDC, need to be identified and a mechanism to control their production and disposal need to be developed.

  Creation of database in this regard has been proposed.

17. Wildlife (overlapping)

i. Wildlife is in effect synonymous with bio-diversity conservation. Wildlife (Protection) Act 1972 provide elaborate provisions for wildlife conservation outside the PAs also that is in managed forests.

ii. Forests of Nagpur division occupy an important place in wildlife management on following counts.
   - Organizing special and effective anti-poaching measures in Central India.
   - Providing corridor to PTR as well as Bor WLS.
   - Developing eco-tourism in Vidarbha area.

iii. Implementation of standing order 001 from PCCF (WL) in letter and spirit is suggested, which mandates.
   - preparing inventory of water holes and special vigilance there
   - Sensitizing and strengthening anti-poaching machinery
   - timely and effective dealing of compensation cases of injury due to wildlife.

iv. Identification of ecologically sensitive sites which are important from wildlife management point of view.

v. Development of eco-tourism in 45 sites and 20 circuits identified.

vi. Development of following facilities at Gorewada.
   - Zoo
   - Nature Interpretation Center
   - Forest Park

vii. Special conservation of alternative home of GIB in Nagpur-Mauda-Umred-Butibori-Nagpur as designated PPA-Pilot Project Area, with the NGO intervention.

18. Miscellaneous regulations

1. Fixation of outer boundaries

   Priority areas
   - Erstwhile Forest villages,
   - Zudapi jungle and non-forest land made available as compensatory land,

- Protected forests.

2. Management of miscellaneous area (Zudapi jungle and Non-forest land). Besides the demarcation and fixation of boundaries of these lands, attempts will be made to collect scientific information during the currency of this plan so that regular management of these lands is started as early as possible. For the areas of Ambazari and Gorewada, prescriptions have however been given under P&CAM&CAM as well as wildlife overlapping working circle.
3. The RF and PF have been digitized fully and the geo-media cell in the officer of the Conservator of Forests, Working Plans Circle, Nagpur is now the custodian of this information. PF ahs been digitized using village maps. Hence, these maps should be very handy for management as well as for fixing the boundary. However, some validation prior to routine use of these maps is recommended.
4. JFM arrangements are recommended to be given due place of prominence while deciding the agency of harvesting / working. GFRM, RSM&A and NWFP working circles are specially recommended for this purpose. Areas under other working circles, and activities prescribed therein, may be assigned to JFMCs on case to case basis. However, due to the high skill and periodical monitoring, working in old teak plantations has been prescribed to be through departmental agency only.

   It is recommended that different categories of forests (areas under different working circles) may be assigned to a JFMC; the needs of the village/s identified and quantified on the basis of nistar partak and wazib-ul-arz; and such needs/dependences are met from the forests assigned. These aspects will be covered in the micro-plan developed and formulated for each village.

19. Reorganization constituting two divisions - North and South Nagpur, which is long overdue, has been reiterated in this plan also. The division in its present form is unwieldy and hence is recommended to be split into two during this plan period.

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IV. Local and Botanical names of Plants occurring in Nagpur Forest Division

A. Trees

Local Name	Botanical Name	Family
Achar	Buchanania latifolia (Spr.)	Anacardiaceae
Amaltas/Bahawa	Cassia fistula, (L.)	Caesalpiniaceae
Apta / Kachnar	Bauhunia racemosa, (Lam.)	Caesalpiniaceae
Aonia	Phyllanthus emblica, (L.)	Euphorblaceae
Aran	Cassine glauca, (Rottb.)	Calastraceae
Arjun / Kahu	Terminalia arjuna, (DC.) Wight	Combretaceae
Ain	Terminalia tomentosa	Combretaceae
Babul / Babhool	Acacia arabica, (L.) Wild ex Del.	Mimoseae
Bad/Wad	Ficus bengalensis(L.)	Moraceae
Behada	Terminalia belerica (Gaertn.) Roxb.	Combretaceae
Bel	Aegle marmelos (L.) Corr.	Rutaceae
Bhirra	Chloroxylon swietenia (Roxb.) DC	Rutaceae
Biba/Bhilawa	Semecarpus anacardium	Anacardiaceae
Bija	Pterocarpus marsupium, (Roxb.)	Fabaceae
Bistendu	Diospyros montana, (Roxb.)	Ebenaceae
Bor/Ber	Ziziphus mauritiana, (Lam.)	Rhamnaceae
Chichwa	Albizzia odoratissima, (Lf.) Bth	Mimoseae
Chinch/Imli	Tamarindus Indica,(L.)	Caesalpinaceae
Datrangi	Ehretia laevis, (Roxb.)	Ephretiaceae
Dhaman	Grewia tiliaefolia, (vahl.)	Tiliaceae
Dhaora/Dhawada	Anogeissus latifolia, (R.Br. ex. DC)	Combretaceae
Dhoban	Dalbergia paniculata, (Roxb.)	Fabaceae
Garari	Clelstanthus collinus, (Roxb.) Bth. ex. Hook. F.	Euphorbiaceae
Ghogar	Gardinia latifolia, (Soland.)	Rubiaceae
Ghoti/Ghot	Ziziphus xylopyra, (Sedgw) Sant	Rhamnaceae

Local Name	Botanical Name	Family
Gogal/Gongal	Cochlospermum religiosum, (L.)	Chlorospermaceae
Gular	Ficus glomerata,(Roxb.)	Urticaceae
Haldu	Adina cordifolia, (Roxb.)	Rubiaceae
Hiwar	Acacia leucophloea	Mimoseae
Hirda/Harra	Terminalia chebula, (Retz.) Wild	Combretaceae
Jambhul/Jamun	Eugenia Jambolana, (L.) Skeels	Myrtaceae
Kalakarai	Casearia elliptica, (Wild.)	Fabaceae
Kalaphetra	Randia uliginosa, (DG)	Rubiaceae
Kakad	Garuga pinnata,(Roxb)	Burseraceae
Kakai	Flacourtia indica,(Burm. f.)	Flacourtiaceae
Karai	Miliusa velutina,(Dunal)	Anonaceae
Karam/Mundi	Mitragyna parviflora,(Roxb)	Rubiaceae
Karanj	Pongamia pinnata, (L.) Prerre	Fabaceae
Kashid	Cassia siamea, (Lam.)	Caesalpiniaceae
Kateain/Kasai	Bridelia retusa , (L.) spr.	Euphorbiaceae
Katsawar/Semal	Bombax ceiba, (L.)	Bombaceae
Khair	Acacia catechu, (L.F.) Wild	Minosaceae
Khirni	Manilkara hexandra, (Roxb.)	Sapotaceae
Kullu/Kulu	Sterculia urens,(Roxb.)	Sterculiaceae
Kumbhi	Careya arborea, (Roxb.)	Lecythidiaceae
Kusum	Schleichera oleosa, (Lour.)	Sapotaceae
Lendia/Lenda	Lagerstroemia parviflora, (Roxb.)	Lythraceae
Lokhandi	Ixora arborea, (Roxb.) ex.J.E.sm	Rubiaceae
Maharukh	Ailanthus excelsa, (Roxb.)	Simaroubaceae
Medsing	Dolichandrone falcata, (Seem.)	Bignoniaceae
Moha/Mahuwa	Madhuca longifolia, (Koen.) Macbride	Sapotaceae
Mokha	Schrebera swietenioides, (Roxb.)	Aristolochiaceae
Moyen/Mowai	Lannea coromandelica (Houtt.)	Anacardiaceae

Local Name	Botanical Name	Family
Neem	Azadirachta indica, (A.Juss.)	Maliaceae
Padar	Stereospermum susveolens	Bignoniaceae
Palas	Butea frondosa (Lam.)Taub	Fabaceae
Pangara	Erythrina variegata (L.)	Fabaceae
Rohan	Soymida febrifuga (Roxb.)	Meliaceae
Sag/ Sagwan/Teak	Tectona grandis, (L.F.)	Verbenaceae
Saja/Ain	Terminalia tomentosa, (Heyne ex. Roth)	Combretaceae
Salai	Boswellia serrata, (Roxb.ex. Colebr)	Burseraceae
Shisham	Dalbergia latifolia, (Roxb.)	Fabaceae
Shiwan/Siwan	Gmelina arborea, (Roxb.)	Verbenaceae
Siras (Black)	Albizzia lebbek, (L.) Bth.	Mimosaceae
Siras (White)	Albizzia procera, (Roxb.) Bth.	Mimosaceae
Sissoo	Dalbergia sissoo (Roxb.)	Fabaceae
Sitaphal	Annona squamosa, (L.)	Annonaceae
Subabul	Leucaena leucocephala (L.)	Mimosaceae
Surya	Xylia xylocarpa, (Roxb)	Mimosaceae
Tendu	Diospyros malanoxylon (Roxb)	Ebenaceae
Tiwas/Tinsa	Ougeinia dalbergioides, (Roxb.)	Fabaceae
Tondri	Casearia tomentosa, (Roxb.)	Samydaceae
Umber	Ficus glomerata, (L.)	Moraceae
Wandra/Bainsa	Salix tetraperma, (Roxb)	Salicaceae
Warang/Baranga	Kydia calycina, (Roxb.)	Malvaceae
White kuda/Satkuda/ Kuda	Holarrhena pubescens (Buch. Ham.) Wall. ex. G. Don	Apocynaceae

B. Shrub

Aal	Moringa citrifolia, (Linn.)	Celastraceae
Bharati	Maytenus emarginata, (Wild)	Celastraceae
Bhawarmal	Hamlitonia suaveolens, (Roxb.)	Rubiaceae

Local Name	Botanical Name	Family
Dikamali	Gardenia resinfera, (Roxb.)	Rubiaceae
Dudhi/Kalakuda	Wrightia tinctoria, (Roxb)	Apocyanaceae
Gautri	Grewia hirsuta (Vahl, symb.)	Tiliaaceae
Ghaneri/Ulta	Lantena Camera, (Linn.)	Verbenaceae
Jilbili	Woodfordia fruticosa, (Kurz)	Lythraceae
Kaladhotra	Datura metel, (Linn)	Solanaceae
Katekolati	Barleria prionites, (Linn.)	Acanthaceae
Katumber	Ficus hispida, (Linn)	Moraceae
Kharata	Dodonea viscosa, (Linn.)	Sapinadaceae
Kharasani/Kharasi	Nyctanthes arbortristis, (L.)	Astraceae
Muradsheng/ Marophal	Helicteres isora, (L.)	Sterculaceae
Neel	Indigofera tinctoria, (Linn.)	Fabaceae
Nirgudi	Vitex negundo, (L.)	Verbanaceae
Phetra (Safed)	Gardenia turgida, (Roxb)	Rubiaceae
Rui	Calotropis procera, (Aitl) R. Br.	Asclepiadaceae
Sindhi/Chhindi (Palmae)	Phoenix sylvestris, (Linn)	Areacaceae
Waghnakhi	Martynia annua, (Linn)	Martyniaceae

C. Herbs

Divali	Tephrosia hamiltonil, (Drumm)	Fabaceae
Gajargawat	Parthenium hysterophorus (Linn)	Astraceae
Gokru	Tribulus terrestris (Linn)	Zygophyllaceae
Hamata	Stylosanthes hamata (L.)	
Kamarmodi	Tridax procumbens (Linn)	Astraceae
Pivla dhotra	Argemone mexicana (L.)	Papaveraceae
Pivilitilwan	Cleome viscosa (Linn)	Cleomaceae
Rantulasi/Bantulasi	Hyptis suaveolins (Linn)	Lamiaceae
Rantur	Atylosia scarabaeoides, (L.)	Fabaceae

Local Name	Botanical Name	Family
	D. Bamboo and Grasses	
Bans/Bamboo	Dendrocalmus strictus, (Roxb)	Poaceae/ (Gramineae)
Bhurbhusi	Eragrostic tenella, (L.)	Poaceae/(Gramineae)
Dab/Dabat/ Phylpya	Imperata cylindrica, (Beauv)	Poaceae/(Gramineae)
Diwartan	Andropogan pumilus, (Roxb)	Poaceae/(Gramineae)
Duswa/Hariyalli/Doob	Cynodon dactylon, (prs)	Poaceae/(Gramineae)
Gadasheda	Chrysopogon fulvus, (Spr)	Poaceae/(Gramineae)
Ghonad	Themeda quadrivalvis (L.), O.ktze	Poaceae/(Gramineae)
Fuler	Arundinella setosa, (Trin)	Poaceae/(Gramineae)
Katanbahari/Kusara	Aristida funiculata, (Trin. et. Rupr)	Poaceae/(Gramineae)
Katang bamboo	Bamboosa arundinacea, (Willd)	Poaceae/(Gramineae)
Khas	Vetiveria zizaniodes, (Linn) Nesh	Poaceae/(Gramineae)
Kusal	Hetropogon contortus, (Linn)	Dicanthium
Marvel (Small)	Dicanthium annulatum, (Forssk)	Poaceae/(Gramineae)
Marvel (Big)	Dicanthium aristaum (Poir)	Poaceae/(Gramineae)
Mushan	Iseilema laxum (Heck)	Poaceae/(Gramineae)
Paonia	Schima sulcatum (Heck)	Poaceae/(Gramineae)
Phulkia	Apluda mutica, (Linn)	Poaceae/(Gramineae
Sabai / Sum	Ischaemum angustifolium (Heck)	Poaceae/(Gramineae)
Sheda	Sehima nervosum (Rottl.)	Poaceae/(Gramineae)
Tikhadi	Cymbopogon martini (Roxb.)	Poaceae/(Gramineae)
	D. Climber	
Aradphari	Olax scandens, (Roxb.)	Olacaceae
Chilati	Mimosa hamata (Willd)	Mimoseae
Dhimarwel/Malkagni	Celastrus paniculatus (Willd)	Celastruseae
Dhudhi/ Bokadwel/ Nagwel	Cryptolepis buchanani, R. & S.	Periplocaceae
Eruni	Zizyphus oenoplia, (L.) Mill	Rhomnaceae

Local Name	Botanical Name	Family
Gunj	Abrus trecatorius, (L.)	Fabaceae
Gulvel	Tinospora coardifolia, (Willd)	Menispermaceae
Kajkuri	Mucuna pruriens, (L.) D.C.	Fabaceae
Khadyanag/ Langali	Gloriosa superba, (L.)	Liliaceae
Khobarvel	Hemidesmus indicus, (L.) Ait.	Periplocacea
Kukudranji	Calicopteris floribunda, (Land)	Combretaceae
Mahulbel	Bauhinia vahli, (Wand. A)	Caesalpiniaceae
Nasbel	Milletia extensa, (Bth.) Baker	Papilionaceae
Papri Lalbel	Vantilago denticulata, (Willd)	Rhamnaceae
Palasvel	Butea superba (Roxb)	Liliaceae
Piwarvel	Combretum ovalifolium (Roxb)	----------
Ramdaton	Smilax macrophylla,	Smilaceae
Vasanvel	Cocculus hirsutus, (L.) Diels.	Menispermaceae

F. Parasites

Amarvel	Cuscuta reflexa, (Roxb)	Cuscutaceae
Bandha/ Bandh	Vanda tessellata, (Roxb)	Orchidaceae
Scabra	Stylosanthes scabra	----------
Tarota	Casia tora, (Linn)	Caesalpiniaceae

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V. The Common and Zoological names of Animals and Birds commonly found in the Nagpur Forest Division

Common Name	Zoological Name
A. Animals	
Tiger	Panthera tigris
Panther	Panthera pardus
Hyaena	Hyaena hyaena
Wild dog	Cuon alpinus
Jackal	Canis aureus
Fox	Vulpes bengalensis
Leopard cat	Felis bengalensis
Jungle cat	Felis chaus
Nilgai	Boselaphus tragocamelus
Sambhar	Cervus unicolor
Cheetal	Axis axis
Barking deer	Muntiacus muntjak
Wild boar	Sus cristatus
Sloth bear	Melursus ursinus
Four horned antelope	Teraceros quadricornis
Langur	Prebytis entellus
Palm squirrel	Funambulus palmarum
Procupine	Hyhtrix indica
Hare	Lepus ruficaudatus
B. Birds	
Painted sand grouse	Pterocles indicus
Common sand grouse	Pterocles exustus
Pea fowl	Pavo cristatus

Common Name	Zoological Name
Grey jungle fowl	Gallus sonneratil
Grey partridge	Francolinus pondicerianus
Black breasted quail	Cturnix coromandelicus
Indian bustard quail	Turmix suscitator
Pigeon	Treron phoenicaptera
Crane	Grus antigone
Dove	Streptopelia spp.
Cotton teal	Nettapus coromandelianus
Whistling teal	Dendrocygna javanica
Vulture	Otogypa calvus
Owl	Sivix Spp.
Pied kingfisher	Ceryle rudis
Jungle babbler	Turdoides striatus
Black drongo	Dicrurus adsimilis
Blue jay	Coracias bengalensis

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Draft Working Plan Report of the Nagpur Forest Division

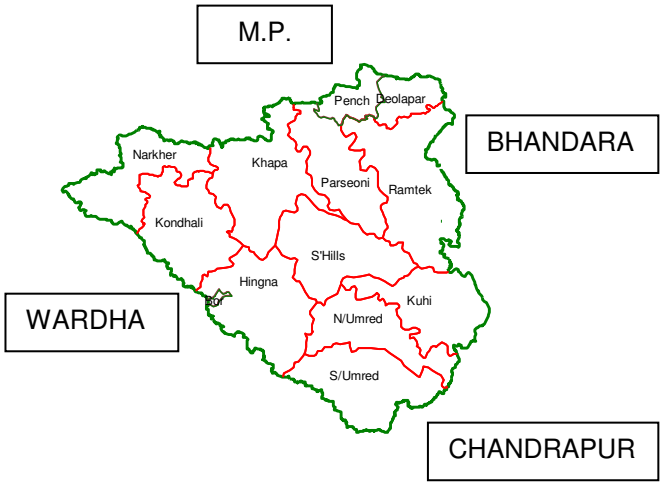
Part – I: Summary of the Facts on which the Proposals are based

Chapter 1. NAME AND SITUATION

1.1. INTRODUCTION

1.1.01. This working plan deals with all the forest areas of the Nagpur district except those forest areas which have been transferred to the Pench National Park, Bor Wildlife Sanctuary and the Forest Development Corporation of Maharastra (FDCM). The total forest areas of the division are 2388.857 sq km of which 273.479 sq km constitute the Protected Areas of Pench National Park and Bor Sanctuary and 394.110 sq km are with the FDCM. It constitutes 24.14 percent of geographical area of the district, which extends over to 9,892 sq km.

1.1.02. The forest areas included in this working plan is 1721.268 sq km, out of which 852.124 sq km are the Reserved Forests, 26.405 sq. km are the new Reserved Forest, 700.426 sq km are the Protected Forests and 146.17 sq km are the Zudupi Jungles and 2.935 sq km as the Non Forest lands. The Jawala Prasad's Plan for these forests expired in 2000, leading to its revision in the shape of this plan. The Division constitutes a compact forest block in North-eastern part while in the remaining areas of the Division, forests patches are found scattered and interspersed with non-forest areas.



1.1.03. The boundary of the Nagpur Division is coterminous with the boundary of the Nagpur district. The Nagpur Division extends over to 20º 35' to 21º 44' North as latitude and 78º 15' to 79º 40' East as longitude. The boundaries of the tract dealt with are given, as under:

North	Chhindwara and Seoni Districts of Madhya Pradesh
East	Bhandara District of Maharashtra
South	Chandrapur and Wardha Districts of Maharashtra
West	Amaravati and Wardha Districts of Maharashtra

1.2. CONFIGURATION OF THE GROUND

1.2.01. The forests are widely spread and mainly situated on hilly slopes surrounded by cultivated plains. The majority of forest areas in the Division are plain and undulating, whereas, West and North-east portions are hilly. Altitude in the Division varies from 274 meters to 652 meters above Mean Sea Level. The highest point falls in the Narkhed Range along the boundary with Madhya Pradesh.

1.2.02. Major hill ranges of the Division are the Satpura Range, the Ambagarh Hills and the Pilkapar Hills. Southern fringes of the Satpura Range extend to the Nagpur District. This range is narrow in the West while it widens towards the East. The Ambagarh Hills having famous Ramtek temple are located to the South of Satpura hills. The Pilkapar Hills, consisting of low hills in the western part, continues towards South-east part of Umrer after cutting off the valley of Nand on its southern side, and crosses the Katol Tahsil from North to South.

1.2.03. The Division is well drained and falls in the catchments of the Wardha and the Wainganga rivers. Jam, Kar and Vina rivers drain the western part before draining into the Wardha river. Southern part of Umrer Tahsil is drained by Nand river, which meets Vena and ultimately drains into the Wardha river. Pench and Kanhan drain the central part and Koilar joins them at Kamptee. Thereafter, Kanhan flows at boundary of Kamptee and Kuhi Tahsils and drains into the Wainganga river. Nag and Amb drain Umrer and Kuhi Tahsils. Nag joins Kanhan, while Amb drains directly into the Wainganga river. Bhiwapur Tahsil is drained by Mau, which flows along the North and eastern boundary of the division and discharges into the Wainganga river. Sur after flowing along Ramtek Tahsil also drains into the Wainganga river.

1.3. GEOLOGY, ROCK AND SOIL

Geological formation

1.3.01. Ancient crystalline rock mainly consisting of gneiss and granulate occupy North-east portion, and a 25-km wide East-west stretch in North-central part of the division. The Deccan Trap volcanic flow lies in western and southern parts of the division. In addition, a large number of sedimentary rock formations including some coal bearing beds are also found (Table 1.1).

Table 1.1. Rock formations in Nagpur District (Source: The Geological Survey of India)

Geological formation	Rock assemblage	Geological Period
Alluvium	Soil, Kankar and Laterite	Recent.
Deccan Trap	Volcanic flow with partings of sedimentary rocks like limestone and sandstone	Upper cretaceous Eocene
Lameta	Conglomerate, Sandstone, limestone and clay	Upper cretaceous
Gondwana super group	Dark brownish and Grey sandstone	Permian
Sausar group		
(i) Bichua fomation	Crystalline lime stone and dolomite	Middle proterozoic
(ii) Junewani formation	Muscovite-biotite schist and dolomite.	----do---
(iii) Chorbaoli formation	Quartzite & quartz	----do---
(iv) Mansar formation	Muscovite-biotite schist with manganese ores	----do---
(v) Lohangi formation	Calc-gneisses and black manganiferous marble with some manganese ores	----do---
(vi) Sitasaongi formation	Quartz-muscovite schist feldspar-muscovite schist and intercalated quartzite.	----do---
Geological formation	**Rock assemblage**	**Geological Period**
Sakoli group	Chlorite-muscovite schist and middle phyllite (undifferentiated)-proterozoic	
	(a) Chlorite schist with andalusite porphyroblast	Middle proterozoic
	(b) Chlorite schist with chloritoid porphyroblast	----do---
	(c) Chlorite schist with magnetite	----do---
	(d) Phyllite	----do---
	(e) Chlorite schist with chloritoid,staurolite garnet	----do---
	(f) Rutile-quartz-tourmaline-muscovite schist with kyanite,dumortierite or sillimanite	----do---
	(g) Biotite gneisses, granulite and biotite aplite	----do---
Granite gneiss	Granite, quartzite, amphibolites and granite gneiss	Archean lower proterozoic

1.3.02. The Tirodi-biotite gneiss, streaky gneiss consisting of Hornblende gneiss and amphibolite, is found in the central part. Northern part has a fairly wide East–west stretch of banded and foliated crystalline rocks. Manganese bearing rocks are found in the Sausar group. Metamorphosed rocks of the Sakoli group are located in the southern part. These rocks are intruded by tourmaline-garnet-muscovite granite. The Sakoli group, at places, has indications of base metals and Tungsten mineralisation near Bhiwapur and Agargaon in Umrer Tahsil, respectively.

1.3.03. The Deccan Trap occupies almost half of the division and gives rise to characteristics plateau-type hills separated by broad valleys in West and Southwest. The Trap is a thick pile of basaltic flow sometimes up to 60 km thick with sedimentary Inter-Trappean beds of limestone, and sandstone deposited during breaks in volcanic activities. Trap basalt is usually dark grey compact and fine grained rock with clinkery surface and irregular to sub-rounded blocks. Laterite capping tops the Trap zone areas at places.

1.3.04. Conglomerates and sandstone of the Vindhyan super-group are exposed over a stretch of about 3 (three) kilometres in southern part of the Dongal ridge South of Tarna and around Deni in Umrer Tahsil. Narrow and disconnected stretch of exposed fosilliferrous sandy and gritty lime stones constituting the well known Lameta beds are found at about 40 km south-east of Nagpur and about 10 km north-west of Umrer. These are succeeded by the Deccan Trap volcanic flows. Towns of Kamptee and Umrer have coal bearing sandy-clayey rocks belonging to the Godwana super-group. Many important coal-fields of the Central India are yielding coal from these beds. Alluvium with thickness up to 30 meter at places occupies the Wainganga basin.

Mineral Deposits

1.3.05. Nagpur district is well known for its minerals of economic importance. In addition to coal, clay and building stones, major minerals in the district include manganese, copper and tungsten ores.

1.3.06. Coal occurs near Kamptee and Umrer in the Barakar rocks of the Gondwana super-group. Coal found here is of low non-coking grade having high moisture content. However, it is quite useful for steam generation; and is used in two major thermal power stations, namely, the Koradi and Khaperkheda in the district. This coal is also supplied to the Indian Railways and to some steel plants, primarily, for steam generation.

1.3.07. Clay deposits are associated with the Kamthi formation of the Gondwana Supper-Group. Estimated clay reserve is 1.2 million tonnes. It is used for manufacturing pipes and stoneware, and one such unit is at Kanhan. Kamthi sandstone yields good building stones and a number of quarries are located at Silewara and Bokhara. Trap basalt is also used for road metal, concrete aggregate and blocks. Marble of the Sausar Group extracted near Koradi and Kandri is used for lime production and marble chips.

1.3.08. About 55 known deposits of manganese ore having 3.33 million tonnes of recoverable ore is found in 50 km. long and 17 km. wide stretch in Ramtek Tahsil. The known sites include Gumgaon, Ramdongri, Kodegaon, Kandri, Satak, Mandi, Lohdongri, Kachurwahi, Waregaon, Bhandarbodi, Manegaon, Maudekasa and Hiwara. A part of the extracted ore is used for manufacturing ferromanganese in a plant at Kanhan. Most of the mined ore is consumed in various steel plants within the country while a small part is exported also.

1.3.09. Copper mineralisation had occurred along contact zone between quartzite and phylite of Sakoli group near Pular and Parsori in Umrer Tahsil. Tungsten bearing Wolframite and schists in chloritic schists of Sakoli group is found at Agargaon in Umrer Tahsil over a belt of 1400 meter. Gold is found in Bluish-grey quartz veins in Sakoli formation. Stream sands near Mokhabardi and Kolari in Umrer Tahsil also have grains of gold.

Soil types

1.3.10. Soil types in the division are strongly influenced by the dominant underlying rock types – the ancient metamorphic rocks and the Deccan Trap. The metamorphic rocks are found in Ramtek, Deolapar, Parseoni, Khapa, Kuhi and north east of North Umrer ranges. The Archean rocks produce a variety of soils. Slow decomposition and small soil movement produces rich 'Kankar' soil, but rapid disintegration and much flux produces coarse and sandy soil. Alluvium derived from this rock is never stiff as the fine particles of sand prevent the blocking of the soil pore space. Alluvium in metamorphic zone is very good for the tree growth. Soil is mostly sandy-loam, which is eminently suited to the tree growth.

1.3.11. Deccan Trap is found in Narkhed, Kondhali, Hingna, South Umrer ranges and in the parts of North Umrer range. Soils derived from the Trap differ on the basis of the compactness of the source rock. Two kinds of Trap rocks are distinguishable. Compact, hard and homogeneous type. Such rocks weather very slowly and process of soil formation is extremely slow. These soils can support poor quality tree growth. Other rocks are softer basalt exfoliating in concentric flakes. It decomposes rapidly yielding fine yellowish brown loamy soil capable of supporting valuable tree crop. Finer soil grains and decomposed organic matter are gradually washed away and deposited in the lower sheltered regions forming *'Regur'* patches or black cotton soil. This is a fine-grained dark soil, which varies greatly in colour, consistency and fertility. It becomes highly adhesive when wet and contracts to an unusual extent under influences of heat and drought. Being clayey in nature, *'Regur'* is highly hygroscopic, that is, absorbs large quantity of moisture when it is dry and the soil particles begin to swell at the saturation point reducing considerably the soil pore space. This causes water logging. Although this soil is chemically rich, it is not always suited to raise plantation unless the drainage is good. For instance, good forests on such soils can be seen along streams with vertical cutting. Presence of kankar (calcareous content) in '*Regur*' generally indicates high alkalinity and such soil are less suitable for growth of vegetation. The proportion of SiO_2/ RiO_2 in such soils is very high and these soils also have high dispersion constant. Sand and silt are the products of physical weathering and clay is the product of chemical weathering and it is clay which determines the quality of soil like high water holding capacity, acidity etc.

1.3.12. The inter-trappean formation disintegrates into fertile loam capable of supporting good forest growth. The soil derived from Lametas does not seem to be influencing the vegetation. Micaceous schists of Sakoli series produce rich loam that supports valuable mixed forests of the division. Laterite, a vesicular mixture of hydrated oxides of iron and aluminium, is found at some places. After weathering, it retains much moisture in the wet seasons and dries quickly in the dry period. Hence, it is generally poorly suited for teak growth.

1.4. CLIMATE

1.4.01. Nagpur has hot and dry climate with distinct three seasons: summer, rainy and winter seasons. The summer starts from mid-February and continues till onset of the monsoon in the middle of June. April and May are very hot and day temperature may soar up to 45º C. For instance, in the year 1998 the maximum temperature was 46.8º C in the month of May and the minimum temperature was 6.6^{0}C in the month of December. Rains start in the middle of June and continue up to the end of September. Few showers are common in October and November. The winter starts from the end of November and lasts till mid-February. Diurnal temperature range is maximum during March and minimum during August. Very hot summer adversely affects vegetation growth more so because of highly radiating exposed quartzite and basalt in the tract **(Appendix 1.1).**

RAINFALL AND HUMIDITY

1.4.02. The rainy season generally starts from the second week of June and continues up to the end of September every year. About 85 percent of rainfall is received during the summer monsoons. Maximum rainfall, about 29% of the total, is received during the month of August. The average annual rainfall in the division is about 1,100 mm. Rainfall is usually higher on ridges of the Satpura in (Deolapar ~1200 mm), Ramtek and Parseoni ranges, and gradually decreases towards the west. Rainfall in Katol is about 869.95 mm. The number of rainy days varies from 59 to 82 per annum. **(Appendix 1.2).** It is mostly the south-west monsoon originating in Arabian sea. Winter rains are negligible.

1.4.03. The relative humidity is the highest in the month of August, generally, decreases till the month of April, thereafter, it begins to increase again with the onset of the summer monsoon.

FROST, DROUGHT AND WIND

1.4.04. Although rare, the frost occurs occasionally in Khapa, Parseoni, Deolapar and Ramtek ranges, along the Pench River and other low lying areas. Occurrence of frost causes injuries to the young forest crop especially that of teak, lendia and garari. Some frost damage to young growth in low-lying patches has been recorded in 1928-29, 1936-37, 1942-45 and 1945-46. The damage is less as the tropical species have an adaptation to pass into dormant phase during the winter.

1.4.05. The worst damage to the forest crop due to drought was occurred in 1939-40 and 1941- 42. Mature and established crops are seldom affected by drought. However, natural regeneration and the young crops are affected severely due to lack of soil moisture, that is, physiological dryness and increased probability of occurrence of forest fires.

1.4.06. The winds are generally moderate, but occasional storms occur in the pre-monsoon period. Six months from October to March experience North-easterly wind, and the months of April to September have South-westerly wind.

1.5. WATER SUPPLY

1.5.01. High temperature, existence of only a few perennial rivers and quick draining off of the rainwater causes acute water scarcity in the division during the summer months. It is estimated that rainfall more than 5 cms per day usually results in surface runoff. Drinking water in many villages is supplied by tankers. However, construction of many dams, both big and small, has eased out the situation to some extent over a large area. The Forest Department has also built many anicuts and tanks in the forest areas **(Appendix 1.3a).**

1.5.02. There are many dug-wells and bore-wells to tap the groundwater. Depth of dug-wells varies from 12 to 15 meters, and their yield is 45,000 – 1,00,000 litres per day. Most of the wells, however, go dry after March. Bore-wells are generally 50 to 60 meters deep, and have yield in the range of 11,000 – 75,000 litres per day. Metamorphic rocks have good groundwater storage with well-defined water table, but the groundwater in the Deccan Trap zone is confined to joints and sheeted zones along the flow contacts and the bole beds. Interconnected vesicles in vesicular basalt may make such rocks permeable and good aquifer. **(Appendix 1.3b).**

1.6. DISTRIBUTION AND AREA

RESERVED FORESTS

1.6.01. The total Reserved Forests (RF) in the undivided Nagpur division was 1,87,191.55 hectare in 72 blocks, till 1959, when the Wardha division was carved out by transferring 52,657.33 hectares in 217 compartments of the Reserved Forests. The balance Reserved Forests with the Nagpur Division at that time was 1,27,881.55 hectares, in 497 compartments. These Reserved Forests are often referred as Old Reserved Forests (ORF). Subsequently, 11,270.71 hectares of the Protected Forests was notified as Reserved Forests during 1977-78. These forests are, referred as, the New Reserved Forests (NRF). **(Appendix 1.4).**The net balance Reserved Forests in the charge of Nagpur Division constitute 85,212.41 ha in 407 compartments and is given in Table 1.4. The area 2640.45 ha. of Gorewada and Ambazari has been notified in 1990 under section 4 of IFA, 1927. This has been constituted into 10 compartments.

PROTECTED FORESTS

1.6.02. Consequent to the abolition of the proprietary rights in 1951, the ex-proprietary forests were taken over by the Government. Subsequently, 97,492.228 hectares of the ex-proprietary forests in 594 villages was handed over to the Forest Department and declared as the Protected Forests in 1955. A total of 2,784.06 hectares of the Protected Forests was deforested for various purposes in different villages during 1970-73. As described above 11,270.71 hectare of the Protected Forests in 72 villages were declared as the Reserved Forests in 1977-78. The balance area of the Protected Forests in this division is 70042.60 hectares, distributed in 594 villages of the division have been organized in 501 compartments. The net Protected Forests in the charge of Nagpur Division have been given in **Table 1.4**. The matter relating to regulation of removal of

forest produce and grant of licenses etc. for such removal by local people from these protected forests is provided in the Bombay Protected Forests (Vidarbha Area) Rules, 1959. Area of 2 villages (Dhawalapur-mal & Pardi - rithi) were excluded in previous plan. The necessary corrections have been done under this plan for including this area and 2 compartments have been added accordingly. **(Appendix 1.5).**

ZUDUPI JUNGLE TAKEN OVER BY THE DIVISION

1.6.03. The Revenue Department has transferred 14,516.74 hectares of Zudupi Jungles in 621 villages to the division for management. The Range-wise Zudupi Jungles in the division are given in **Table 1.4. (Appendix 1.6).**

Non Forest Areas for Compensatory Afforestation The Division received 293.48 ha of Non-forest land for raising compensatory afforestation in lieu of forest areas diverted from the division for various non-forestry purposes. The details of non forest lands in the division are given in Table 1.4.

AREAS TRANSFERRED TO THE WILDLIFE DIVISION

1.6.04. Total forest area, falling in the Pench National Park and the Bor Wildlife Sanctuary measuring 27,347.91 hectares, was transferred to the Nagpur Wildlife Division. The Pench National Park has 25,220.45 hectares of the Reserved Forests in 90 compartments and 118.44 hectares in one compartment of the Protected Forests. Similarly 1,590.62 hectares the Reserved Forests, in 10 compartments; and 418.40 hectares the Protected Forests in 5 compartments, falls in the Bor Wildlife Sanctuary. The details of range-wise areas transferred to the Wildlife division have been given in **Table 1.2 and 1.3**. It has been noticed that a part of the compartment number 115 PF - in Malkapur village, covering area 75.74 ha, has wrongly been included and notified as Bor Sanctuary. The said compartment is far away from the outer periphery of the Bor Sanctuary, leading to management problems. It is therefore proposed that the Nagpur division would move a proposal to de-notify this area from the Bor Sanctuary, on priority basis. **(Appendix 1.7).**

Table 1.2. Net Forest Area of Division included in this Working Plan (in ha)

S.N	Range	Gross Area of Nagpur Division	Area transferred to FDCM	Area transferred to Wildlife	Net Area of Nagpur Division
1	Narkhed	14,663.10	--	--	14,663.10
2	Kondhali	22,739.55	1,882.88	7,5.74	20,780.93
3	Hingna	20,356.51	--	1,933.28	18,423.23
4	Khapa	10,115.58	1,747.84	--	8,367.74
5	Kuhi	12,730.00	4,769.14	--	7,960.86
6	S. Umrer	28,361.86	3,705.64	--	24,656.22
7	N. Umrer	24,155.58	3975.18	--	20,180.40
8	Ramtek	33,085.27	11,499.73	--	21,585.54

9	Deolapar	33,987.88	--	14,588.93	19,398.95
10	Parseoni	35,372.28	11,830.56	10,749.96	12,791.76
11	S. Hills	3,318.06	--	--	3,318.06
	Total	**2,38,885.67**	**39,410.97**	**27,347.91**	**172126.79**

AREAS TRANSFERRED TO F.D.C.M.

1.6.05. In accordance with of years 1978 and the 1980 Government Resolutions, 24,067.53 hectares of the Reserved Forests in 85 compartments was transferred to the Forest Development Corporation of Maharashtra Limited (FDCM) vide Principal Chief Conservator of Forests' letter No.773 dated 05/12/95. Later, Government Resolution dated 23/07/97 shows that 3,132.64 hectares of Reserved Forests in 12 compartments and 12,091.09 hectares of Protected Forests in 44 compartments, thus 15,223.73 hectares of additional forest areas is to be transferred to FDCM (No. FDC/1094/ case/ 578/ F-5). Therefore, 39,302.16 hectares forest area, including, 27,028.74 hectares of the Reserved Forests in 96 compartments; and 12,273.42 hectares of the Protected Forest in 47 compartments has been earmarked for transfer to FDCM. The details of range-wise areas transferred to the FDCM have been given in Table 1.2 and 1.3. Area transferred to the FDCM and the Wildlife Division Nagpur **(Table 1.3)** has been shown for the purpose to maintain area statistics of this division. **(Appendix 1.8).**

Table 1.3. Area transferred to FDCM and Wildlife Division (in ha)

Range	FDCM					Wild Life				
	RF		PF		Total	RF		PF		Total
	Com*	Area	Com	Area	Area	Com	Area	Com	Area	Area
Narkhed	---	----	---	---	---	--	--	---	--	--
Kondhali	9	1370.45	3	512.43	1882.88	--	--	1	75.74	75.74
Hingana	--	---	--	---	--	10	1,590.62	4	342.66	1933.28
Khapa	6	1747.84	---	---	1,747.84	--	---	--	--	-----
Kuhi	--	--	18	4,769.14	4,769.14	--	---	--	--	--
S. Umrer	2	680.28	12	3,025.36	3705.64					--
N. Umrer		----	14	3,975.18	3975.18	---	---	--	--	--
Ramtek	40	11499.73	--	---	11499.73	--	---	--	--	--
Deolapar	---	---	---	---		56	14,588.93	---	--	14,588.93
Parseoni	39	11830.56			11,830.56	34	10631.52	1	118.44	10749.96
S. Hills	--	--	--	---	---	---	---	---	---	---
Total	**96**	**27,128.86**	**47**	**12282.11**	**39,410.97**	**100**	**26,811.07**	**6**	**536.84**	**27,347.91**

Where, Com* is the Nos of Compartments.

AREA FOR MANAGEMENT BY THE NAGPUR DIVISION

1.6.06. The remaining forest area after excluding areas transferred to FDCM and the Wildlife Division is 1,72,121.47 hectares. It has been distributed in 407 compartments of Reserved Forests and 499 compartments of the Protected Forests alongwith Zudupi Jungles in about 880 villages of the division. The details of net forest areas available with the Nagpur Division and its range-wise distribution are given in **Table 1.2;** and the

range-wise distributions of various types of forest areas in the division have been given in

Table 1.4. Range-wise Area statement of Nagpur Forest Division (in hectares)

Range	Rounds	Beats	Reserved Forests		Protected Forests		Zudupi Jungles		Non Forest Land	Total
			Com	Area	Com	Area	Villages	Area	Area	Area
Narkhed	5	19	31	6155.40	63	7149.58	67	1358.12	0	**14663.10**
Kondhali	6	34	40	7611.53	96	11215.24	71	1892.08	62.08	**20780.93**
Hingna	6	28	53	9512.40	50	5650.01	107	3241.30	19.52	**18423.23**
Khapa	4	11	11	2082.86	28	3522.39	124	2550.61	211.88	**8367.74**
Kuhi	3	12	5	998.57	37	6526.94	35	435.35	0	**7960.86**
S.Umrer	7	39	61	14085.45	57	10253.69	38	317.08	0	**24656.22**
N.Umrer	3	28	25	6039.07	63	12081.35	39	2638.87	0	**20180.40**
Ramtek	8	33	67	14459.45	45	6565.75	41	560.34	0	**21585.54**
Deolapar	5	28	74	16847.73	28	2523.41	8	27.81	0	**19398.95**
Parsioni	4	19	39	7352.54	34	4554.24	49	884.98	0	**12791.76**
S.Hills	2	4	11	2707.86	0	0.00	42	610.20	0	**3318.06**
Total	**53**	**255**	**417**	**87852.86**	**501**	**70042.60**	**621**	**14516.74**	**293.48**	**172126.79**

BLOCKS AND COMPARTMENTS

1.6.07. Reserved forests of the division, except compartment no. 716 to 789, are divided into 48 blocks numbered 1–19, 25–30, 32–34, 36–39, 41– 48, 2A, 7A, 10A, 26A, 31A, 33A, 42A and 68A. These blocks except the block 68A have been marked on “4 inch =1 mile" scale topo-sheets. Block 68A was declared as the Reserved Forests in 1939. **(Appendix 1.9a)**

1.6.08. In 1934, the forest blocks were permanently divided into 497 compartments with numbers 1 to 38, 60 to 96, 276 to 313 and 331 to 714. One compartment numbered 715 of Seminary Hills was added in 1939. The Reserved Forests constituted in 1977-78 were divided into 74 new compartments bearing numbers 716 to 789. Compartment number 399 was completely disforested in 1952. **(Appendix 1.9b)** The missing compartment numbers pertains to Wardha division, which was a part of Nagpur division, till its formation as an independent unit in the year 1959. The area of Gorewada and Ambazari has been constituted in to 10 compartments bearing numbers 790 to 799.

1.6.09. Earlier the Protected Forests had 484 compartments. Compartment numbers 172 and 173 were made the Reserved Forests, and compartment numbers 318 and 446

were disforested. Net area under the Protected Forests is 82861.55 hectares. Jwala Prasad's Plan divided the Protected Forests areas into 480 compartments by clubbing survey numbers of the Protected Forests from adjacent villages. This plan proposes to assign a distinct compartment number to the Protected Forests of each village. Area of 2 villages (Dhawalapur-mal & Pardi - rithi) has been constituted as compartments having numbers 485 & 486.

1.6.10. Map prepared during Jwala Prasad's Working Plan transferred the Protected Forests boundaries on 4" = 1 mile topo-sheets from village maps of '16 inch = 1 mile' scale with the help of pantograph. Isolated patches of protected forests have been shown on separate sheets. The present plan has endeavoured to prepare digital database of the entire forest area in the GIS (Geographical Information System) environment. This includes digitisation of cadastral maps (village maps) of the protected forest area (of the 594 revenue villages).

ADMINISTRATIVE UNITS

1.6.11. For administrative convenience the ranges, rounds and beats were reorganised in 1982 and the entire division has been divided into 11 Ranges, 53 Rounds and 255 Beats. Range-wise distribution of forests is given in the Table 1.4. **(Appendix 1.10)**

DISFORESTATION PRIOR TO 1980

1.6.12. The disforestation made in Nagpur Division 10098.57 ha. in Reserved Forest **(Appendix 1.11a) and 2826.47** ha. in Protected Forest **(Appendix 1.11b).** Area of Forest villages 2113.18 ha. disforested and transferred to Revenue department **(Appendix 1.11c)**

AREAS DIVERTED FOR NON- FORESTRY PURPOSES UNDER FOREST CONSERVATION ACT, 1980

1.6.14 Forest areas as given in the appendix 20.4 are under non-forestry use and the provisions of Forest Conservation Act, 1980 are applicable in such cases. The total area of such forestland is 3794.91 ha under 121 projects, out of which Government of India has finally approved 86 projects involving 3615.96 ha and has principally approved 35 projects involving 178.95 ha. In lieu of this, 2933.93 ha of non-forest and 15974.03 ha Zudapi jungle have been made available to the division which includes 12194.05 ha made available against the projects of other divisions. Abstract of this is as follows:

Projects of Nagpur district					Projects of other district			
No of Pro-jects	Forest Land	Compensatory land			No of Pro-jects	Compensatory land		
		ZJ	NF	Total		ZJ	NF	Total
121	3794.91	846.05	2933.93	3779.98	43	12194.05	--	12194.05

No of Projects	Total Compensatory Area		
	ZJ	NF	Total
164	13040.10	2933.93	15974.03

1.7. STATE OF BOUNDARIES

1.7.01. The total length of the of external boundaries of the Reserved Forests in the division is 1804.01 km, of which 105.461 kms of the external boundary follows the permanent natural features. The remaining boundary is demarcated by artificial lines, 12 meters wide cleared and cut-strips; and marked by pillars at suitable intervals. All pillars have been serially numbered in anti-clockwise direction. If the boundary line is shared by other forest areas, centre of this width lies on the boundary, otherwise, the entire width lies within the Reserved Forest. The NRF do not have well-defined demarcation by pillars, at a number of places.

1.7.02. The total length of the boundary line of the Protected Forests extends over to 5,374.978 km. The boundaries of the Protected Forests have not been demarcated and maintained properly. Records of survey and demarcation done in 1958, as mentioned in the previous plan, are not available. These areas require survey and demarcation by fix boundary marks on priority basis to ensure the integrity and protection of the tracts under the Protected Forests. **(Appendix 1.12).** The position is likely to improve now as the fixation of permanent boundary marks on the outer boundary of the forests has been given a priority in the light of the directives given by the Hon. Supreme Court in the writ petition No.202/95 and 171/96. This work is being facilitated with the creation of a separate land cell in the office of the PCCF,M.S. Nagpur.

1.8. LEGAL POSITION

1.8.01. The forests of Nagpur district were declared as the **'Reserved Forests'** and the **'Protected Forests'** under the provisions of the Indian Forest Act, Chapter VII of 1878 as well as under the provisions of Indian Forest (Protection) Act, 1927. The relevant notifications, to this effect, have been listed, as follows:

A) RESERVED FORESTS

i) Notification no. 917 (b) dated 24/1/1879

ii) Notification no. 116 dated 11/3/1887

iii) Notification no. 1585 dated 3/4/1893

iv) Notification no. 1193 dated 7/3/1893

v) Notification no. 2629 dated 30/5/1895

vi) Notification no. 700-562-XI dated 18/7/1939 (Compartment 715)

vii) Notification no. FLD-3470/6975/F-2 dated 23/11/1977 notified 11,270.71 hectares of Protected Forests in 72 villages as the Reserved Forests.

B) PROTECTED FORESTS

i) Notification no. FLD-3057-853-XI dated 4/6/1955 declared the ex-proprietary forests taken over by the government as the Protected Forests.

C) SECTION 4 NOTIFICATIONS

The position regarding section 4 notification for the non-forest and Zudapi jungle lands made available to the division as indicated under para 1.6.14 and as explained under para 20.2 is as follows:

i) Notification No. FLD-3490/143390/CR101/F-3, dt. 25.10.1990.

Ambazari and Gorewada forests area 2640.45 ha

ii) Proposals for notification under section 4 for Zudapi jungle (14516.74 ha) has been sent by the Deputy Conservator of Forests, Nagpur through following letters:

1) Desk-13/Survey/3365, Nagpur, dt. 26.09.03
2) Desk-13/Survey/3401, Nagpur, dt. 29.09.03
3) Desk-13/Survey/4157, Nagpur, dt. 29.10.03
4) Desk-13/Survey/4928, Nagpur, dt. 02.12.03
5) Desk-13/Survey/4950, Nagpur, dt. 04.12.03
6) Desk-13/Survey/6131, Nagpur, dt. 31.01.04
7) Desk-13/Survey/6145, Nagpur, dt. 03.02.04
8) Desk-13/Survey/6987, Nagpur, dt. 20.03.04

iii) Non-forest land of 293.48 ha is yet to the notified.

1.9. RIGHTS AND CONCESSIONS

A) RESERVED FORESTS

1.9.01. No rights in the Reserved Forests has been recognized, except right to way and access to water. There is no commutation of nistar or paidawar in the Nagpur Forest Division. Various concessions have been granted to the agriculturists and to others local inhabitants by the erstwhile Government of Madhya Pradesh and Government of Maharashtra, from time to time. The following, concessions have been allowed to the local inhabitants.

- The grazing of cattle belonging to the agriculturists of certain villages in the vicinity of the Reserved Forests in accordance with the grazing rules in force.
- Agriculturists of villages in the vicinity of the Reserved Forests have been provided with the facility of certain quantity of timber, bamboo and firewood for their bonafide domestic use at concessional rates from the coupes under working. None of these concessions is a legal right and these may be withdrawn by the government if the need so arises.

B) PROTECTED FORESTS

1.9.02. Before abolition of the proprietary rights, the rights and concessions were governed by the '*Wazib-ul-arz*' - a village record for settlements; showing the survey numbers and areas set apart for each particular purpose. The Central Province Land Revenue Code 1917, in section 202, provided punishment for violation of the recorded customs. After enacting of the Madhya Pradesh Abolition of Proprietary Rights (Estates, Mahala, Alienated Lands) Act, 1950 (Act I of 1951), all communal and other wastelands became property of the Government. In order to distinguish between the rights existing on such lands, the Madhya Pradesh Land Revenue Code, 1957 prescribed preparation of the '*Nistar Patrak' and 'Wazib-ul-arz*' for every village. The Nistar Patrak deals exclusively with management and use of the government land while the *Wazib-ul-arz* deals with community and customary use over private land. The nistar patraks are applicable to all the Protected Forests in the division.

Xerox copy of Nistar patrak and Wazib-ul-arz of Chargaon, (P.C.No.27) of Ramtek taluka is given in **(Appendix 1.12a.)**

1.9.03. The nistar inquiry had been conducted in Nagpur district during 1954-1956, and this inquiry included villages having the Protected Forests. The nistar officers had formed 'grazing zones' and 'nistar zones' by clubbing together surplus villages with deficit villages while self-sufficient villages had been treated as individual zones. Villages assigned to particular zone can exercise their nistar rights within that zone only. The classification of the villages into surplus, deficit or self sufficient for the exercise of nistar rights was made on the following basis:

- A village having tree clad area equal to half the occupied area was considered to be self-sufficient.
- A village having tree clad area more than half the occupied area was considered to be surplus village.
- A village having tree clad area less than half the occupied area considered to be a deficit village.

GRAZING CONCESSIONS

1.9.04. For the purpose of forming grazing zones, each head of cattle in the cotton-jowar tract should have 0.2 hectare grazing area and that in other tracts it should have 0.4 hectare, was taken as the basis. Villages in which the grazing lands are less than the above requirement was clubbed with the neighbouring village in which such area exceeds the above standard. In villages, where grazing lands was just sufficient for the needs of the cattle of that village, no rights for persons residing in other villages to graze their cattle have been recognised unless already recorded in the '*Wazib-ul-arz.'*

1.9.05. Villages clubbed as above constituted a grazing zone. The clubbing of the villages was done in such a way that the villagers were not required to take cattle to a distance longer than the distance, which the cattle can easily cover in a day. Within a specific zone all persons are at liberty to graze their cattle free until, otherwise, ordered by the Collector. **(Appendix 1.13).**

1.9.06. The directives contained in the Madhya Pradesh Land Reforms Department's memorandum no. 1290-1227-XXVIII, dated 4th September 1953 prohibited grazing by sheep and goats in forests meant for production of big timber and even in the forest areas where villagers generally exercise their nistar rights. This ban is because while grazing in the forests, these animals also uproot seedling regeneration of the important species. However, subsequent directives from the Government have allowed grazing by sheep in specified areas but continued complete prohibition on grazing by goats. Following norms of concessional grazing have been prescribed under the Protected Forests (Vidarbha Area) Rules, 1959:

a) Cultivators-2 plough cattle per plough plus 4 others including one she-buffalo.

b) Agricultural artisans and labourers –

4 cattle including one she-buffalo;

Provided further that all animals in excess of those specified in 5;

Provided that a calf under one year shall not be counted;

Provided further that all animals in excess of those specified in clauses (a) and (b) shall be charged at such rates as the State Government may from time to time sanction in this behalf.

OCCUPATIONAL NISTAR

1.9.07. In the nistar patraks, the occupational rights of the *Kumbhars, Chambars, Gonds, Mahars, Pradhan and Lohar* communities have been recorded and recognised in several villages and their entries are found in the *'wazib-ul-arz'*- the village instrument prepared for each village.

1.9.08. The nistar is required by the villagers for *bona fide* domestic and agricultural purposes. Forest nistar generally includes timber of certain species and sizes for *agricultural implements, houses and cattle sheds, fire woods, bamboo, thatching and fodder grasses, fencing material, bark, fibre, minor minerals and paidawar i.e. edible fruits, flowers and roots, honey wax, etc.* The rights and concessions are governed by the provisions made in the Nistar Patrak for each village. Generally, agriculturists and agricultural labourers are entitled to kinds of forest produce given in the following paras, for their nistar either free of charge or at concessional rates fixed by the Collector, from their nistar zones only.

SMALL TIMBER AND POLES

1.9.09. According to the zone arrangement made by the Nistar Officers, the villagers are entitled to obtain their nistar requirements of small timber and poles from the available material from the forests included in a particular zone either free or on payment up to a certain quantum fixed by the Collector. In order to meet the demand of the cultivators of the villages which were not included in the zone, the nistar officers have prescribed that in the event of supply being in excess in a particular zone after meeting the demand of zone villages, the excess could be given to persons outsides the zone on payment at the rates fixed by the Collector

TIMBER FOR CONSTRUCTION OF NEW HOUSES FROM EX-PROPRIETORY FORESTS

1.9.10. Madhya Pradesh Government through their Memo No.2525/650/C.R. (Land Reform Department) dated 29/10/1956, decided that timber for construction of new houses can be supplied to the agriculturists on a certificate issued by the Revenue Officer, on the concessional rates equal to half the market rates.

SUPPLY OF SALAI WOOD IN MARRIAGE CEREMONIES

1.9.11. Several communities use green salai poles as *kham, adam and thuni* in marriage ceremonies. The villagers are permitted to remove their requirement up to the maximum limit of two trees on permits.

FIREWOOD, BAMBOOS AND OTHER USUFRUCTS

1.9.12. Removal of firewood from Khasra numbers, set aside for meeting the nistar requirements, have been permitted free of cost as per rights recorded in Nistar Patraks to the prescribed extent for bona fide use of the assigned villages.

1.9.13. Dry bamboo is allowed to be removed free from the ex-proprietary forests for *bona fide* nistar needs. Green bamboo is permitted on payment of the prescribed royalty. Where thorns are not available, removal of brushwood such as lops and tops of the felled trees and bamboo are permitted. Where removal of thorns and brushwood is allowed free of cost or at nominal rates, the existing practice continues.

1.9.14. Bark, fibre and roots are allowed to be removed where it is customary to allow their removal for cordage.

1.9.15. Moha, achar, tendu or other edible fruits, flowers and roots are allowed to be removed free of cost from all over the forests for domestic consumption. The removal however, is permitted by head loads only. This concession however does not include harra, lac, rosha grass, tendu leaves and gums as they are not included in nistar but villagers are allowed to collect these forest produce found in their land in a protected forests. These provisions are contained in the Protected Forests (Vidarbha Area) Rules, 1959.

1.9.16. As regard occupational nistar, ghont; fruits and dhaora leaves are allowed to be removed by the charmakers free of charge. They are also allowed to remove the *bakkal and kahu* bark on nominal payment from trees marked for felling.

1.9.17. In the Nistar Patrak of each village the khasara numbers set-aside for nistar and grazing are recorded. The details regarding quantum of nistar, period during which it is to be allowed, payment if any to be made, etc. are generally not given in the nistar patraks. The Protected Forests are no longer in a position to meet most of the nistar requirements of the people because of unsustainable exploitation, illicit removal and heavy grazing in the past. Most forest areas have been severely degraded, and need immediate rehabilitation to restore their health and productivity. Much of these forests have been encroached because the outer boundary of the forests are not clear.

1.9.18. Misuse of right in reserved forests is covered under section 24(2) of IFA, 1927, read with section 77 and in protected forests under section 33 of IFA, 1927 and under section 167 of Maharashtra Land Revenue Code, 1966

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Chapter 2. THE FORESTS

2.1. COMPOSITION AND CONDITION OF THE CROP

2.1.01. The forests of Nagpur division belong to the **Sub Group 5A - Southern Tropical Dry Deciduous Forests** as per the revised classification of 'Champion and Seth'. Underneath this main sub group, considerable local variations occur depending primarily upon the edaphic factors such as parent rock and consequent soil types; topography of the tract and the past treatment provided to these forest crops. The aspect also plays an important part in determining the character of the vegetation in the hilly areas. In the hilly tracts, the western and northern slopes are generally better stocked than the eastern and the southern slopes. This is because the moist conditions exist for a longer period in such tracts. The geology, soil type and depth also plays an important role in determining the composition and quality of the forest crops. The biotic factors like grazing and fires also contribute to the variations in the crop composition; leading to forest degradation in many areas of the Division and seriously damaging the natural regeneration of tree species and other micro flora.

Table 2.1. Forest types found in the Nagpur Division (Champion and Seth's classification)

Type Notation		Type description
Group 5		Tropical Dry Deciduous Forests
Sub-group 5 A		Southern Tropical Dry Deciduous Forests.
Climate types	5A/ci 5A/cia 5A/cib	Dry Teak Bearing Forests Very Dry Teak Forests Dry Teak Forests.
	5A/c-3	Southern Dry Mixed Deciduous Forests
Edaphic types	5/E-2 5/E-4 5/E-5	Bosewellia Forests Hardwickia Forests Butea Forests
Degradation stages	5/D S1 5/D S2	Dry Deciduous Scrub Forests. Dry Savannah Forests
Primary serial type	5/ISI	Dry Tropical Riverain Forests

2.1.02. Teak is predominantly found as pure crop in South Umrer, Hingna, Kondhali and Narkhed ranges as well as in parts of the Parseoni, Deolapar and Ramtek ranges. Mixed forests with scattered teak are found in Ramtek, Khapa, Kuhi, Deolapar, North Umrer and Parseoni ranges. Teak is a calcicolous plant growing well in soil rich in $CaCO_3$. Teak is a best example of a migratory plant species following the deposition of lime.

2.1.03. Soils derived from different geological formations viz. the metamorphic rocks and the Deccan Trap; varies in chemical composition and structure and, thereby, strongly influences the quality, density and composition of forest vegetation cover they supports. The different forest types found in the division based on distinct geological formation are given, as under;

A) FORESTS IN THE METAMORPHIC ZONE

2.1.04. The forest areas falling in the metamorphic zone of this division support, the following, types of forests;

i). Good quality teak forests.

ii). Good quality mixed forests interspersed with teak.

iii). **Poor quality mixed forests with scattered teak;** the local variations (edaphico-biotic) found within this subtype are given, as follows;

(a) Bhirra forests
(b) Garari forests
(c) Rohan forests
(d) Moha and Palas forests
(e) Mowai forests

B) THE FORESTS IN THE TRAP ZONE

2.1.05 The forest areas falling in the Trap zone of this division support, the following, types of forests:

(i) Good quality teak forests.

(ii) Poor quality teak forests.

(iii) **Mixed forests;** comprising of the following types due to local (edaphico-biotic) variations in the forest tracts of this zone;

(a) Ain forests.
(b) Kalam forests
(c) Salai forests.

2.2. DRY TEAK BEARING FORESTS

2.2.01. Three distinct types of Teak forests can be recognised: (A) Good quality teak forests in the Metamorphic zone, (B) Good quality teak forests in the Trap zone and (C) Poor quality teak forests in the Trap zone

(A) GOOD QUALITY TEAK FORESTS IN THE METAMORPHIC ZONE

2.2.02. These forests are found in the Parseoni and Deolapar ranges where the soil is sandy loam, deep and well drained. As the conditions are favourable for the growth of teak, it forms about 20--60% of the stocking. The site quality of the crop varies from IVa to II; as the top height is varies 13 m to 24 m. The density of the crop varies from 0.6 to 0.8. The over-wood consists of *teak, ain, tendu, dhaora, bija, salai etc. The middle storey consists of khair, ghot, achar, gararai, ghoghar, karai, etc.* Bamboo is also found in a few compartments in Parseoni range. The under-wood consists of neel*, muradsheng, kharasi, etc*. The common climbers found are *piwarbel, mahulbel, palasbel, malkagni, ramdatun, etc*. Metamorphic rocks like granite, gneiss, schestose, limestone carry high proportion of teak because they are associated with limestone.

(B) GOOD QUALITY TEAK FORESTS IN THE TRAP ZONE

2.2.03. This type of forests is mainly found in the southern part of South Umrer range. Teak is the predominant species forming about 40 to 80% of the stocking of

the forest crops. The density varies from 0.4 to 0.7 and the top height varies from 10m to 18m. The site quality of the crop is primarily IVa and IVb. The common associates of teak found in these forests are *ain, dhaora, tendu, salai and mowai*. The soil is black cotton and gets waterlogged during the rainy season. The trees mainly found in the middle storey are *ghot, achar, aonla and dhaman*. Trap is a natural home of the teak.

(C) POOR QUALITY TEAK FORESTS IN THE TRAP ZONE

2.2.04. This type of forest is found mainly in Kondhali, Narkhed, Hingna; and part of South Umrer ranges. The forest tracts in these ranges constitute refractory areas having shallow soil layer, which are prone to heavy grazing and frequent fires. The quality of the forests is mainly IVb. Teak is the predominant species consisting about 50 to 70 percent of the crop. The density of the crop varies from 0.4 to 0.6. The main associates of teak in the over-wood are *dhaora, lendia, ain, movai, bhirra, achar, bel, etc.* The common shrubs found are *zilbili, bharati, kharasi, ber and neel*. The main climbers found in such areas are *chilati and eroni*. Usually such soils are either very dry or very moist. The post climax changes in such soils have resulted in poor growth of teak.

2.3. THE MIXED FORESTS

2.3.01. The mixed forests may be divided into the following 2 categories:

(A) Mixed forests with scattered Teak in the Metamorphic Zone

(B) Mixed forests in the Trap Zone.

(A) MIXED FORESTS WITH SCATTERED TEAK IN THE METAMORPHIC ZONE

2.3.02. The forests are composed mainly of miscellaneous species and teak occurs scattered or in patches spread through out the crop. These types of forests are found in Khapa, Parseoni, Deolapar and Ramtek ranges. The over-wood consists of *ain, lendia, dhaora, rohan, garari, bhirra, salai, bel, aonla, etc*. The site quality varies from III to IVa/IVb; whereas density of the crop varies from 0.4 to 0.8. The state of regeneration is far from satisfactory in the areas adjoining the villages. The under wood consists of *khair, ber, ghot, dikamali, gogal, etc*. The main shrubs are *bharati, zilbili, kharasani and neel.* The common climbers found are *piwarbel, ramdatun, chilati and mahul*.

The local variations (edapho-biotic) types found within the this sub type are given, as follows:

BHIRRA FORESTS

2.3.03. Bhirra is the main species found in the areas where the soil is shallow, sandy and arid. The common associates of *bhira are lendia, dhaora and garari*. The forest crop is generally of IVb quality. It is common in plateaux.

GARARI FORESTS

2.3.04. Large patches of garari are found in the Reserved Forests, north of Bhakari in Deolapar range; and also in the Protected Forests of Manegaon, Bandra and Chawri villages. It also occurs as under-storey in the Teak and Mixed forests in Deolapar range and also in the Protected Forests of North Umrer and Kuhi ranges. The site quality of these forests is generally found to be IVb.

ROHAN FORESTS

2.3.05. In the forest tracts, where the soil is calcareous and coarse, Rohan has been found to grow well. Good patches of Rohan are found in some eroded areas of Deolapar and Ramtek ranges, as well. The usual associates found are *bel, mowai, bhirra and dhaora;* while bharati and zilbili occurs as the undergrowth. It is mainly found in water logged areas containing lime.

(B) MIXED FORESTS IS THE TRAP ZONE

2.3.06. These forests are mainly confined to the areas having poorly drained clayey soil. The over-wood consists mainly of ain, dhaora, tendu, lendia, moha, mowai, bhirra, rohan, salai etc, whereas, the under-wood comprises of mainly Kharasi, bharati, zilbili and kuda. The density of the forest crops varies from 0.2 to 0.5; and the site quality is IVb.

The local variations (edaphic) found within this sub type are given, as follows;

AIN FORESTS

2.3.07. Ain is found to thrive in the low-lying areas with heavy soil, where drainage is poor due to the presence of clay. The site quality of forests in such patches is generally poor. These forests are found in the Reserved Forests of Dhamangaon, Dhighori and Amghat felling series of South Umrer range as well as in the Protected Forests of Lohara, Pandhartal, Sedeshwar, Kachalkuhi, Nandra in South Umrer range and Tekadi and Salaimendha in North Umrer range.

EDAPHIC TYPES

5/E 2 - SALAI FORESTS

2.3.08. In these forests salai forms the over wood and sometimes well grown medium to large trees occur on the flatter tops of the hills. It is generally 12m to 15m in height and 1.2 m to 1.8 m in girth. The only species that equalize it, in size, is kullu. In these forests salai is found with ghogal, dhaora, kullu, lendia, mowai and aonla. This type occurs on a variety of rocks, particularly, on the crystalline rocks and sometimes lateritic rocks as well as on the trap. The soil is shallow and dry and usually consists of boulders or pebbles. Hill tops, ridges, spurs and the well-drained plateaus are the usual sites. Reproduction of salai in such forests has been found to be scanty and, often, non-existing.

5/E 4 - ANJAN FORESTS

2.3.09. This type is found in small patches in the forest areas of the Seminary Hills where anjan is the predominant species. The soil is hard and gravelly overlying the trap rock formation. The other species occurring with it are teak, salai and shisham. Most of the anjan trees are middle-aged to mature; and the regeneration of these forests is found to be scanty or absent.

5/E 5 - PALAS FORESTS

2.3.10. This sub-type is found in the stiff badly drained very dry clayey soils and particularly in black cotton soils in the ill-drained flats and depressions. On the flat ground this sub-type presents a savannah appearance; with scattered stunted and malformed trees or thickets standing over the short grass or the bare ground.

2.4. SCRUB FORESTS

5/D S I - DRY DECIDUOUS SCRUB FORESTS

2.4.01. It consists of a low broken soil cover of shrubby growth 3m to 6m high, including some trees species reduced to similar conditions usually having many stems emerging out from the base. The grass occurs throughout in these forest tracts. In this type, two sub-types have been distinguished.

DRY TEAK SCRUB FORESTS

2.4.02. In these forests teak is found in the crooked and stunted form, due to maltreatment of the crop as a consequence of unregulated felling, lopping, grazing and fires. Here teak is associated with ain, bhirra, palas, etc.; with bharati being the thorny species. Such types of forests are found at several places in the Protected Forests of Kondhali and Narkhed ranges mainly on the badly eroded hillsides. Surface boulders are usually found exposed in such areas.

DRY MIXED SCRUB FORESTS

2.4.03. A considerable variety of degenerated forests could be included in this type. These forests are the result of long continued maltreatment, of which excessive grazing and repeated cutting are the chief factors. These forests usually grow under heavy grazing conditions. **Ain-dhaora-lendia** are the most common species found in the Protected Forests of Jabalpani, Tarana, Wag, Sonpuri, Ruyad, Mandhal, Weltur, Kitodi, Makheburdi, Salai-mendha villages. The other associates are tendu, moha, palas, hiwar, khair, ber, ghoti, bhirra, etc. The trees hardly reach the height of 6 metre in such areas. The other sub types found in this type are **Palas-khair-dhaoda** in the Protected Forests of Masalkund and Bhiwapur village. Ain, garari, salai and mowai are found in the Protected Forests of the Devlikala village.

5/D S2 - DRY SAVANNAH FORESTS

2.4.04. These are usually open forests and the trees stand far apart singly or in small groups in the heavy grasses. The trees have very short stems and are usually crooked, unsound and hollow. Thorny shrubs are also of common occurrence in

these forests. This type of forests is found in the Protected Forests of Kuhi and North Umrer ranges. The grass-birs at Champa and pasture areas at Matkazari are the typical examples. These forests are also found in the Protected Forests of Bhijpur, Sasegaon, Salesawari. Tuthanbori, Barwha, Borda, Salwa, Haladgaon, Bodkhipeth, Kharbi and Pratapgarh villages of the Kuhi range.

PRIMARY SERAL TYPE- 1S1- DRY TROPICAL RIVERAIN FOREST

2.4.05. These forests consist of an irregular over-wood of greater height than the climax Dry Deciduous Forests. The trees are of larger size and are found in narrow strips along the hilly section of the larger streams; and the strips become widened as the valleys get broader. Soils are sandy, often overlying more or less impervious rock formation, liable to be temporarily submerged during monsoon period and usually retain adequate water supply during most of the year. Arjun (Terminalia arjuna) is found in the over-wood and it is associated with a few species found in the underground such as *Kalam, Palas, Imli (Tamarindus indica), Sitaphal (Anona squamosa), Karanj (Pongamia pinnata), Jamun (Syzygium cumini), Aam (Mangifera indica)* etc. At places, Tamarix diocia is found as a shrub.

2.5. REGENERATION IN GENERAL

2.5.01. In the Metamorphic Zone coppice regeneration of teak, lendia, garari, bhirra, aonla, dhaman, khair, palas, ghot and baranga is satisfactory, while that of ain, dhaora, tendu and tinsa is inadequate. The seedling regeneration of teak, in the better quality areas of metamorphic zone, occurs in patches while in the trap zone it is quite inadequate and occurs singly and scattered in the well drained areas. Teak regeneration is found satisfactory in good quality areas of metamorphic zone.

2.5.02. Seedling regeneration of lendia, ain, dhaora, bhirra and gongal, is fairly satisfactory and occurs well distributed over most of the areas in the metamorphic zone except areas heavily grazed and contain thick growth of shrubs, climbers, grasses and areas severely eroded. Seedling reproduction of bhirra is particularly noticeable in the sandy and open areas of metamorphic zone. In trap zone areas where teak is tending to be pure, seedling regeneration of teak and other species is absent and the coppice regeneration is also inadequate to restock the area.

2.5.03. TEAK & ROCK

Teak is the predominant timber species found in the region and is associated with many species of varied importance and it is usually associated with metamorphic (calcareous, crystalline phyltite, schists and granite gneiss) rocks and Deccan trap (sills, dykes, flows, inter-trappean beds). It's associated with rocks of volcanic origin as they are rich in calcium. Teak is absent from sedimentary rocks due to leaching of calcium from such rocks. Chemical properties rather than structural geology of soils are more important for the teak to grow. Teak is usually absent from sandstone belt and therefore trap-Gondawana line is a perfectly separates teak and non-teak vegetation. Teak is present in such alluvium deposits while are rich in lime. The trap in this region contain 46.4% felspar. It is found growing best in it pH between 6.5 to 7.5

but subsoil acidity is not a dominating factor for the presence of teak. Teak is a calcium accommodating plant. It is found doing well is soils with high SiO_2/R_2O_3 ratio, a high dispersion coefficient and high moisture retention. It is replaced by Lagestromia parviflora in the swampy conditions, and by Xylea xylocarpa in lateretic soils.

2.6. INJURIES TO WHICH CROP IS LIABLE

2.6.01. The forests are subjected to injuries caused by a number of factors. They can be classified as injuries caused by man, wild animals and parasites as well as by factors like frost, drought, fire, etc.

A) DAMAGE BY THE MAN

2.6.02. Man causes primarily, the following, two types of injuries.

(1) Illicit Cutting: The illicit cutting of forests for timber, poles and firewood is a major factor causing serious problems of protection of forests throughout the division. It is heavy in areas adjoining the inhabited pockets of the division. The main consumption centres are Nagpur, Hingna, Kamptee, Katol, Umrer, where construction activities consumes the major share. Due to phenomenal increase in timber price of teak and other commercial species, inter-state illicit transport of timber and other forest produce from the division is a major challenge to deal with. Demand for firewood has also increased due to the increase in population compounded by the lack of an alternate and economical sources of energy. Increase in network of roads in forested tracts has further compounded the problem. During tendu season cutting and lopping of tendu trees is a common practice to enable easy collection of leaves. In addition to timber, illicit felling of bamboo has also increased due to the increase in population of Burads, who earn their livelihood by making bamboo mats and other bamboo articles. As a consequence, bamboo clumps have become malformed and deteriorated leading to poor culms growth and slow clump formation. Illicit felling has become a major cause for the deterioration of forests and depletion of the growing stock in the inhabited regions of the division. The illicit cutting has led to a serious deterioration of forest. The extent of illicit cutting during the last 10 years is given in the **(Appendix. 2.1)**

(2) Encroachment: The hunger for land is a main cause of forest encroachments carried out by the local inhabitants by clearing the forests, primarily, for agricultural purposes. Regularisation of encroachments in the forest areas in past has served as motivation for encroachments upon forest areas in anticipation of regularisation sometimes, in future. Enactment of the Forest Conservation Act, 1980 and its strict implementation, however, has reduced this tendency, to an extent. Recently, the state government through the resolution no. PWR-1196/296/17/L-2 dated 18/1/1997 has delegated the power of summary eviction of encroachment in forest areas to the forest officials of the rank of the Assistant Conservator of Forests and the Deputy Conservator of Forests.

2.6.03. Moreover, boundaries of the Protected Forests have not been well demarcated, at most of the places. As a result, the problem of encroachment in the

Protected Forests has become a thorny issue for the Department. Thus, prevention, detection and eviction of encroachment in forest areas in time can not be ensured due to lack of proper demarcation of these areas with permanent marks. In view of the cognisance taken by the Supreme Court, the issue requires addressal on priority basis.

DAMAGE BY CATTLE

2.6.04. Due to the manifold increase in the population of the cattle, which is very much in excess of the carrying capacity fixed by the grazing settlement, the pressure on the forests has increased to an alarming proportion. The nistar rights granted in the *malgujari* forests continued even after these forests were declared as the Protected Forests and hence the scenario in the Protected Forests is more severe as compared to the Reserved Forests. As a result of continuous and heavy grazing beyond sustainable limits, the soil gets compacted, which adversely affects the survival and growth of natural regeneration as well as plantations.

DAMAGE BY WILD ANIMALS

2.6.05. The damage by the wild animals has been found to be nominal only. Primarily, the damage is caused by wild boars who dig up the bamboo rhizomes, while the chital and nilgai cause damage by nibbling the young seedlings.

DAMAGE BY INSECTS, PARASITES AND CLIMBERS

2.6.06. The attack by defoliator (*Hyblia purea*) and skeletonizer (*Hapalia macharalis*) is of common occurrence in forest tracts having substantial percentage of teak. It is estimated that such insect attack causes 10% loss of increment. Hyblaea puera is a teak defoliator and it attacks forests of this region during the period of July and August i.e. during the rainy season. The attack is more sever in teak plantations. The teak trees practically become leafless. However new leaves soon emerge and remain on the tree up to November i.e. more than usual period of their existence on a tree and it has been observed in some experiments that the acquired longevity of leaves compensates loss due to attack of defoliator and hence net loss is insignificance.

The use of chemicals for the control of these insects is not feasible because of the short life cycle of these insects and extensive areas where teak forests exist. Biological control is advised and may be more effective. The parasites that feed on these insects are harboured on the following tree species.

1. Anogeisses latifilia,
2. Careya arborea
3. Cassia fistula,
4. Garuga pinnata
5. Grevia telifolia
6. Helicteres isora,
7. Lagestroemia parviflora
8. Xylia xylocorpa,
9. Terminaliatomentosa

Hence, the above species should be retained in considerable number in the teak forests.

Vitex negunda is the alternate host of above two pests.

Teak skeletonizor usually attacks during the end of rainy season i.e. around September. Because of this reason, loss due to skeletonizor attack is also not very significant. However, such damage on the growth of the teak has not been quantified.

2.6.07. Termite attack has also been observed in some parts of the division, leading to the mortality in the weaker plants. The fallen logs of Terminalia tomentosa are attacked by the insect called Aeolesthes holosericea usually in the month of June and July. The insects attacks the bark and hence as a protection the logs should be debarked kept in the open. Terminalia tomentosa as well as Terminalia bellerica is attacked by the insect Sinoxylon anale and S. crassam of family Bostrycideae (powder pest beatles that convert starchy sapwood into powder like substance), Acaolesthus holosericea of family Cerambycideae (insects that make a large tunnel inside the sapwood as well as hearwood), Sphenoptera kombicernis of family Buprestidaceae (instects that convert sapwood in to powder and Platyblis solidus of family Platypodilaceae (the insects damage timber by making black stem pin holes into it). The beatles however do not attack logs. The felled logs of Adina cordifolia (Haldu) is attacked by Xylotrechus smei. Very less number of pest species attacks Jamun. Lymexylonid borer and Atractocerus reversus attack Salai logs. In this attack, the insect makes a long sinuous tunnel inside the logs. Bija logs are attacked by Xylotrechus smei and Chrysobothrus species but logs are not attacked if they are debarked. Xylotrechus smei and Sepalus hypocritia attack Maharukh logs. The phenomenon of dying back of leading and lateral shoots of teak is noticed mainly due to attack of insect called Aelcides ludificator. Zanzera coffece attacks the young leaf of teak. Termites attack the collar of the small seedlings of teak. They also attack seedlings of Dhawada and Aonla. Dhawada is also attacked by bark eating caterpillars of Inderbela quadrinotales. Leaves of Garuga pinnata and Ficus glomerata are attacked by gall insects. Teak in nursery attacked by the whit grub called hototrcacher serrcta.

Fungal attack is also very common. The fungus usually enters through the damaged branches or through roots and usually destroys heartwood. Fungal attack is not common in softwood species. The affected tree does not die but is uprooted due to the wind pressure. Polyporus gilvus attacks the sapwood of Dalbergia sissoo, D. latifolia, Acacia arabica, Katha, bija, sirus (A. procera) and it causes white rot. In this fungal attack, heartwood is affected in a limited way. Ganoderma lucidum attacks Dalbergia sissoo, neem and Acrocarpus fraxinifolus. It being a root parasite attacks the tree through roots. The roots become brittle and leaves turn yellow. The other species of Ganoderma, G. applanitum attacks usually the dead logs but few living trees of species like sissoo, babul, bamboo and Jackfruit are also attacked by this fungus. It renders the wood spongy. Such affected tree becomes lighter and is thrown

away by wind. Fornes rimosus attacks Beheda, ain, dhawda and lendia. It is a facultative (opportunistic) parasite and enters the tree through injury. Only the heartwood is affected.

In very dry locality, teak develop hollowness at base while may go even upto 2-4 meter in height in heart wood and is caused due to decay active by Fungus Forres lividres and Polyporeus Zonates.

2.6.08. Parasite plant, bandh (*Loranthus longiflora*) was found on some trees especially achar, hiwar, etc.

2.6.09. The common climbers found are Chilati, Palasbel, Bokadbel, Yeruni, Kukutranj and Mahurbel. The damage is caused by strangling of trees when they entwine a sapling or a tree. If is climbers are not cut in the initial stages. They cause deterioration in the value of trees.

DAMAGE BY DROUGHT, FROST, WIND AND HAILSTORMS

2.6.10. Lowering of the water table caused by scanty or irregular rainfall cause drought like conditions and damage seedlings, saplings and occasionally young trees. Frost is quite uncommon. Occasionally, strong winds cause uprooting of trees. Hailstorms in the month of May cause damage to tendu leaves making them unfit for *bidi* making.

DAMAGE BY FIRE

2.6.11. The incidences of fire are very common in Nagpur Division due to deciduous nature of forests that provide a large quantity of combustible matter in the form of dried leaves, grasses and twigs. Considerable damage is caused by scorching heat, which kills the saplings, seedlings, ground flora and micro-fauna. Surface organic matter, which is the source of nitrogen to the plants, is destroyed in fire. However phosphorus, alkaline salts and alkaline oxides are returned to the soil. Alkaline ash containing higher percentage of these salts and oxides neutralises the acidity of soil. High temperature causes breaking up of colloidal clay complex leaving an inert material which has less moisture retention capacity. Besides such burnt soils become stiff and this leads to increased surface water run off. The silicate gel, which is available in soil, is burnt leading to laterization of such sides. Protozoan organisms are also killed in the fire. Repeated fires lead to reduced aeration.

2.6.12. All most all incidences are man-made. Tendu contractors set fires during tendu season to obtain profuse flush of leaves on the tendu shoots. Villagers also set fires to clear under growth under the Moha and gum-yielding trees to facilitate collection of moha flowers and gum. Sometimes, villagers also set fire to get good flush of grasses. Such fires if left unattended spread to the adjoining forest areas. **(Appendix 2.2)**.

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Chapter 3. UTILIZATION OF THE PRODUCE

3.1. AGRICULTURE CUSTOMS AND WANTS OF THE POPULATION

3.1.01. The Nagpur city was established in the eighteenth century by a Gond king, named as Bakhat Buland. Later, the Bhosle rulers made Nagpur its capital and ruled over the area till 1817, when Bhosle were defeated by the British forces. British took over the administration of Nagpur region in 1853 and made it capital of Central Province and Berar. After independence, it served as the capital of Madhya Pradesh till 1956, when reorganization of states was undertaken on language basis. Berar region was attached to Bombay State; and the Nagpur city lost its stature as a capital city. Subsequently, Maharastra state was formed on 1st May 1960 and the Nagpur City was provided the stature of second capital of the State. The Nagpur district has been named after the name of Nagpur city. Nag river originates in the western part, and flows through the middle, of the city but because of the disposal of city wastage and effluents into it, the river is highly polluted and has practically lost its character.

3.1.02. Nagpur is also known for its strategic location as the central point of the country viz. the city of Zero Mile. It is well connected with other major cities of the country through an elaborate network of roads, rails and Airways.

3.1.03. The boundary of the Nagpur Forest Division is coterminous with the boundaries of Nagpur district. It extends over to 9,892 sq. km. as the Geographical Area, forming 3.23 percent of Maharastra State; of which the forest areas extend over to about 2765 sq km; forming about 21.95% of its Geographical Area.

3.1.04. As per Socio-Economic Survey Report (2000-2001) of Nagpur District, the population of Nagpur district as per 2001 census is 40,51,444; of which, 64.36% live in the urban area while 35.64% live in the rural areas (Table 3.1). It forms about 4.19 percent of the total population of Maharashtra State. The rare of increase for the last ten years since 1991 census is 23.24 percent. The scheduled castes and scheduled tribe populations forms about 18.53% and 13.93% of the total population of the district, respectively.

Table 3.1. Taluka Wise Breakup of the Population of Nagpur District

Taluka	Area in square kilometer	Male population (in thousands)	Female population (in thousands)	Total Population (in thousands)
Nagpur City	218	847	778	1,625
Nagpur rural	684	63	71	134
Saoner	612	98	89	187
Parseoni	919	66	60	126
Ramtek	734	66	62	128
Mouda	952	56	52	108
Kamptee	455	95	88	183
Kuhi	829	55	53	108
Bhiwapur	692	38	37	75

Umrer	988	68	63	131
Taluka	**Area in square kilometer**	**Male population (in thousands)**	**Female population (in thousands)**	**Total Population (in thousands)**
Hingna	698	61	53	114
Katol	807	72	67	139
Narkhed	803	67	62	129
Total	**9,892**	**1,710**	**1,577**	**3,287**

3.1.05. The density of population of the district is 331 persons per sq. km, which is more than the State average (257 persons/sq km) as well as the national average (267 persons/sq km). As per census figures, there are 934 women for every 1000 men in the district, which is more than the state average of 922, in this regard.

3.1.06. The average literacy rate of the district is 84.18 percent, comprising 77.65 percent for women and 90.25 percent men,. Whereas, the literacy rate in the rural and urban areas is 75.76 percent and 88.75 percent, respectively.

3.1.07. For administrative purposed Nagpur district has been divided into 14 talukas, comprising around 1874 villages, including 312 as the uninhabited villages, organized into 13 Panchayat Simittees and 778 village Panchayats (Socio-economic Survey Report -2000-2001).

3.1.08. The 1997 livestock census estimated 10.94 lakhs domestic cattle in the district. Cows 21.53 percent and bulls 26.16 percent; buffaloes 11.22 percent; goats and sheep contribute about 39.31 percent and others around 1.78 percent of the domestic animals **(Table 3.2).** There is 3.1 percent increase in the livestock population, since the last livestock census in 1992. Most of these cattle graze in the forests, leading to their degradation, particularly, in the forest areas in the vicinity of the villages. As per District Social and Economic Status 1994-95 Report there are about 273 registered milk societies in the district. **(Appendix 3.1).**

Table 3.2. Taluka Wise Breakup of the Live - Stock Population in Nagpur District

(as per 1997 census)

Taluka	Bulls	Cows	Buffaloes	Goats	Sheeps	Horses	Others	Total
Nagpur City	1197	6108	7484	20,947	496	59	2425	**38716**
Nagpur rural	16958	18893	18606	32783	41	20	774	**92887**
Saoner	15381	13704	4288	30019	1236	7	1782	**73183**
Parseoni	16936	17169	3905	22041	278	3	949	**56261**
Ramtek	18658	10542	6858	24077	6	0	540	**65586**
Mouda	12395	10043	8880	21131	8	1	199	**59419**
Kamptee	23215	11260	5909	26386	405	6	2110	**57254**
Kuhi	20192	11773	4622	22492	669	124	574	**62956**
Bhiwapur	21584	17118	2794	15234	539	35	113	**50680**
Umrer	19603	21060	6016	21028	2335	9	865	**68955**
Hingna	13324	14353	5471	20569	2928	64	851	**57507**
Katol	16510	22108	7624	30450	495	12	1101	**78300**
Narkhed	17308	21856	7309	22313	1791	93	1048	**71718**

Kalmeshwar	12595	14252	4568	21150	3741	189	1159	**57654**
Total	**225856**	**210239**	**94334**	**330620**	**14968**	622	14490	**891119**
Percent	**25.34**	**23.59**	**10.58**	**37.10**	**1.68**	**0.07**	**1.62**	**100**

3.1.09. Land use pattern of the district reveal that about 71.60 percent of the total geographical area is suitable for the cultivation; and about 5.76 percent constitutes the grazing lands. In addition, around 11.25 percent area was not available for cultivation. In the year 1998-99, out of the 706 thousands hectares areas suitable for cultivation, only 544 thousands hectares (77.05 percent) were sown under various crops; of which around 11.19 percent area was under double cropping.

3.1.10. The main agricultural crops are Jowar, Wheat, Rice, Pulses, Cotton, Tur, Ground-Nut, Chillies, linseed and Oranges. The paddy is the main crop grown in the district. There are over ten (10) Agricultural Produce Marketing Committees where the agriculturists bring their excess material for sale. In the Tribal Sub-Plan Areas, as per the (Maharashtra Tribal Economic Conditions Upliftment Act (1956), the Government has declared monopoly over the purchase of food grains as well as the minor forest produce with the exception of Tendu. The Maharashtra Government has recently passed an Act. called Maharashtra Transfer of Ownership of M.F.P. in the Scheduled Areas and the Maharashtra M.F.P. (Regulation of trade) (Amended) Act, 1997 as Act. No. XIX of 1997 on 10th December 1997. According to section 4 of the Ordinance the ownership of the M.F.P. found in the Government lands in the scheduled areas, excluding the National Parks and Sanctuaries, shall vest in the Village Panchayats within whose jurisdiction such area falls. However the ownership of M.F.P does not include the ownership of land or trees in that Panchayat areas. The list of M.F.P covered under the ordinance is specified in the schedule. Tendu, Apata, Bamboo have been excluded from the purview of this ordinance and still remain the property of the State Government.

3.1.11. There are 1 major project, 15 medium projects and over 48 minor irrigation projects, in the district. In addition to this, works of several medium and minor irrigation tanks are in progress. In spite of this, the irrigation facilities in the district are not sufficient to meet the irrigation needs of the district. In the year 1998-99 around 15.92% of cultivated area was under irrigation. The total irrigation capacity of these projects is 2,47,823 ha, whereas, in the year 2000-01 only 58139 ha was brought under irrigation forming about 23.36 percent of the capacity.

3.1.12. There are over 7,73,170 households in the district, including 3,13,700 households in rural areas and in the 4,59,470 households in the urban areas. About 600 villages inhabit in the vicinity of the forest areas; and over 60 percent of the inhabitants of these villages depend on the forests to sustain their livelihood.

3.1.13. The rural population consists mainly of agriculturists and agricultural labourers such as *mahars, gonds, kunbis, telis, etc*. The way of life of the people in rural areas has direct bearing to the forests as they depend on forests for timber, poles, firewood, bamboo and grasses for constructing their housed and cattle sheds and making agricultural implements. They also require fodder, flowers and fruits as

well as variety of other non timber forest produce such as moha, gum, lac, honey, tendu leaves, herbs, roots etc for food and medicinal purposes.

3.2. WANTS OF THE PEOPLE

3.2.01. Teak is the most valuable species used for building purposes. However due to its prohibitive cost, other species like Bija, Ain, Tiwas, Haldu, Kalam, Siwan Rohan, Dhaora etc are being used as timber for various household purposes. Teak poles are used for centring purposes as well as for making houses, sheds etc.

TIMBER

3.2.02. Timber It is required for construction purposes and for making furniture for households and business enterprises. The most preferred timber species is Teak. Other species used are Bija, Ain, Tiwas, Haldu, Kalam, Dhaora, Bhirra, Lendia, Garari, Siwan and Bamboos. Demand is heavy in intensively cultivated plains of Ramtek, Saoner, Narkhed, Kondhali, Katol and Umrer talukas. In hilly areas of Deolapar and Khapa demand is limited.

3.2.03. For the construction of carts, teak is preferred for making the body, tiwas, ain, dhaman, lendia, dhaora or tendu for shaft, dhaora for axles, tiwas, kusum or kahu for naves, teak for spokes and shiwan for yokes; mowai and salai are also used if shiwan is not available in the required quantity. For the purposes of agriculture implements such as ploughs; tiwas, shiwan, khair and babul are preferred. Dhaman is usually used for axe handles and semal for dugouts.

FIREWOOD

3.2.04. The demand for firewood has greatly increased throughout the division. Large quantity of firewood is consumed in Nagpur and adjoining urban areas. Dhaora, khair, ain, garari and bhirra are the main species used as firewood in the division. Due to heavy demand, even the inferior firewood of soft wood species like salai, mowai and dhoban are also extracted to fulfill the demand. Local villagers usually remove dry fallen firewood on rated passes. However, it is a common sight to see the local people bringing head loads of firewood each day without passes from the adjoining forest areas, many a times by cutting the live trees as well.

BAMBOO

3.2.05. Bamboo is generally available in the forests of Parseoni, Khapa, Ramtek and Deolapar ranges. Bamboos are in great demand, locally, for providing support to fruit laden branches in the orange gardens and also for making mats, baskets and dholis. They are also use for making roofs and walls of their huts as well as the cattle sheds by the local inhabitants.

GRAZING

3.2.06. The cattle population has gone up many times in recent times while the carrying capacity of forests have remained the same. As a result there is lot of illicit

grazing in the forests. Even goats and sheep have been found grazing in the Reserved Forests. The demand for grazing is heavy in Kondhali, Narkhed , Hingna, Kuhi and South Umrer ranges. The grazing incidences in these areas are far beyond their carrying capacity leading to their deterioration in the process. Many *Kathiawadis* people with their large herds of cattle also settle near the large water bodies in these areas and frequently graze their cattle unauthorizedly, both, in the Reserved Forests and the Protected forests including the grass-birs and kurans of this division. Unauthorized grazing by the Kathiawadis and the local inhabitants is the main reason of deterioration of site conditions and carrying capacity of forest areas near the habitations. The issue requires a comprehensive strategy and approach for satisfactorily addressal, which is the sole cause for lack of regeneration and degradation of site conditions of majority of forest areas in this region.

NON TIMBER FOREST PRODUCE

3.2.07. The main NWFPs required by the villagers from the forests are Moha flowers and seeds, fruits, gum, bark, flowers, fibers, roots, leaves, thorns etc. Leaves of *teak, palas, palasbel, mahul and mahua* are used for various purposes such as for making *donas, plates, patrabalis* and covering the roofs of cattle sheds. The thorny branches of *ber, bharati, babul, chilati, eruni, ghot, hiwar, kharasi etc*. are used for fencing purposes to protect the crops from both the domestic and the wild animals. The vegetable growers use the thorny branches of *dikamali and khakri* as support for beans creepers. Cordage and lashing are made out from the bark of *kuda, palas, mahul and piwarbel*.

3.3. OCCUPATION AND INDUSTRIES

3.3.01. Besides agriculture, many small occupations and industries in the villages and the urban areas depend on various type of forest produce harvested from the forests. Orange gardens in Narkhed, Katol, Kalmeshwar, Saoner and Hingna talukas extensively use small poles and bamboo for supporting fruit-laden tree branches. Bamboo baskets or soft wood packing cases are also required for packing the oranges for transport to other areas. Similarly, Betal pans growers in Ramtek taluka need small poles or bamboo for spreading the climbers.

As the bamboos are confined to a few ranges in the division. It is not possible to fulfil the entire bamboo requirement of the people from the forests of Nagpur division.

3.3.02. Bidi making is an important small scale industry in this area. Kamptee and Nagpur are the important *bidi* manufacturing centres in the division. They depend solely on the forests areas to provide for the raw material – tendu leaves- required for wrapping tobacco. Moreover, tendu leaves collection is a main source of employment for rural poor and tribal living in the vicinity of forest areas.

3.3.03. There are over 522 sawmills in the Nagpur district which depend on the forests areas of the division for regular supply of timber. A large quantity of timber,

mainly teak, is consumed by these sawmills and the furniture shops in the rural and the urban areas. Furniture industry and carpentry, provide job opportunities to the hundreds of skilled carpenters engaged in furniture-making, joinery works, house construction etc. In addition, veneer and plywood board industry requires good quality teak and other miscellaneous species from the forest areas of this division for their sustenance and balanced growth. These sawmills are increasingly being dependent on the material being brought from the private land holdings.

3.4. COLLECTION OF NON WOOD FOREST PRODUCE

3.4.01. Some of the villagers, living nearby the forests, collect various NWFPs such as moha, charoli, gum, honey, roots, bark, leaves etc and sell them locally. Firewood, bamboos and grass are also collected on rated passes and sold locally. Most of the dhabas along the highways and hotels and shops in rural areas use firewood as a fuel for their preparations. Collection of NWFPs constitutes a substantial part of the income of tribal populations and other inhabitants living in and around in the vicinity of the forest areas.

3.5. MARKETS AND MARKETABLE PRODUCE

3.5.01. Markets: The forests of Nagpur are rich in valuable timber species, like, teak, bija, saja, haldu, kalam, rohan, bhirra, dhaora etc. The various products such as timber, poles, firewood and bamboos, after extraction from the forest coupes are brought to the forest depots for sale by public auction. The timber and other forest produce is partly consumed locally and mostly exported to Mumbai, Pune, Chennai, Kolkata, Delhi, Raipur and other consuming centres in the country. For local supply Nagpur, Kondhali, Umrer, Hingna, Katol, Saoner, Kamtee and Ramtek are the main market centres.

3.5.02. The major timber depots of Nagpur division are at Paoni, Nara, Sirmi, Ambazari, Umrer and Seoni. In the forest depots the timber is arranged species-wise, in distinct girth and length classes for the purpose of formation of lots for sale. After formation of the lots, grading of lots in distinct quality classes is done by the senior officers in the rank of Assistant Conservator of Forests. Deputy Conservator of Forests proposes the upset price for each lot on the basis of the grading proposed by the Assistant Conservator of Forests and the prevailing market price.

3.5.03. Firewood and bamboos are also brought to these depots for sale by public auction. Indora is a major bamboo depot in the division. The nistar material is also supplied from these depots. The forests area of this division is, however, inadequate to meet the fuel wood, bamboo and other nistar needs of the people of the district.

3.5.04. Various NWFPs such as gum, moha fruits, charoli, amla etc are sold in various weekly markets held through out at various places in the division. Tendu leaves also find their way in the market centres in Gondia, Bhandara, Pune and other major cities in Maharastra, Gujarat and Andhra Pradesh.

3.5.05. The materials seized, as a result of offence cases, are usually sold at the temporary depots at the range or round head quarters.

Marketable Forest Produce

3.5.06. **TIMBER AND POLES**: Teak wood is in the maximum demand due to its multiple utility and durability and material of any dimension is saleable. The timber and poles of Bija, Tiwas, Haldu, Saja, Chichwa, Shisham, Siwan, Dhaman, Khair, etc are also readily saleable. Due to steep rise in the prices of the teak and superior miscellaneous species, the species like Dhaora, Bhirra, Rohan, Kahu, Kusum and Kasai are also in demand. The softwoods species like Salai, Mowai, Semal, etc. are usually used for the purpose of making of the packing cases. Semal logs over 75 cm girth provide raw material for match making industry. Poles of Teak, Garari, Lendia and Dhaora are in demand; and are mainly used for making agricultural implements, rural housing, sheds etc. *The production of timber in the year 1997-98 was around 8204.00 cm*.

3.5.07. **FIREWOOD:** Due to increase in population, the subsistence need and market demand for firewood has gone up, over the years. Almost all the villagers in and around the forest areas entirely depend on firewood for their household energy needs. Small dhabas and hotels along main roads and in small towns also consume firewood to a large extent. The wood of species like Garari, Dhaora, Salai, Mowai, Palas and Dikamali is considered as a good firewood because of their high calorific value. In the depots, fuelwood is normally stacked in beats of '2m x 1.20m x 1m' dimension and sold in the open public auction. The average annual productive potential of the fuel wood in the Division is 30,500 cu m.

3.5.08. **BAMBOO:** Bamboo is mainly found in Khapa, Parseoni, Ramtek and part of Deolapar ranges. *Dendrocalamus strictus* is the main species found in the forests of this division. It is used by the burads for making mats, baskets, thatas etc. During the year 1997-98 over 3,62,548 bamboos was harvested in the entire division.

3.5.09. **TENDU LEAVES:** Nagpur is a major tendu leaves producing division and earns substantial revenue for the state exchequer. There are 67 tendu units in the division having annual productive potential of over 50,000 standard bags amounting to over Rs 3 crores revenue for the division. The total tendu collection for the year 1998-99 was 53,934.220 standard bags and the revenue realised was Rs 30,062,803. Tendu leaves collection and bidi making are the major employment generating occupations for the people in the division.

3.5.10. **GRASS:** The main grass species used as fodder in the division are *paonia, sheda, marvel and mushan*. Due to tremendous pressure of livestock on the adjoining forest areas the productive capacity of the forests for quality grasses have been severely affected. The productivity of even the kurans and grass-birs has been seriously impaired due to excessive unregulated grazing by both the local and the

kathiawadi cattle. The *khus grass* is usually used for making the mats which are used in coolers in summer.

3.5.11. MAHUA FLOWERS AND SEEDS: Mahua flowers and seeds are collected by the villagers who use them partly for their domestic consumption while the excess quantity is sold to supplement their incomes. The other NWFPs such as gum, lac, wax, honey, fruits, roots, bark, fencing material etc. are mainly collected by the villagers for their domestic bona-fide use.

3.5.12. MINERALS: The Nagpur forests are rich in mineral deposits. Manganese, coal, dolomite are the important minerals found in the division. However, after the enactment of the Forest Conservation Act 1980, prior approval of Government of India is required for mining or quarrying in the forest areas. Instances of illegal quarrying have also been noticed in the division. The issue require serious attention and focus of the department for its satisfactorily addressal.

3.6. LINES OF EXPORT

3.6.01. The division has very good network of rails and roads and are being used in transporting forest produce and movement of manpower in the division.

RAILWAY AND ROADS

3.6.02. The broad-gauge railway lines which pass through the division are Calcutta-Bombay via Raipur and Delhi-Chennai main lines as well as the Nagpur-Ramtek branch line. Three narrow gauge railway routes passing through the division are Nagpur-Nagbhir (Distt. Chadrapur) via Umrer and Nagpur-Chhindwara via Saoner. These railway lines help carry forest produce to various consumption centres both within the state and in the country.

3.6.03. The division is well connected by a network of 'National and State Highways' These are extensively used by timber merchants for transport of timber, firewood and other forest produce to the market places within the state and elsewhere in the country. There is a very good net work of forest roads, metalled as well as fair-weather roads, throughout the division .

3.7. METHODS OF EXPLOITATION AND THEIR COST.

AGENCY FOR HARVESTING

3.7.01. With the abolition of the contractor system for timber harvesting vide Government Resolution R & F D No. FCT/1581/93544-F-1 dated 4.4.1981 forest coupes are worked either through the Forest Labourers Co-operative Societies (FLCS) or directly by the Forest Department by engaging local labour. Annual coupes of other subsidiary cultural operations are normally worked departmentally and the produce obtained is disposed of by public auction. ***During the year 1995-96; over 76 coupes were allotted to 28 Forest Labour Cooperative Societies.***

3.8. METHODS OF FELLING AND EXTRACTION

3.8.01. As per practice, the vogue in the Department, marking of the coupes due for working is done a year in advance. Estimates are prepared and approved by the competent authority as per due process before starting the coupe operations. The harvesting is normally undertaken after the rainy season.

3.8.02. Trees marked for fellings are categorized as timber or fuel wood trees for the purpose of volume estimation of timber and fuel wood. The local volume tables are used for preparing the estimated volume of the timber and the fuel wood; expected to be harvested from the coupes. Chalk timber is sold separately.

3.8.03. The timber and pole wood trees are felled first; followed by firewood species. Saw is used for felling and conversion of timber while axe is used for fashioning purposes. After conversion of the felled trees into logs of merchantable sizes, their measurements are taken after carting to the jungle depot and are embossed at the butt end of the logs using digit nails. The volume read off from the ready reckoner along with the tree number and the log number are also embossed on the butt end.

3.8.04. The firewood is cut into billets of length 1.2 m and stacked as standard sized beats 2 meter long, 1.2 meter wide and 1 meter high. The beat stacks are normally formed in distinct girth classes. After taking entry in the jungle register, timber, poles and firewood are transported to the main sale depots. At the depots, the logs are measured again and assigned new serial numbers. The difference in two measurements reconciled later to ensure the accuracy of the material produced in the coupes and transported to the sale depot.

3.9. COST OF HARVESTING:-

3.9.01. All the coupe operations ranging from coupe marking to the transport of forest produce are carried out at the rates fixed by the Wage Board, for the current year. While fixing the wage rates for harvesting operations, wages sanctioned by the Government of Maharashtra and cost of living allowance (*Rahniman Bhatta*) are also taken into consideration.

3.9.02. BAMBOO: The bamboo is extracted from the coupes departmentally using local workforce as per prescriptions of bamboo working. The rates for cutting, fashioning, stacking and transporting are fixed by the Wage Board.

3.9.03. TENDU LEAVES: Tendu leaves trade has been nationalized by Government of Maharashtra Act No. LVII of 1969. These are in total 67 tendu units in the division, which are sold on lump-sum basis by way of open tender. The rates of collection of tendu leaves and target are fixed by the Government. The collection charges for 2001 season was Rs. 46 in Government lands and Rs. 48 in private lands for 100 bundles of 75 leaves each. The tendu leaves after collection by the local villagers are purchased from them by the agents of the tendu contractor at the collection centers known as *phadis*. The leaves after drying and curing are packed in

gunny bags. A bag containing 1000 *pudas* is known as a standard bag. Thereafter, the gunny bags are transported from the *phadis* to the approved go-downs for storage and subsequent transport to consumption centres.

3.9.04. The other NWFPs such as Gum, Sitaphal etc. are being sold by public auction. The Maharashtra Government has recently passed an ordinance called Maharashtra Transfer of Ownership of M.F.P in the Scheduled Areas and the Maharashtra M.F.P (Regulation of trade) Ordinance, 1997 as Ordinance No. XIX of 1997 on 10th December 1997. According to section 4 of the Ordinance the ownership of the M.F.P found in the Government lands in the scheduled areas, excluding the Nagar Panchayat and Samitee, shall vest in the Panchayat within whose jurisdiction such areas falls. However, the ownership of M.F.P does not include the ownership of land or trees in that Panchayat areas. The list of M.F.P covered under the ordinance is specified in the schedule. The species of state significance such as Tendu, Apata and Bamboo have been excluded from the purview of the ordinance.

3.9.05. GRASS: The grass from Grass birs, closed coupes and plantation areas are available on cutting basis. As per existing Government order annual lease of grass birs for removal of grass on cutting basis, is first offered to Gram-Panchayats, Co-operative societies and other Public Bodies at a price fixed by Forest Department considering current market trend and the availability of grass. The lease of grass birs which could not be disposed of in this way is sold by auction. Grass from the birs which could not be allotted to Societies or sold by auction is sold on rated passes. In the drought year the grass from grass birs is kept reserved under the order of the Collector and is cut and supplied to the drought affected areas. Due to excessive cattle pressure the site conditions of grass-birs have been deteriorated severely; and hence are not in position to meet the demand of the entire division as well as to fulfil objective of producing quality grass in their present shape.

3.10. PAST AND CURRENT PRICES

3.10.01. Due to the increase in construction activities coupled with increasing requirement for furniture items for house interiors the demand for timber is steadily going up. As the supply position is not commensurate with the demand, the price of timber has shown a steep rising trend, over the years **(Appendix 3.2)**.

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CHAPTER 4. MANPOWER AVAILABILITY

4.1 MANPOWER

4.1.01 The present Nagpur Division constitute a part of the original Nagpur Forest Division which was reorganized on 24.12.1959 by delineating the forest areas of Wardha district as a separate unit of forest management. It is coterminous with the district boundaries having its headquarters at Nagpur. It is headed by an officer in the rank of the Deputy Conservator of Forests. **(Appendix 4.1).**

4.1.02 Further reorganisation of the Forest Department was done in 1981-82 with a view to remove unwieldiness of administrative charges by making them compact and manageable units for efficient administration. Government of Maharastra vide its G R No FDN-1081/76/03-F-2, dated 11.6.1981 sanctioned reorganisation of ranges, round and beats with effect from 1.9.1981. The new posts of accountants were created vide G R No FDM-1879/17-F-2 dated 11.6.81 and each range was provided with an accountant to cope with the increased quantum of work and to increase the efficiency in the range offices. One post of Junior Statistical Assistant was created in each Division vide G R No FDM-1081/76710-F-2 dated 12.5.1981, to have timely and accurate statistical data needed for the formulation and implementation of forestry development programmes and diversifying the forest management.

4.1.03 Jawla Prasad's plan (1990-1991 to 1999-2000 and extended upto 2003-2004) had also proposed bifurcation of the division into two – North Nagpur Division and South Nagpur Division. As per this proposal, the two divisions were to be formed as follows:

	North Nagpur	South Nagpur
DCF	1	1
ACF	3	3
Ranges	8	7
Rounds	34	29
Beats	169	157
Mobile Squads	1	1
Depots	2	2

4.1.04 On the basis of recommendations made by the Tata Consultancy Services, administrative charges upto the Range levels have been further reorganized into two distinct categories, namely, the 'Protection charges' and the 'Development charges',

since 2000. The objective is to optimise the workload at the Beat, Round and Range levels with a view to improve efficiency of performance and ensure accountability in the discharge of assigned duties and functions.

4.1.05 Nagpur Division has sanctioned strength of 1474 posts in total, including 1145 permanent posts and 329 temporary posts in the 23 designated categories, ranging from the Deputy Conservator of Forests to the Van Kamgar. The details of the staff and the manpower, in the Division, as on date, are given in the **Table 4.1** below.

4.2.0 LABOUR SUPPLY

4.2.01 The erstwhile forest villages, which were established with the object of supplying adequate and assured labour for the various forestry operations have since been declared as revenue villages vide Govt. Notification No FLD 4207/ I- Y dated 23.05.1967 and 3675/87519-F-6 dated 24.6.1977. Administration of these villages, at present, lies with the Revenue Department. However, labourers from these villages are continued to be engaged for various forestry works in the Division.

4.2.02 The labour supply in general is inadequate, especially, in the compact blocks of Deolapar, Parseoni, Ramtek , South Umrer, Hingna and Kondhali ranges, because of the less population density due to remoteness of the area. The forestry works are not usually affected by the dearth of workforce except during the months of July and August when the *kharif* crop is planted; and in the month of November when it is harvested. At times, labourers are brought from the adjoining districts, to complete the plantation works. However, with suitable planning and adequate scattering of work centres labourers can be made available for all forestry works.

Table 4.1. Present staff position in the Nagpur Division

S. N	Designation	Sanctioned strength			Pay scale (Rupees)
		Permanent	Temporary	Total	
A- Gazetted Officers					
1	Deputy Conservator of Forests	1	--	1	12000-16500
2	Assistant Conservator of Forests	3	2	5	7500-11500
3	Range Forest Officer	13	18	31	6500-10500
B- Non-Gazetted Staff					
4	Surveyor	2	--	2	4000-6000
5	Forester	85	49	134	4000-6000
6	Forest Guard	225	206	431	2750-4400
7	Junior Statistical Assistant.	1	-	1	4000-6000
8	Chief Accountant	1	--	1	5000-8000
9	Accountant	7	17	24	4500-7000
10	Clerk	26	13	39	3050-4590
11	Driver	4	3	7	3050-4590
12	Cleaner	1	1	2	2550-3200
13	Daftari	1	--	1	2610-4000

14	Peon	4	2	6	2550-3200
15	Chaukidar	7	7	14	2610-4000
16	Police constable	--	1	1	4000-6000
17	Sweeper	--	1	1	2550-3200
18	Mali	--	6	6	2550-3200
19	Khansama	--	2	2	2750-4400
20	Mini Train Driver	--	1	1	3050-4590
21	Mini Train Cleaner	--	1	1	2550-3200
22	Tractor Driver	--	1	1	3050-4590
23	Van Kamgar	763	--	763	2550-3200
	Total	**1,144**	**329**	**1,473**	

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Chapter 6. STATISTICS OF GROWTH AND YIELD

STATISTICS OF THE RATE OF GROWTH OF TEAK AND MISCELLANEOUS SPECIES

6.1. GROWTH OF TEAK

6.1.01. The growth data, obtained from Stem Analysis carried out on 4 (four) trees of teak on site quality II / III in the RF of Deolapar range of Nagpur division carried out in 2002, was used to understand and determine the growth pattern of teak. The results of stem analysis are summed up in the Table 6.1. The CAI and MAI curves intersect at 87 years, corresponding to a GBH (OB) equal to 142 cm. **Appendix 6.1a**

Table - 6.1. Growth statistics of teak (Site Quality II / III)

Age in Years	Ht. in mts.	DBH (OB) in mts.	GBH(OB) in mts.	Volume in cum.	CAI in Cum.	MAI in Cum.
10	3.90	9.60	30.14	0.020	0.0020	0.0020
20	8.00	17.15	53.85	0.095	0.0075	0.0048
30	12.20	23.20	72.85	0.205	0.0110	0.0068
40	14.20	28.25	88.70	0.355	0.0150	0.0089
50	16.10	32.90	103.30	0.560	0.0210	0.0112
60	18.60	37.10	116.50	0.800	0.0240	0.0133
70	21.10	40.75	127.96	1.010	0.0210	0.0144
80	22.80	43.40	136.28	1.175	0.0165	0.0147
90	24.20	44.80	140.67	1.305	0.0130	0.0145

6.1.02. The stem analysis results carried on 2 trees of teak, in Quality III / IV areas, in the R F of South Umred range are reproduced in the Table 6.2. CAI and MAI curve intersect at 114 years corresponding to a GBH (OB) 124 cms. **Appendix 6.1b**

Table- 6.2. Growth statistics of teak (Site Quality III / IV)

Age in Years	Ht. in mts.	DBH(OB) in cm.	GBH (OB) in cm.	Volume in cum.	CAI cum.	MAI cum.
10	3.70	3.40	10.70	0.0049	0.00049	0.00049
20	7.10	10.20	32.03	0.0250	0.0020	0.0012
30	10.70	14.80	46.47	0.0650	0.0040	0.0022
40	13.20	18.60	58.40	0.1350	0.0070	0.0034
50	14.90	22.40	70.34	0.2400	0.0105	0.0048
60	16.60	25.20	79.13	0.3600	0.0120	0.0060
70	18.20	29.10	91.34	0.5000	0.0140	0.0071
80	19.70	31.90	100.17	0.6450	0.0145	0.0081
90	20.30	34.20	107.39	0.7860	0.0141	0.0087
100	20.80	36.40	114.30	0.9050	0.0119	0.00905
110	21.20	38.50	120.49	0.9900	0.0085	0.0090
120	21.40	40.25	126.38	1.0700	0.0080	0.0089

The periodic CAI and MAI curves intersect at 85 years. The girth (OB) corresponding to this exploitable age is 144 cm. The exploitable girth is, hence, fixed as 145 cm.

6.1.03. Stem analysis of teak on the site quality IV area was carried out by CF Nagpur Circle, in Compartment No. 265, of Hingna Range of Nagpur Division. On the basis of this work the exploitable girth in site quality IV areas is fixed as 120 cm.

TABLE - 6.3. Growth statistics of teak (Site Quality IV)

Age in Years	Height in mtrs.	GBH (OB) in mts.	DBH (OB) in mts.	Stem vol. in cm.	Periodic in Cm	MAI in Cm
10	2.8	10	3	0.01	0.001	0.001
20	5.2	37	12	0.03	0.002	0.0015
30	7	54	17	0.07	0.004	0.0023
40	9	69	22	0.13	0.006	0.0033
50	9.8	81	26	0.2	0.007	0.004
60	11.4	91	29	0.26	0.006	0.0043
70	12.8	101	32	0.34	0.008	0.0049
80	14.5	110	35	0.41	0.007	0.0051
90	15.6	116	37	0.46	0.005	0.0051
100	17.5	121	39	0.49	0.003	0.0049
110	--	125	40	0.52	0.003	0.0047

6.1.04 Local volume table for teak has been developed by the FDCM in the year 2003. This table is useful for calculating standing volume in a coupe either by actual measurement of number of trees girth class wise or by wedge prism and then reading the volume from this table. The table is given below:

6.2. TEAK PLANTATION

The height and girth of teak trees in plantations in site quality IVb has been calculated in Prasad's plan by using regression equations worked out from the measurement in old plantations of Deolapar and Ramtek ranges. It is given in **Table 6.4** below:

TABLE - 6.4. Growth statistics of teak Plantations

Age in years	Height in mtrs.	Girth b.h.o.b in cms	Age in years	Height in mtrs.	Girth b.h.o.b in cms
5	4.82	16	10	7.60	26
15	9.61	35	20	10.86	43
25	11.35	50	30	(11.80)	(57)
35	(12.10)	(62)	40	(12.30)	(67)
45	(12.40)	(70)	50	(12.50)	(73)

***The figure in the brackets are obtained from the extrapolation**

6.3. GROWTH STATISTICS OF THE MISCELLANEOUS SPECIES

6.3.1 Growth statistics of 26 miscellaneous species is tabulated as follows:

Table - 6.5
[1]Growth statistics of Non-Teak Species forming Annual Growth Rings (Stem Analysis in the Year 2002)

			1.	**Shiwan**				
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
Ht. In mtrs.	4.5	10.2	16.3	20.2	22.6	23.6		
Dbh.ob.(cms)	9.2000	18.2000	25.8000	32.8000	38.5000	44.4000	49.2000	52.8000
Volume(cumt)	0.0680	0.1620	0.4740	0.9420	1.1460	1.3200	1.4000	0.0000
CAI(cumt)	0.0048	0.0124	0.0392	0.0436	0.0172	0.0160	0.0040	0.0000
MAI(cumt)	0.0068	0.0081	0.0158	0.0235	0.0229	0.0220	0.0200	0.0000
Diam.Incr.	15.7575	4.6625	3.8216	1.9169	1.2315	1.1111	1.0000	0.5374
Volume Incr.	8.5714	9.4656	10.4255	4.6975	1.5593	1.2500	0.2877	0.0000
Rate	800	9300	11600	12900	13700	15400	16100	16100
Amt in Rs.	54	1507	5498	12152	15700	20328	22540	0
Price CAI	6.99	10.80	12.05	1.02	2.48	0.00	0.00	
Price MAI	5.44	75.33	183.28	303.80	314.00	338.80	322.00	0.00
			2.	**Sissam**				
Ht. In mtrs.	6.60	11.30	15.00	18.30	21.00	23.20	24.50	25.00
Dbh.ob.(cms)	7.5000	14.8000	22.4000	28.8000	34.3000	38.7000	42.8000	46.8000
Volume(cumt)	0.0400	0.1000	0.0200	0.3400	0.5400	0.7900	1.0800	1.2800
CAI(cumt)	0.0080	0.0060	0.0120	0.0140	0.0220	0.0240	0.0320	0.0160
MAI(cumt)	0.0040	0.0050	0.0067	0.0085	0.0108	0.0132	0.0154	0.0160
Diam.Incr.	16.0748	6.9841	4.0295	2.4309	1.5129	1.3904	1.2530	0.8734
Volume Incr.	15.1724	7.0588	7.0588	4.5902	4.5361	3.2877	3.2000	1.2903
Rate	280	550	2600	2875	3350	3500	3500	3625
Amt. In Rs.	11.20	55.00	52.00	977.50	1809.00	2765.00	3780.00	4640.00
Price MAI	1.12	2.75	5.20	24.44	36.18	46.08	54.00	58.00
Price CAI	0.16	0.25	1.92	1.17	0.99	0.79	0.40	-5.80
			3.	**Dhawada**				
Ht. In mtrs.	4.40	7.80	10.70	13.40	15.90	18.00	19.50	20.40

Dbh.ob.(cms)	8.8000	18.7000	27.8000	35.2000	43.2000	53.8000	58.6000	
Volume(cumt)	0.0350	0.1400	0.2450	0.2950	0.3270	0.3700	0.3880	
CAI(cumt)	0.0040	0.0140	0.0070	0.0042	0.0030	0.0000	0.0000	
MAI(cumt)	0.0035	0.0070	0.0082	0.0073	0.0065	0.0000	0.0000	
Diam.Incr.	10.2857	5.8895	3.2684	2.2188	1.5763	1.0687	0.8362	
Volume Incr.	16.0000	13.3330	3.0769	1.4762	0.9389	0.5479	0.4166	
Rate	280	425	700	825	1050	1150	1150	
Amt in Rs.	9.80	59.50	171.50	243.38	343.35	425.50	446.20	
Price MAI	0.98	2.98	5.72	6.08	6.87	7.09	6.37	
Price CAI	0.20	0.27	0.04	0.08	0.02	-0.07	-0.64	
			4.	**Lendia**				
Ht. In mtrs.	2.00	5.50	7.80	9.80	11.90	13.80	15.50	14.80
Dbh.ob.(cms)	8.9000	18.8000	27.8000	35.6000	40.6000	45.0000	48.4000	51.2000
Volume(cumt)	0.0180	0.1420	0.2640	0.3000	0.3270	0.3570	0.0000	0.0000
CAI(cumt)	0.0012	0.0052	0.0150	0.0120	0.0070	0.0061	0.0000	0.0000
MAI(cumt)	0.0010	0.0035	0.0088	0.0080	0.0070	0.0067	0.0000	0.0000
Diam.Incr.	14.7692	6.4197	3.6935	1.7595	1.0101	0.9090	0.6722	0.4743
Volume Incr.	40.0000	23.8202	3.6363	1.3793	0.7476	0.7417	0.0000	0.0000
Rate	280	425	700	825	1050	1150	1150	1150
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
Amt in Rs.	5.04	60.35	184.80	247.50	343.35	410.55	0.00	0.00
Price MAI	0.50	3.02	6.16	6.19	6.87	6.84	0.00	0.00
Price CAI	0.25	0.31	0.00	0.07	0.00	-0.68	0.00	0.00
			5.	**Khair**				
Ht. In mtrs.	4.80	9.80	12.90	14.60	15.10			
Dbh.ob.(cms)	9.2000	15.6000	22.0000	28.7000	34.5000	39.7000	44.7000	48.3000
Volume(cumt)	0.0450	0.1000	0.1950	0.3400	0.5500	0.7800	1.0400	1.2200
CAI(cumt)	0.0040	0.0070	0.0110	0.0155	0.0225	0.0280	0.0263	0.0180
MAI(cumt)	0.0028	0.0045	0.0062	0.0080	0.1020	0.1220	0.0143	0.0152
Diam.Incr.	16.6153	4.4128	3.2432	2.8358	2.0091	1.5706	1.1507	0.6736
Volume Incr.	15.3846	5.7142	3.9436	6.1016	6.3157	2.4489	2.2335	1.3559
Rate	3400	5300	7200	9000	12200	13600	13600	13600
Amt. In Rs.	153	530	1404	3060	6710	10608	14144	16592
Price CAI	1.12	2.03	2.97	5.77	4.26	2.53	0.53	
Price MAI	15.3	26.5	46.8	76.5	134.2	176.8	202.1	207.4
			6.	**Tendu**				
Ht. In mtrs.	6.20	11.80	16.50	20.00	22.30	23.50		
Dbh.ob.(cms)	7.9000	16.4000	25.1000	31.1000	36.1000	41.1000	45.1000	47.5000
Volume(cumt)	0.0440	0.1000	0.1640	0.3200	0.5200	0.6200	0.6740	0.7000
CAI(cumt)	0.0048	0.0056	0.0068	0.0160	0.0220	0.0080	0.0048	0.0000
MAI(cumt)	0.0044	0.0050	0.0054	0.0080	0.0100	0.0100	0.0096	0.0000
Diam.Incr.	10.9677	6.5248	3.7472	1.6053	1.1396	1.3065	0.7223	0.4255
Volume Incr.	15.0000	6.5116	4.6258	5.7142	4.7311	1.3333	0.7250	0.2877
Rate	280	425	700	825	1050	1150	1150	1150
Amt. In Rs.	12.32	42.50	114.80	264.00	546.00	713.00	775.10	805.00
Price MAI	1.23	2.13	3.83	6.60	10.92	11.88	11.07	10.06
Price CAI	0.09	0.17	0.28	0.43	0.10	-0.08	-0.10	-1.01

			7.	**Chichawa**				
Ht. In mtrs.	5.00	10.00	13.50	17.00	19.70	21.50	22.50	
Dbh.ob.(cms)	9.3000	15.8000	20.2000	24.0000	27.4000	30.6000	34.0000	

Volume(cumt)	0.0800	0.2100	0.2850	0.3260	0.0000	0.0000		
CAI(cumt)	0.0023	0.0090	0.0140	0.0090	0.0075	0.0000		
MAI(cumt)	0.0021	0.0050	0.0084	0.0084	0.0075	0.0000		
Diam.Incr.	10.6122	3.4364	1.9740	1.5584	1.3584	0.9364	0.9638	
Volume Incr.	15.6521	8.2758	2.2222	1.1356	0.4000	0.0000	0.0000	
Rate	280	425	700	825	1050	1150	1150	
Amt in Rs.	22.40	89.25	199.50	268.95	0.00	0.00	0.00	
Price MAI	2.24	4.46	6.65	6.72	0.00	0.00	0.00	
Price CAI	0.22	0.22	0.01	-0.67	0.00	0.00	0.00	
8. Black Shiras								
Ht. In mtrs.	2.10	6.00	8.70	11.20	13.60	15.70		
Dbh.ob.(cms)	9.7000	17.6000	25.6000	32.2000	39.2000	44.6000	50.0000	55.0000
Volume(cumt)	0.0500	0.1200	0.2450	0.4050	0.5040	0.5600	0.6050	0.6500
CAI(cumt)	0.0060	0.0070	0.0150	0.0140	0.0068	0.0050	0.0050	0.0040
MAI(cumt)	0.0050	0.0060	0.0081	0.0101	0.0100	0.0093	0.0086	0.0081
Diam.Incr.	12.7891	5.4193	3.0252	1.8181	2.0375	1.2962	0.9836	0.8921
Volume Incr.	17.1428	6.8292	7.2289	3.7838	1.3963	0.9132	0.8438	0.6250
Rate	280	425	700	825	1050	1150	1150	1150
Amt in Rs.	14.00	51.00	171.50	334.13	529.20	644.00	695.75	747.50
Price MAI	1.40	2.55	5.72	8.35	10.58	10.73	9.94	9.34
Price CAI	0.12	0.32	0.26	0.22	0.01	-0.08	-0.06	-0.93
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
9. Bahawa								
Ht. In mtrs.	6.70	10.40	12.60	13.90				
Dbh.ob.(cms)	9.4000	15.9000	21.4000	26.4000	30.8000	34.6000	37.8000	0.0000
Volume(cumt)	0.0280	0.0800	0.1500	0.2080	0.2400	0.2670	0.2870	0.3050
CAI(cumt)	0.0026	0.0005	0.0081	0.0052	0.0048	0.0044	0.0000	0.0000
MAI(cumt)	0.0002	0.0038	0.0005	0.0052	0.0050	0.0043	0.0000	0.0000
Diam.Incr.	12.2222	5.2669	2.5870	2.9268	1.3422	1.0680	0.7547	0.4000
Volume Incr.	17.4359	10.3937	6.6926	2.4489	1.2903	0.9195	0.7092	0.5315
Rate	280	425	700	825	1050	1150	1150	1150
Amt in Rs.	7.84	34.00	105.00	171.60	252.00	307.05	330.05	350.75
Price MAI	0.78	3.40	10.50	17.16	25.20	30.71	33.01	35.08
Price CAI	0.26	0.71	0.67	0.80	0.55	0.23	0.21	-3.51
10. Hiwar								
Ht. In mtrs.	4.20	9.100	13.00	16.60	19.50	21.50	22.40	
Dbh.ob.(cms)	8.6000	16.5000	24.1000	31.3000	36.7000	39.7000	42.5000	45.5000
Volume(cumt)	0.0440	0.1000	0.1640	0.3200	0.5200	0.6200	0.6740	0.0000
CAI(cumt)	0.0052	0.0064	0.0128	0.0272	0.0096	0.0052	0.0028	0.0000
MAI(cumt)	0.0046	0.0055	0.0074	0.0115	0.0118	0.0100	0.0090	0.0000
Diam.Incr.	15.9349	7.8260	4.0182	1.7333	0.8913	0.7179	0.6698	0.6250
Volume Incr.	15.0000	6.5116	4.6258	5.7142	4.7311	1.3333	0.7250	0.0000
Rate	280	425	700	825	1050	1150	1150	1150
Amt in Rs.	12.32	42.50	114.80	264.00	546.00	713.00	775.10	0.00
Price MAI	1.23	2.13	3.83	6.60	10.92	11.88	11.07	0.00
Price CAI	0.09	0.17	0.28	0.43	0.10	-0.08	-1.11	0.00
11. Kinhi								
Ht. In mtrs.	3.00	9.20	13.00	16.90	19.30	21.60	23.50	24.60
Dbh.ob.(cms)	10.5000	20.9000	29.2000	36.4000	42.8000	48.4000	53.8000	58.2000
Volume(cumt)	0.0100	0.0280	0.0550	0.1150	0.1930	0.2400	0.2650	0.2840
CAI(cumt)	0.0006	0.0016	0.0028	0.0044	0.0080	0.0064	0.0028	0.0017
MAI(cumt)	0.0010	0.0013	0.0014	0.0022	0.0034	0.0040	0.0038	0.0035
Diam.Incr.	11.5337	5.9340	2.5500	1.9596	1.5533	1.1040	1.0687	0.8421
Volume Incr.	13.3333	6.6666	6.8085	7.9166	4.2406	1.2903	0.8477	0.6440
Rate	280	425	700	825	1050	1150	1150	1150

Amt. In Rs.	2.80	11.90	38.50	94.88	202.65	276.00	304.75	326.60
Price MAI	0.28	0.60	1.28	2.37	4.05	4.60	4.35	4.08
Price CAI	0.03	0.07	0.11	0.17	0.05	-0.02	-0.03	-0.41
			12.	**Ajan**				
Ht. In mtrs.	3.00	10.10	14.00	17.60	20.50	22.80	24.50	25.30
Dbh.ob.(cms)	11.3000	21.6000	29.5000	36.9000	43.9000	46.9000	50.5000	53.7000
Volume(cumt)	0.0400	0.1000	0.2500	0.8000	1.3000	1.4400	0.0000	0.0000
CAI(cumt)	0.0060	0.0060	0.0180	0.0740	0.0360	0.0120	0.0000	0.0000
MAI(cumt)	0.0040	0.0050	0.0083	0.0200	0.0260	0.0260	0.0000	0.0000
Diam.Incr.	12.8655	5.2356	2.2939	2.0512	1.4492	0.8714	0.7258	0.6818
Volume Incr.	24.0000	7.0588	8.7804	12.0325	2.9752	1.1428	0.4000	0.0000
Rate	280	425	700	825	1050	1150	1150	1150
Amt in Rs.	11.20	42.50	175.00	660.00	1365.00	1656.00	0.00	0.00
Price MAI	1.12	2.13	5.83	16.50	27.30	27.60	0.00	0.00
Price CAI	0.10	0.37	1.07	1.08	0.03	-2.76	0.00	0.00
			13.	**Karanj**				
Ht. In mtrs.	5.60	8.90	11.10	12.40				
Dbh.ob.(cms)	5.3000	10.6000	15.6000	20.5000	24.7000	28.4000		
Volume(cumt)	0.0370	0.1750	0.2700	0.3050	0.3340	0.3560		
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
CAI(cumt)	0.0022	0.0055	0.0080	0.0042	0.0030	0.0017		
MAI(cumt)	0.0022	0.0048	0.0080	0.0072	0.0064	0.0057		
Diam.Incr.	14.3589	5.5913	3.4843	2.2680	1.6877	1.3843		
Volume Incr.	8.8888	7.8260	0.7643	-11.2821	-3.0769	-6.8292		
Rate	280	425	700	825	1050	1150		
Amt in Rs.	10.36	74.38	189.00	251.63	350.70	409.40		
Price MAI	1.04	7.44	18.90	25.16	35.07	40.94		
Price CAI	0.64	1.15	0.63	0.99	0.59	-4.09		
			14.	**Mango**				
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
Ht. In mtrs.	5.20	9.20	12.00	13.80	14.70			
Dbh.ob.(cms)	7.4000	13.9000	20.7000	28.1000	35.3000	41.7000	47.5000	53.1000
Volume(cumt)	0.0300	0.0750	0.1500	0.3700	0.8200	1.1000	1.2200	1.3200
CAI(cumt)	0.0022	0.0055	0.0150	0.0200	0.0300	0.0200	0.0200	0.0100
MAI(cumt)	0.0013	0.0030	0.0051	0.0100	0.0100	0.0200	0.0200	0.0100
Diam.Incr.	13.8180	5.3880	3.3510	2.9000	2.0200	1.2900	1.1300	1.0000
Volume Incr.	20.0000	12.1740	5.4550	9.0100	7.8800	1.9000	1.0100	0.7700
Rate	280	425	700	825	1050	1150	1150	1150
Amt. In Rs.	8.40	31.88	105.00	305.25	861.00	1265.00	1403.00	1518.00
Price MAI	0.84	1.59	3.50	7.63	17.22	21.08	20.04	18.98
Price CAI	0.08	0.19	0.41	0.96	0.39	-0.10	-0.11	-1.90
			15.	**Prosopis**				
Ht. In mtrs.	5.70	9.20	11.40	12.70				
Dbh.ob.(cms)	5.4000	10.6000	14.5000	17.5000	20.1000	22.3000	24.5000	
Volume(cumt)	0.0120	0.0280	0.0520	0.1080	0.1800	0.2200	0.2540	0.2740
CAI(cumt)	0.0009	0.0027	0.0047	0.0066	0.0067	0.0042	0.0024	0.0000
MAI(cumt)	0.0004	0.0001	0.0016	0.0024	0.0025	0.0037	0.0021	0.0000
Diam.Incr.	13.3333	5.1063	3.1226	1.7910	1.3367	0.9174	0.8333	0.0000
Volume Incr.	10.5263	4.8000	6.2222	7.4725	3.9024	1.4117	1.4693	0.8823
Rate	280	425	700	825	1050	1150	1150	1150
Amt in Rs.	3.36	11.90	36.40	89.10	189.00	253.00	292.10	315.10
Price MAI	0.34	0.60	1.21	2.23	3.78	4.22	4.17	3.94
Price CAI	0.026	0.062	0.101	0.155	0.044	-0.004	-0.023	-0.394

Table - 6.6

Growth statistics of Non-Teak Species not forming Annual Growth Rings (Analysis of Research Data, 1931-1993 and Actual Yield Data of FDCM Coupes for the Year 2003-04)

16. Semal												
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
Girth at Breast ht.in cm	18.50	34.00	48.50	60.50	72.50	82.00	89.00	94.00				
Dbh.(cms)	5.8900	10.830	15.450	19.270	23.080	26.110	28.340	29.940				
Volume (cumt)	0.0045	0.010	0.0175	0.0260	0.0360	0.0475	0.0575	0.0660	0.0725	0.0775	0.0820	0.0850
MAI(cumt)	0.0005	0.0005	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
CAI(cumt)	0.0006	0.0008	0.0009	0.0010	0.0012	0.0010	0.0009	0.0007	0.0005	0.0005	0.0003	
Diam.Incr.	5.9100	3.520	2.200	1.5700	1.2300	0.8200	0.5500					
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
Volume Incr.	7.5900	5.450	3.910	3.2300	2.7500	1.9000	1.3800	0.9400	0.6700	0.5600	0.3600	
Rate	200	340	3300	3300	3600	3750	3750	3750				
Amt in Rs.	0.90	3.40	57.75	85.80	129.60	178.13	215.63	247.50				
Price MAI	0.09	0.17	1.93	2.15	2.59	2.97	3.08	3.09				
Price CAI	0.25	5.44	2.81	4.38	4.85	3.75	3.19					
17. Dhawada												
Girth at Breast ht.in cm	20.000	35.00	48.000	60.000	71.000	79.500	82.750	88.000				
Dbh.(cms)	6.3700	11.150	15.290	19.110	22.610	25.320	26.350	28.030				
Volume(cumt)	0.0050	0.0100	0.0225	0.0460	0.0765	0.1000	0.1160	0.1200	0.1240			
MAI(cumt)	0.0005	0.0005	0.0008	0.0012	0.0015	0.0017	0.0017	0.0015	0.0014			
CAI(cumt)	0.0005	0.0013	0.0024	0.0031	0.0024	0.0016	0.0004	0.0004				
Diam.Incr.	5.4560	3.1310	2.2200	1.6770	1.1300	0.3870	0.6170					
Volume Incr.	6.6660	7.6920	6.8610	4.9790	2.6620	1.4810	0.3380	0.3270				
Rate	200	340	3300	3300	3600	3750	3750	3750				
Amt in Rs.	1.00	3.40	74.25	151.80	275.40	375.00	435.00	450.00				
Price MAI	0.10	0.17	2.48	3.80	5.51	6.25	6.21	5.63				
Price CAI	0.24	7.00	7.76	12.36	9.96	6.00	1.50					
18. Ain												
Girth at Breast ht.in cm	12.250	22.500	31.250	38.750	46.000	53.000	58.500	63.750				
Dbh.(cms)	3.9000	7.1700	9.9500	12.340	14.650	16.880	18.630	20.300				
Volume (cumt)	0.0003	0.0076	0.0136	0.0212	0.0300	0.0400	0.0525	0.0613	0.0643			
MAI(cumt)	0.000033	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0008	0.0007			
CAI(cumt)	0.0007	0.0006	0.0008	0.0009	0.0010	0.0013	0.0009	0.0003				
Diam.Incr.	5.9078	3.2470	2.1440	1.7110	1.4145	0.9856	0.8579					
Volume Incr.	18.359	5.6600	4.3670	3.4375	2.8571	2.7027	1.5384	0.4780				
Rate	800	800	1300	1300	6900	6900	6900	6900				
Amt in Rs.	0.26	6.08	17.68	27.56	207.00	276.00	362.25	422.63				
Price MAI	0.026	0.30	0.59	0.70	4.14	4.60	5.17	5.28				
Price CAI	0.58	1.17	1.03	17.90	6.90	8.60	6.10					

19. Karai												
Girth at Breast ht.in cm	17.250	29.000	39.000	48.000	56.000	63.000	69.500	75.500	81.500	86.500		
Dbh.(cms)	5.4900	9.2400	12.420	15.290	17.830	20.060	22.130	24.400	25.960	27.550		
Volume (cumt)	0.0040	0.0090	0.0150	0.0230	0.0350	0.0480	0.0655	0.0830	0.1000	0.1125	0.1250	0.1255
MAI(cumt)	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.00111	0.00112	0.00113	0.0011
CAI(cumt)	0.0005	0.0006	0.0008	0.0012	0.0013	0.0018	0.0018	0.0002	0.0013	0.0009	0.0005	
Diam.Incr.	5.0900	2.9400	2.0700	1.5300	1.1800	0.9800	0.8300	0.7700	0.5900			
Volume Incr.	7.6900	5.0000	4.2100	4.1400	3.1300	3.0800	2.3600	1.8600	1.1800	0.7300	0.3700	
Rate	280	280	425	3300	3300	3600	3600	3750	3750	3750		
Amt in Rs.	1.12	2.52	6.38	75.90	115.50	172.80	235.80	311.25	375.00	421.88		
Price MAI	0.1120	0.1260	0.2125	1.8975	2.3100	2.8800	3.3600	3.8900	4.1600			
Price CAI	0.1400	0.3850	6.9500	3.9600	5.7300	6.3000	7.5400	6.3750	4.6870			
20. Lendia												
Girth at Breast ht.in cm	20.500	34.0000	43.5000	56.0000	66.0000	74.5000	81.0000	86.0000				
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
Dbh.(cms)	6.5300	10.8300	13.8500	17.8300	21.0200	23.7300	25.8000	27.3900				
Volume (cumt)	0.0150	0.0300	0.0400	0.0600	0.0775	0.0975	0.1125	0.1275				
MAI(cumt)	0.0015	0.0015	0.0013	0.0015	0.0016	0.0016	0.0016	0.0016				
CAI(cumt)	0.0015	0.0010	0.0020	0.0018	0.0020	0.0015	0.0015					
Diam.Incr.	4.9500	2.4500	2.5120	1.6400	1.2110	0.8350	0.5970					
Volume Incr.	6.6660	2.8570	4.0000	2.5450	2.2850	1.4280	0.6666					
Rate	200	340	340	3300	3600	3600	3750	3750				
Amt in Rs.	3.00	10.20	13.60	198.00	279.00	351.00	421.88	478.13				
Price MAI	0.300	0.510	0.453	4.950	5.580	5.850	6.010	5.975				
Price CAI	0.720	0.340	18.440	8.100	7.200	7.000	5.700					
21. Bija												
Girth at Breast ht.in cm	18.2500	31.2500	42.0000	52.2500	62.2500	72.2500	80.5000	87.7500	93.2500			
Dbh.(cms)	5.8100	9.9500	13.3800	16.6400	19.8200	23.0000	25.6400	27.9500	29.7000			
Volume (cumt)	0.0600	0.1300	0.1900	0.2400	0.3100	0.3700	0.4200	0.4800	0.5000	0.6200	0.6900	0.7800
MAI(cumt)	0.00010	0.00015	0.00020	0.00035	0.00051	0.00073	0.00094	0.00111	0.00116	0.00115	0.00109	
CAI(cumt)	0.00020	0.00030	0.00080	0.00115	0.00180	0.00220	0.00240	0.00115	0.00100	0.00058		
Diam.Incr.	5.2500	2.9400	2.1700	1.7400	1.4900	1.0900	0.8600	0.6100				
Volume Incr.	10.0000	6.6700	8.0000	5.8200	4.0400	3.1000	1.5900	0.9100	0.4900			
Rate	450	750	750	8400	9400	9400	10800	10800	10800			
Amt in Rs.	0.45	2.25	4.50	117.60	239.70	408.90	707.40	966.60	1134.00			
Price MAI	0.0450	0.1125	0.1500	2.9400	4.7940	6.8150	10.1050	12.0800	14.2000			
Price CAI	0.1800	0.2250	11.3100	12.2100	16.9200	29.8500	25.9200	16.7140				
22. Garadi												
Girth at Breast ht.in cm	13.5000	26.0000	38.0000	49.0000	57.5000	65.5000	72.0000	79.0000	85.0000	91.0000		
Dbh.(cms)	4.3000	8.2800	12.1000	15.6100	18.3100	20.8600	22.9300	25.1600	27.0700	28.9800		
Volume (cumt)	0.0025	0.0065	0.0115	0.0185	0.0280	0.0400	0.0530	0.0685	0.0865	0.1015	0.1130	
MAI(cumt)	0.00025	0.00033	0.00038	0.00046	0.00056	0.00067	0.00076	0.0008562	0.00096	0.00102	0.00103	
CAI(cumt)	0.00040	0.00050	0.00070	0.00095	0.00120	0.00130	0.00155	0.00180	0.00150	0.00115		

Diam.Incr.	6.3300	3.7500	2.5300	1.5900	1.3000	0.9500	0.9300	0.7300	0.6800			
Volume Incr.	8.8900	5.5600	4.6700	4.0900	3.5300	2.8000	2.5500	2.3200	1.6000	1.0700		
Rate	200	3500	3600	4075	4225	4375	4375	4500	4625	4625	4625	
Amt in Rs.	0.50	22.75	41.40	75.39	118.30	175.00	231.88	308.25	400.06	469.44	522.63	
Price MAI	2.25	1.87	3.40	4.29	5.67	5.69	7.64	9.18	6.9370	5.3190		
Price CAI	0.050	1.125	1.380	1.885	2.366	2.916	3.312	3.853	4.445	4.690	4.751	
23. Aonla												
Girth at Breast ht.in cm	19.5000	34.5000	47.5000	59.5000	70.5000	79.5000						
Dbh.(cms)	6.2100	10.9900	15.1300	18.9500	22.4500	25.3200						
Diam.Incr.	5.5900	3.1700	2.2400	1.6900	1.2000							
24. Kakad												
Girth at Breast ht.in cm	28.0000	54.0000	72.5000	83.5000	88.5000							
Dbh.(cms)	8.9200	17.2000	23.0900	26.5900	28.1800							
Age(in Years)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
Diam.Incr.	6.3400	2.9200	1.4100	0.5800								
25. Behada												
Girth at Breast ht.in cm	23.5000	41.5000	58.5000	72.5000	83.5000							
Dbh.(cms)	7.4800	13.2200	18.6300	23.0900	26.5900							
Diam.Incr.	5.5500	3.4000	2.1400	1.4100								
26. Homba												
Girth at Breast ht.in cm	17.5000	33.0000	47.0000	59.0000	69.0000	76.0000	81.0000					
Dbh.(cms)	5.5700	10.5100	14.9700	18.7900	21.9700	24.2000	25.8000					
Diam.Incr.	6.1400	3.5000	2.2600	1.5600	0.9700	0.6400						

Following species form annual growth rings during the development of their wood :

1. Shiwan
2. Shisham
3. Dhawada
4. Lendia
5. Khair
6. Tendu
7. Chichawa
8. Black siras
9. Bahawa
10. Hiwar
11. Kinhi
12. Ajan
13. Karanj
14. Mango
15. Prosopis

6.3.2 A maiden attempt therefore has been made to carry out stem analysis for obtaining growth statistics of these tree species occurring in the Nagpur forests. Samples of Black Siras however were brought from Gondia division. The job was assigned by Conservator of Forests, Working Plan Circle, Nagpur to Shri R S Yadav, the then Deputy Conservator of Forests, Working Plans, Yavatmal and his staff. 45 trees, as given in the table 6.7 below, were felled for this purpose during January 2003 – February 2003.

Table 6.7
Trees felled for Stem Analysis in Jan-Feb 2003

Range	Felling Series	Comptt.No	Site quality	Tree No	Species	Girth
Ramtek	Chichda	416	IVA	37	Shiwan	82
Ramtek	Chichda	416	IVA	38	Shiwan	120
Ramtek	Chichda	416	IVA	39	Shiwan	72
Ramtek	Chichda	428	IVA	34	Sissam	83
Ramtek	Chichda	428	IVA	35	Sissam	118
Ramtek	Chichda	428	IVA	36	Sissam	77
S/Umred	Amghat	394	IVA	4	Dhawada	86
S/Umred	Amghat	394	IVA	5	Dhawada	96
S/Umred	Amghat	394	IVA	6	Dhawada	113
Ramtek	Chorbauli	595	IVA	23	Lendia	97
Ramtek	Chorbauli	595	IVA	24	Lendia	89
Ramtek	Chorbauli	595	IVA	25	Lendia	94
Ramtek	Chorbauli	591	IVA	30	Khair	89
S/Umred	Amghat	394	IVA	1	Khair	77
Range	**Felling Series**	**Comptt.No**	**Site quality**	**Tree No**	**Species**	**Girth**
S/Umred	Amghat	394	IVA	2	Khair	79
S/Umred	Amghat	394	IVA	3	Khair	76
S/Umred	Amghat	391	IVA	10	Tendu	77
S/Umred	Amghat	391	IVA	11	Tendu	72
S/Umred	Amghat	391	IVA	12	Tendu	71
S/Umred	Amghat	391	IVA	13	Chichawa	74
S/Umred	Amghat	391	IVA	14	Chichawa	82
S/Umred	Amghat	391	IVA	15	Chichawa	99
Deori	Zunzaritola	500	IVA	43	Black Shiras	99
Deori	Zunzaritola	500	IVA	44	Black Shiras	89
Deori	Zunzaritola	500	IVA	45	Black Shiras	104
Ramtek	Chorbauli	595	IVA	26	Bahawa	52
Ramtek	Chorbauli	595	IVA	27	Bahawa	49
Ramtek	Chorbauli	595	IVA	28	Bahawa	45
S/Umred	Amghat	394	IVA	7	Hiwar	96
S/Umred	Amghat	394	IVA	8	Hiwar	81
S/Umred	Amghat	391	IVA	9	Hiwar	84
S/Umred	Amghat	391	IVA	13	Hiwar	75
S/Umred	Amghat	391	IVA	17	Kinhi	115
S/Umred	Amghat	391	IVA	18	Kinhi	82
S/Umred	Amghat	391	IVA	19	Kinhi	66
Ramtek	Chorbauli	593	IVA	20	Ajan	103
Ramtek	Chorbauli	593	IVA	21	Ajan	95

Ramtek	Chorbauli	593	IVA	22	Ajan	109
Ramtek	Chorbauli	591	IVA	31	Karanj	62
Ramtek	Chorbauli	591	IVA	32	Karanj	59
Ramtek	Chorbauli	591	IVA	33	Karanj	88
Ramtek	Chorbauli	595	IVA	29	Mango	136
Ramtek	MPWP Ramtek	273	IVA	40	Prosopis	42
Ramtek	MPWP Ramtek	273	IVA	41	Prosopis	38
Ramtek	MPWP Ramtek	273	IVA	42		39

6.3.3 The analysis of the data followed subsequently. Detail analysis is given in the **Appendix 6.2** Thus the information on the growth statistics of these species was provided for incorporation into this plan by Shri R S Yadav and his team of dedicated staff. Summary of this information is what is shown in the table 6.5 above.

A totally different approach to obtain growth statistics was adopted in case of the tree species, which do not form annual rings. The list of such species is as follows:

1. Ain
2. Bija
3. Lendia
4. Dhawada
5. Garadi
6. Semal
7. Karai
8. Kakad
9. Aonla
10. Behada
11. Homba

6.3.4 The research wing of the Maharashtra Forest Department maintains a few permanent research plots wherein tree wise growth measurements (measurement of GBH) are recorded every five years. One such plot was established at Kanhargaon in Chandrapur district in November 1931 in comptt. No. 16 of Chandrapur division (presently Central Chandrapur division) in an area of 2.66 ha and containing 1043 trees. All the tree species occurring in this plot are numbered and the GBH measurements of 11 such tree species from 1931 to 1993, approximately at 5 years interval, were made available to us by the Director, MVSS, Chandrapur. This data has been used to generate increment table. Diameter increment and GBH(Age) curves are drawn using this data. **(Appendix No. 6.3)** Then GBH-volume curve was obtained by using actual data of felling (from jungle register) done in the recent coupes by the FDCM in Nagpur district. (Deolapar, Ramtek and Khapa ranges). The comparison of GBH-volume and GBH-age relationship gives Age - Volume relationship. These curves and related information age - volume relation is given under **Appendix 6.4** and summarized information is given in the table 6.6 above.

This analysis was done in the year 2003 by Shri S G Bhowate, RFO, in the office of Deputy Conservator of Forests, Working Plan Division, Nagpur and a few forest guards available in this office. Shri Shailendra Bahadur, Conservator of Forests, Working Plan Circle, Nagpur personally provided all the guidance for this analysis.

While incorporating the above information about the growth statistics of the 26 species, an attempt has been made to fix the rotation, in addition to on the basis of biological considerations of CAI intersecting MAI, in the light of maximum realization of yield in commercial terms. Thus, MAI and CAI is replaced by actual sale data from the schedule of rate of Nagpur circle for the corresponding volume in case of a few species.

The graphs in appendix 6.2 & 6.3 indicate this valuable information. The comparisons are as follows:

Species	Age of Rotation as per CAI & MAI	Age of Rotation as per price MAI & Price CAI
Teak II/III	87	90
Teak III/IV	114	91
Ain	73	73
Bija	87	85
Dhawada	60	59
Lendia	67	68
Semal	74	70
Garadi	102	104
Karai	94	92

6.4. STOCK MAPPING

6.4.01. The stock mapping based on ocular estimation was not done for this plan. The satellite imageries were used to classify the forest patches according to density as revealed in the Normalized Density Vegetation Index (NDVI) mapping. The extensive line-plot sampling data were used for supplementary information for preparation of stock maps. Compilation of the detailed preliminary treatment map for each compartment by the Forest Geomatics Center, Nagpur would be a part of this plan. **(Appendix 6.5).** The following are the grey values at which various densities have been interpreted (the figures are not standardised).

Range of grey values	Interpreted vegetation/ type	Colour
0-44	Water bodies	Blue
41 -140	blank	Yellow
141-160	Density less than 0.4	Light green
160-190	Density 0.4-0.6	--
191-216	Density more than 0.6	Dark green
217-257	Lantana/ Bamboo	--

6.5. ENUMERATION

6.5.01. The enumeration of trees and the regeneration survey of the forest crop in the division were carried out by Forest Resources Survey Unit, Amravati, Chandrapur and

Working Plan Division Nagpur during 1999-2000 to 2002-03. The sampling design was systematic line-plot survey and the intensity of sampling was 1(one) percent.

6.5.02. Systematic line-plot sampling was carried out at the intersections of 600-meter grid. Species and girth distribution (15 cm girth classes) of trees and bamboo counting were done in 0.36-hectare plots (60 meter x 60 meter).

6.5.03. Regeneration count of seedlings and coppice shoots of teak and other miscellaneous species was done in three height classes (0.3 to 1.0; 1.0 to 3.0 and above 3.0 meters) in 0.04-hectare (20 meter x 20 meter) sub-plots.

6.5.04. Enumeration data were analysed using the Forest Inventory Management System (developed by Shri J.S.Grewal). Enumeration results have been computed separately for each working circle and have been discussed, in the chapters, on various working circles. Stem density, basal area and frequency of each species have been calculated and presented in **Tables 6.7** and Species distribution in various working circle is given in **(Appendix 6.6).**

Table 6.7 Stem distribution in the overall areas of Nagpur Division

Species	Stem in girth classes (GBH range in centimeter									Total	B.A. (Sq.m.)
	16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-above		
Char	2.91	2.18	1.07	0.64	0.32	0.14	0.06	0.01	0.01	**7.34**	**0.15**
Chichwa	0.22	0.19	0.16	0.10	0.06	0.05	0.03	0.02	0.03	**0.86**	**0.08**
Dhaman	1.07	0.96	0.34	0.12	0.03	0.02	0.01	0.00	0.00	**2.54**	**0.04**
Dhawada	9.53	5.05	2.83	1.88	1.18	0.67	0.30	0.11	0.08	**21.63**	**0.17**
Garadi	9.17	6.87	2.04	0.62	0.19	0.05	0.01	0.00	0.00	**18.95**	**0.11**
Haldu	0.12	0.16	0.08	0.05	0.03	0.03	0.02	0.01	0.01	**0.52**	**0.16**
Hirda	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	**0.03**	**0.01**
kalam	0.57	0.56	0.38	0.28	0.22	0.16	0.12	0.07	0.13	**2.47**	**0.20**
Kasai	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	**0.05**	**0.01**
Khair	6.78	6.17	3.31	1.43	0.52	0.13	0.04	0.01	0.01	**18.40**	**0.12**
Kullu	0.29	0.19	0.10	0.06	0.03	0.02	0.02	0.01	0.03	**0.75**	**0.10**
Lendia	14.52	5.95	1.63	0.62	0.29	0.09	0.06	0.03	0.02	**23.21**	**0.25**
Moha	1.58	1.01	0.63	0.37	0.26	0.22	0.19	0.10	0.24	**4.58**	**0.16**
Mokha	0.16	0.12	0.08	0.06	0.05	0.04	0.02	0.01	0.00	**0.54**	**0.05**
Mowai	2.23	2.63	2.26	2.04	1.53	0.93	0.45	0.24	0.16	**12.47**	**0.20**
Palas	9.54	6.95	3.42	1.49	0.67	0.29	0.12	0.03	0.05	**22.57**	**0.83**
Rohan	1.02	1.07	0.90	0.90	0.64	0.43	0.24	0.12	0.09	**5.39**	**0.20**
Salai	0.32	0.31	0.36	0.45	0.48	0.49	0.50	0.27	0.24	**3.43**	**0.22**
Semal	0.04	0.06	0.05	0.03	0.02	0.03	0.02	0.02	0.03	**0.30**	**0.08**
Shisam	0.04	0.01	0.03	0.02	0.01	0.00	0.00	0.00	0.00	**0.12**	**0.02**
Shiwan	0.12	0.05	0.04	0.01	0.01	0.00	0.00	0.00	0.00	**0.25**	**0.01**
Teak	33.17	26.33	16.28	10.66	6.22	3.31	1.56	0.70	0.48	**98.70**	**0.90**
Tendu	11.95	3.41	1.35	0.87	0.58	0.29	0.18	0.09	0.06	**18.77**	**1.43**
Tiwas	0.17	0.17	0.05	0.03	0.01	0.01	0.00	0.00	0.00	**0.44**	**0.06**
Bhirra	9.86	6.40	3.70	2.37	1.44	0.79	0.40	0.15	0.10	**25.22**	**0.17**
Ain	8.41	6.19	3.34	2.25	1.31	0.62	0.35	0.14	0.18	**22.80**	**0.24**
Bija	0.57	0.43	0.28	0.19	0.16	0.09	0.05	0.03	0.02	**1.82**	**0.12**
Surya	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.02**	**0.00**
Behada	0.21	0.17	0.11	0.10	0.08	0.06	0.04	0.01	0.03	**0.82**	**0.07**

Aonla	1.10	1.02	0.49	0.26	0.11	0.05	0.02	0.00	0.00	**3.05**	**0.30**
Biba	0.30	0.26	0.08	0.02	0.00	0.01	0.00	0.00	0.00	**0.68**	**0.20**
Other	32.31	18.11	7.13	3.34	1.64	0.84	0.49	0.43	0.52	**64.81**	**0.51**
Total	**158.31**	**103.02**	**52.57**	**31.24**	**18.11**	**9.84**	**5.31**	**2.61**	**2.51**	**383.52**	**7.17**

6.6. **LOCAL VOLUME TABLES**

6.6.01. Local volume table for teak, ain, bija, dhaora and garari based on the measurement of 641 trees from FDCM areas was worked out with the help of a regression equation. Volume table derived is given, as under, in the Table 6.11.

Table - 6.11. Local volume table for teak, ain, bija, dhaora and garari (IVa quality areas)

Girth class (in cms)	Mid-girth in cms.	Volume per tree in cubic meters		
		Teak	Ain, bija, dhaora, and tendu	Garari
16-30	23	0.0166	0.0185	0.0134
31-45	38	0.0340	0.0374	0.0272
46-60	53	0.0784	0.0862	0.0627
61-75	68	0.1483	0.1631	0.1186
76-90	83	0.2437	0.2681	0.1950
91-105	98	0.3646	0.4011	0.2917
106-120	113	0.5111	0.5622	0.4089
121-135	128	0.6831	0.7514	0.5465
136-150	143	0.8806	0.9687	0.7045
Over 150 cms	158	1.1036	1.2140	0.8829

6.6.02 Besides, local volume table for 13 tree species occurring in the forests of Nagpur Forests division has been generated in the year 2003 in the office of Deputy Conservator of Forests, Working Plan Division, Nagpur. This computation work was also guided by Shri Shailendra Bahadur, Conservator of Forests, Working Plan Circle, Nagpur and the work has been done by Shri S G Bhowate, RFO. It is given in the table 6.12 below:

Table - 6.12 Local Volume Table for 13 TREE SPECIES

Local Volume Table													
Diameter Class	**Shisam**	**Surya**	**Haldu**	**Kumbhi**	**Khair**	**Bahbul**	**Garadi**	**Bija**	**Mowai**	**Shiwan**	**Behada**	**Jambhul**	**Wawala**
	Volume (Cumt.)												
10 -- 20	0.060	0.180	0.050	0.160	0.040	0.075	0.045	0.120	0.025	0.005	0.150	0.080	0.030
20 -- 30	0.180	0.360	0.150	0.360	0.100	0.163	0.150	0.300	0.075	0.050	0.400	0.150	0.116
30 -- 40	0.580	0.820	0.300	0.560	0.260	0.500	0.410	0.740	0.300	0.310	0.700	0.350	0.360
40 -- 50	1.340	1.620	0.500	0.980	0.620	1.310	0.850	1.660	1.375	0.940	1.150	0.840	1.100
50 -- 60	2.540	2.760	1.100	1.760	1.200	3.125		4.360		2.200	1.800		1.800
60 -- 70	4.900	4.660	2.250	2.980	2.080						2.550		2.600
70 -- 80			4.400	4.580	4.600						3.500		3.660

To arrive at the above values, we have used Standard Volume tables for various species (available from FRI, Dehradun) and DBH-volume curve for different heights was drawn. Then diameter and height measurements of the various tree species were done in Ramtek and Deolapar ranges. This field data is then interpolated on the same curves. Volume for different diameter (girth) obtained from this curve is then tabulated girth class wise which is the local volume table. Field data of diameter and height measurement as well as the curves generated are given in the **Appendix 6.6**

6.7 ANALYSIS OF THE CROP

6.7.01 Reserved Forests of the division were stock mapped for the first time in the years 1931-1933 at the time of revision of the working plan by Dunbar Brander. The stock maps were revised with each revision of the working plan. Protected Forests of the division were stock mapped for the first time during preparation of the working scheme by S.S. Parsanis. The latest revision of stock mapping was made at the time of the revision of the working plan by Jwala Prasad.

6.7.02 The Conservator of Forests, Working Plan, Nagpur has directed to replace ocular and subjective stock mapping with objective inventory based on the systematic line-plot sampling on 600 meter grid. The standard size of the sample plot is of 0.36 hectares and located at the grid intersections, in the NE quadrant. Inventory work includes complete enumeration of all trees species in these plots in 15cm girth classes. Regeneration counting is done in 0.04-hectare sub-plots. Recording of forest type, site quality, density and nature of forest damage have been included as an integral part of the enumeration exercise. Accordingly, SOFR (Survey of Forest Resource) Unit, Amravati in collaboration with the field staff of Nagpur Working Plan Division has carried out the comprehensive inventory in forests of Nagpur division. The Inventory Management System developed by J S Grewal was used for analysis of the inventory data leading to provide, the following, statements for the purpose of estimation of the growing stock for treatment under various working circles;

1. Girth class-wise estimated growing stock in respect of important 18-20 tree species and rest of species together.
2. Estimated growing stock per hectare separately for ain, bija, lendia, shisham, tiwas, teak, kalam, khair, salai, semal, dhaora, garari and rest of species together.
3. Girth class-wise percentage distribution of each of the above species in the growing stock

6.7.03 The inventory data, so obtained, have been prescribed to be dynamically linked with compartment maps in the GIS environment; showing the necessary stocking and management related details. Resulting interactive digital maps of the compartments will serve as site-specific decision support system for preparation of the working plan. These maps prepared in the GIS environment are cartographically more accurate than traditional stock maps based on ocular estimation. The process has been fairly standardised in the Forest Geomatics Center at Nagpur and has been used in preparation of stock maps for working plans of Gondia, Chadrapur, Pandharkawada and Yeotmal Forest Divisions.

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Chapter 7. The BIODIVERSITY CONSERVATION AND WILD LIFE PRESERVATION

Biodiversity conservation is an important mandate of the forest department and with the enactment of Wildlife (Protection) Act, 1972, wildlife management has become synonymous with biodiversity conservation. The history of wildlife management, summary of Wildlife (Protection) Act, 1972 and other important issues of man-animal interface have been summarized under this chapter.

7.1. DESCRIPTION OF THE FAUNA

7.1.01. Almost all the forest areas of the division have a fairly good distribution of wild animals, but population density varies with the availability of habitat conditions like food, water and shelter. Deolapar, Parseoni, Ramtek, Khapa and Hingna ranges, that is, the areas adjoining to the Pench National Park and Bor Sanctuary and also the South Umred range are particularly rich in wildlife. In Narkhed, Kondhali, North Umred and Kuhi ranges, wild animals are less in number, where they are seen in better patches of the forests. Representative Central Indian fauna is found in the division and the category wise list of the animals usually found is as shown below :

CARNIVORA: (i) Tiger (Panthera tigiris) (ii) Panther (Panthara pardus) (iii) Hyaena (Hyaena hyaena) (iv) Wild Dog (Cuon alpinus) (v) Indian Wolf (Canis lupas pallipes) (vi) Jackal (Canis aureus) (vii) Common Fox (Vulpes bengalensis) (viii) Leopard Cat (Felis bengalnsis (ix) Jungle Cat (Felis chaus).

HERBIVORA: (i) Bison-Gaur (Bos gaurus) (ii) Sambhar (Cervus unicolor) (iii) Cheetal (Axis axis) (iv) Nilgai (Boselaphus tragocamelus) (v) Barking Deer (Muntiacus muntjak) (vi) Wild pig (Sus scrofa) (vii) Sloth bear (Melursus ursinus) (viii) Black Buck (Antilope cervicapra) (ix) Four horned antelope (Tetraceros quadricornis) (x) Chinkara or Indian gazelle (Gazella gazella bennettil), (xi) Mouse deer (Tragulus memina).

RODENTS*:* (i) Flying squirrel (Pteromya fimbriatus) (ii) Three striped palm squirrel (Funambulus palmarun) (iii) Porcupine.

BIRDS: (i) Painted sand grouse (Pterocles indicus) (ii) Common sand grouse (Pterocles exustus) (iii) Pea fowl (Pavo cristatus) (iv) Grey jungle fowl (Gallus sonne ratil) (v) Painted partridges (Francolinus pictus) (vi) Grey partridges (Francolinus pondicerianus) (vii) Jungle bush quail (Pardicula aisstics) (viii) Black breasted Rain quail (Cturnix coronandelicus) (ix) Indian Bustard quail (Turnix suscitator) (x) Indian or yellow legged button quail (Turnix tanki) (xi) Red spur fowl (Galloperdix spadices) (xii) Crane (Grus antigone) (xiii) Spotted bill duck (Anas poecilorhyncha) (xiv) Pigeon (Treron phoonicoptera) (xv) Dove (Streptpotia spps) (xvi) Cotton teal (Nettapus coromandelianus) (xvii) Whistling teal (Dendrocugna javanica).

7.1.02. Tiger is usually found in Ramtek, Khapa, Parseoni and Deolapar ranges and Panther in almost all the ranges. Hyena, Jackal and Foxes are seen frequenting near the inhabited areas. Packs of wild dogs are seen in the Ramtek, Parseoni, Deolapar and Khapa ranges.

Nilgai, Chital and Sambhar are found all over the division. Gaurs are mainly found in Parseoni, Ramtek and Deolapar ranges. Bears are found usually in the valleys of

Deolapar and Ramtek ranges and also in the Ranbodi block of North Umred range. Typical Central Indian avifauna is also found in the forest tracts of this division and waterfowl are seen in the water bodies within as well as those located outside the forests. In fact, there are many large water bodies, some even close to Nagpur city like Koradi lake, which provide good habitat to many migratory winter visiting water birds.

7.2. HISTORY OF THE WILD LIFE MANAGEMENT IN GENERAL

From time immemorial the wild animals have occupied a place of pride in the folklore of Indian culture. They were respected and protected by the tribals who never used to kill the animals for fun or pleasure. However, hunting became an important pastime for the Rajas and Maharajas who used to hunt and kill the animals for meat as well as for preparing trophies. In the Reserved Forests, hunting was restricted and licenses were used to be issued for small game, big game, etc. and shooting blocks were set apart, where the animals specified in the license only could be hunted.

Prior to the abolition of the proprietary rights, hunting in the *malgujari* forests was done with the permission of the *malgujars*. Consequent to the vesting of these forests in the government as Protected Forests, hunting in these forests was also regulated by fixing shooting blocks and by issuing licenses.

However, after the enactment of the Wildlife (Protection) Act, 1972 and subsequent amendments in this act particularly those in 1991 and 2002, no permission for hunting of wild animals, as game or sport, can be granted. Hunting of wild animals however can be allowed for special purposes but only in exceptional circumstances. This act also enjoins on us the responsibility for wildlife conservation outside the protected areas.

The wildlife, which used to flourish in the forests of the division, is threatened due to various factors like population explosion, encroachments, improved network of roads and availability of sophisticated weapons. Due to increase in demand for wildlife products all over the world, poaching problems have increased over the years and Nagpur, the head quarters of this division being a very big city and an important centre of central India, special efforts are required to be made by the division to protect the wildlife in the region.

7.3. LEGAL POSITION

7.3.01. The first step towards the protection of wildlife was taken by including certain provisions, in this regard, in the Berar Forest Act of 1886. Under Section (3) sub section 7, the definition of forest produce incorporated the 'skins, tusks, bones and horns' and as per Section 10, sub section 4, 'The residency by orders may regulate any part of the State Forests for hunting, shooting, fishing, poisoning water and setting up traps or snares."

The Berar Forest Act, 1886 amended in 1891 provided under section 7(b) that forest produce includes the following when found in or brought from a forest:

"Wild animals, skins, tusks, horns, bones, silk cocoons, honey and wax and all other parts or produce of animal."

Section 7(2)(b) of this act after this amendment provided that any one who hunts, shoots, fishes, poisons water or sets traps or snares, shall be punishable with the fine which may extend upto fifty rupees or, when the damage resulting from the offence amounts to more than twenty five rupees, to double the amount of such damage. Section

10(4)(iii) of this act empowered the resident to frame the rules regarding regulation of hunting, shooting, fishing, poisoning water and setting traps and snares.

7.3.02. Vide Notification G.I.F.D. No. 2197-1-B, dated 13th October 1911, the Indian Forest Act, 1878 was also made applicable. The section 2(b)(iii) included wildlife in its definition of the forest produce. Section 25 (i) provided that any person in contravention of any rules, which the local Government may from time to time prescribe, kills or catches elephants, hunts or shoots fishes, poisons water or sets traps or snares shall be punishable with imprisonment for a term which may extend to six months or with fine not exceeding five hundred rupees or with both in addition to compensation for damage done to the forests.

7.3.03. After the promulgation of the Indian Forest Act 1927, rules relating to wildlife regulations were framed under section 26(I) and 76(d). These were essentially to regulate hunting of wild animals and were given in the appendix VIII of MP Forest Manual Vol. II. Wild Birds and Animal Protection Act 1912 as amended in 1935 also ensured protection to certain animals and a check on hunting of others. Shooting block system of hunting was started from 1927. Under the provisions of the two acts, the Conservator of Forests in consultation with the DCF concerned used to declare areas having abundant game as open to hunting. The DCF accordingly used to issue shooting permits, wherein the type of game and their number allowed to be hunted together with other relevant conditions were used to be mentioned.

7.3.04. The Bombay Wild Animals and Wild Birds Protection Act, 1951 was extended to Vidarbha region from 1.6.1961. Though this act did not propose a significant change in the management of game in the Reserved and the Protected Forests, yet it incorporated following significant provisions:

1. Its provisions were also applicable out side the Reserve and the Protected Forests.
2. Arms license holders for sports were to register themselves with the Wildlife Preservation Officer.
3. This Act prescribed a closed season for hunting and classified game into four categories, viz. small game, big game, special big game, and pet animals.
4. It also sought to control transaction in trophies and other wildlife products.
5. Wildlife Advisory Board was constituted under this act to advise the government on various important matters concerning wildlife.

7.3.05. DEVELOPMENTS AFTER 1972

At the national level, the Indian Board for wildlife was constituted in 1952. Its main object was to devise ways and means for conservation of wildlife through co-ordinated legislative and practical measures and sponsoring setting up of National Parks and Wildlife Sanctuaries. A comprehensive and unified National and State Park Act, 1971 was passed which provided for appointment of an Advisory Committee to advise in regard to the constitution and declaration of National Parks and Sanctuaries and formulation of policy for their administration and management. The Parliament then enacted the Wildlife (Protection) Act, 1972, which came into force in the State of Maharashtra with effect from 1st June 1973. With this, other acts relating to any matter contained in this Act and in force in the State stood repealed. This act as amended from time to time as well as the various

regulations made under this act and guidelines issued by the central and the state govt. provide for establishment of a network of national parks and sanctuaries representing various habitats and for giving protection to all type of wildlife in the state. These provisions also address issues relating to the management of wildlife outside the protected areas. Following rules have so far been enacted under the relevant sections of this act.

i) The Wildlife (Stock Declaration) Rules, 1973 (became effective in Maharashtra with effect from 1.6.1973).
ii) The Wildlife (Transactions and Taxidermy) Rules, 1973 (became effective in Maharashtra w.e.f. 16.1973).
iii) Wildlife (Protection) (Maharashtra) Rules, 1975 (became effective from 6.3.1975).
iv) The Wildlife (Protection) Rules and Licensing (Additional matters for consideration) Rules, 1983 (became effective w.f. 13.4.1983).
v) Wildlife (Protection) Rules, 1995
vi) Wildlife (Specified Plants-Condition for Possession by License) Rules, 1995
vii) Recognition of Zoos Rules, 1992.
viii) Declaration of Wildlife Stock Rules, 2003.

Besides the above specific legal framework available for wildlife management, provisions contained in Indian Forest Act, 1927, Forest Conservation Act, 1980 and The Environment (Protection) Act, 1986 may go a long way in protecting and conserving the biodiversity of this division. Pench National Park is geographically located within the Deolapar and Parseoni ranges and part of the Bor sanctuary within Hingna range. Clearance under the Environment Protection Act, 1986 from environmental angle is required from the govt. of India for any project (other than those relating to improvement of forests and particularly the projects relating to industrial activities damaging the environment of these Protected Areas) including an industry located within 10 km from these PAs. Hence, such clearance is obligatory in case of many of the projects involving forestland of this division because large part of its forests is located in the vicinity of these protected areas.

7.4 SUMMARY OF WILDLIFE (PROTECTION) ACT, 1972

The Wildlife (Protection) Act 1972 provides for effective protection and conservation of wildlife, that is, fauna as well as flora, total ban on hunting of wild animals and severe restrictions on wildlife related trade. The act has been amended from time to time and its amendments done in 1991 and recently in 2002 have brought far-reaching changes in it. Summary of salient features particularly the provisions regarding ban on hunting, restrictions on trade, powers and duties of forest officers and conservation of wildlife outside the protected areas is given below.

1. The scope of the Wildlife (Protection) Act, 1972 has been widened appreciably, which can be summarised as follows:

   (i) The objective of Wildlife (Protection) Act 1972 is Protection of Wild animals, Birds and Plants with a view to ensuring the ecological and environmental security of the country.

   (ii) The words and phrases related to hunting like game and game reserve are now totally removed from wildlife management.

(iii) New categories of PAs have been added. 'Chapter IV – Sanctuaries, National Parks and Closed area', has been changed to 'Chapter IV – Protected Areas' and Protected area has been defined under Section 2(24A). These categories are –

1) Sanctuary (Section 2(26) and 18)
2) National Park (Section 2(21) and 35)
3) Conservation Reserve (Section 36A)
4) Community Reserve (Section 36C)

(iv) The category of game reserve was deleted from this chapter by the 1991 amendment and that of closed area has now been deleted through the 2002 amendment.

(v) The 1991 amendment brought zoos under its jurisdiction and the 2002 amendment makes norms for proper upkeep of animals applicable to zoos, also applicable to circus and rescue centres.

2. A wild animal can be hunted only under special and exceptional circumstances and that too after following elaborate procedure prescribed for the purpose.

3. When an animal included in the schedule I becomes dangerous to ***human life*** or is disabled/ diseased beyond recovery, it may be hunted but while doing so, it will be killed only when it can not be captured, tranquillised or translocated and further such captured animal shall not be kept in captivity unless it is established that it can not be rehabilitated.

Animals belonging to other schedules however can be allowed to be hunted in cases where they become dangerous to ***human property***.

4. Penalties for the wildlife offences have been made much more severe and amendments done in the year 2002 have inserted a new chapter "V A- Forfeiture of Property Derived from Illegal Hunting and Trade" containing 25 sections. These provisions can be invoked if an illegal property has been acquired by carrying on business involving animals included in schedule I and Part II of schedule II.

5. No one is allowed to carry on trade relating to any animal or animal article etc. included in Schedule I and Part II of Schedule II and severe restrictions are put even on the trade relating to other wild animals. It is for this reason that the antler trade going on in Nagpur city for many years, and which the Nagpur Forest Division was required to regulate, has virtually discontinued now due to the restrictions put on this trade by various Central as well as State Govt. orders issued under this act.

6. The Wildlife (Protection) Act, 1972 does not allow acquiring of any wild animal, animal article etc. now, yet a large number of individuals do possess the same having owned it prior to promulgation of this act. The act therefore required such individuals to declare these articles within 30 Days of coming into force of this act. CWLW was to issue ownership certificate as per those declarations and after doing the necessary scrutiny. This did not happen due to lack of publicity of the act and consequent ignorance among the public in general about its relevant provisions.

The 2002 amendment to the act has identified this problem and a new section '40A-Immunity in certain cases' has been inserted to provide another chance to such holders of captive animal/animal article etc. Declaration of Wildlife Stock Rules, 2003 have been promulgated to prescribe the time, form and the manner through which such declarations can be made and ownership certificates can be obtained even now. According to these rules, declaration under Section 40A could be done within 180 days from the date of coming into force of these rules. The CWLW shall, as far as possible, decide such cases within 6 months from the date of declaration.

No animal except live elephant or animal article can now be acquired except by way of inheritance.

7. Delegation of Powers to Forest Officers

The CWLW of the state has been authorised to delegate his powers, except those which authorised him to permit hunting of an animal under Schedule I that has become dangerous to human life or is so disabled or diseased as to be beyond recovery, under various sections of the act to various forest officers with previous approval of the state government. Besides the state government has conferred powers of Wildlife Wardens (Govt. Order No.WLP/1077/86854/F-1, dt.5.5.1977) as follows:

1) Chief Wildlife Warden (CWLW)	PCCF(WL)
2) Addl. Chief Wildlife Warden	CF/CF(WL)/RM
3) Dy. Chief Wildlife Warden	DCF/DFO/DM
4) Wildlife Warden	ACF
5) Asstt. Wildlife Warden	RFO

The present delegation under practice is the one which is in force from 18.8.1993 and was ordered vide CCF(Wildlife (Protection) Act 1972) letter No.D-22(D)(1)/C.No.117/1180, dt.18.8.1993. This delegation empowers the forest officers in the field for the various purposes narrated in the act and the manner in which they are to be achieved. This may be summarised as below:

1) Receive declaration of animal/ animal article and applications for different purposes under the act. Also power to deal with matters ancillary to the above.
2) Deal with wildlife offences as well as their compounding.
3) Registration of arms license holder.
4) Power to make complaint in the court.
5) Power to grant permit for hunting of an animal other than specified in schedule I, which has become dangerous to human life and property.
6) Power to deal with a wild animal live or dead, which is a government property.

8. Any person (that is, common man) is authorised to make a complaint regarding the commission of a wildlife offence and the competent court shall take cognisance of such complaint provided complaint is made 60 days after such person must have given a notice to wildlife warden concerned.

9. The 1991 amendment introduced a provision for payment of a 50% of fine (imposed under Section 51) or of compensation (accepted and paid while compounding of a case under Section 54) as reward to a person who renders assistance in detection of offence/apprehension of offenders and the amendment of 2002 has now introduced the provision under Section 60B for arrangement of money to facilitate giving reward upto Rs.10,000/- to the informer, that is, the person who renders assistance in detection of offence or the apprehension of the offenders.
10. Definition of livestock has been appreciably widened to include animals like camel, donkey, horses, mules and pigs, and 2002 amendment has specifically made a mention under this definition that livestock does not include any animal included under Schedule I – V of the act.
11. The 1991 amendment to the act also addressed to the conservation of floral bio-diversity, although present scheduled plants (under the schedule VI) are not found in Maharashtra.
12. Zoos have been brought under the perview of the act. No zoo can operate without being recognised by the Central Zoo Authority and no new zoo can be established without obtaining prior approval of this authority. CZA has framed regulations providing elaborate procedure, norms and set of conditions under which a zoo can be established and run. A zoo under the act means a facility where captured animals are kept for exhibition to the public and it also includes Circus (where such animals are used wholly or mainly for performing tricks) and rescue centres.
13. All the arms license holders within 10 km radius from the PA boundary are to be registered with wildlife wardens and no new license in this area can be issued without prior concurrence of the Chief Wildlife Warden.
14. The Wildlife (Protection) Act, 1972 does not recognise rights and concessions of local people over wild animals or articles made from them except things like peacock feathers. In fact any wild animal found live or dead and/ or animal articles etc. are a government property. However, State Wildlife Advisory Board may advise the state govt. in regard to harmonising the needs of the tribals and other dwellers of the forest with protection and conservation of wildlife. The act also provides that any forest produce removed from a PA can be used for meeting the bonafide needs of people living in and around the PA but the same cannot be sold for commercial purposes.
15. Only Central Govt. can alter entries in the various schedules. However, the act empowers the CWLW to state to take appropriate management measures including hunting for an animal/group of animals (of schedule II, III, IV) as a part of scientific management of such animals which have become abundant in a localised area. This may include translocating such animal/group of animals for the purpose of population management from a specified area to other suitable places.
16. The Wildlife (Protection) Amendment Act, 2002 has inserted Section 36A to 36D for constitution and management of Conservation and Community Reserves. Thus, the areas linking various PAs may be formed into a Conservation Reserve and private/ community lands, wherein the owner (individual/community) volunteers to conserve wildlife, may be formed into a Community Reserve.

17. Sanctuaries have been brought to almost same conservation status as of National Parks through 1991 and now through the of 2002 amendment -
    - There is a complete ban on sale of forest produce recovered for PAs;
    - No construction of tourist facilities or establishment of Zoos etc. inside a PA without prior approval of the National Board for Wildlife is allowed;
    - Forest officers have been empowered to remove encroachments from PAs;
    - Boundary of PAs cannot be altered without National Board's recommendation.
18. Tourism is not recognised as an objective in this Act. Nor is it so under forest acts, namely Indian Forest Act, 1927 and Forest Conservation Act, 1980. Tourism facilities on the other hand within a PA can be established only after concurrence from National Board for Wildlife. National Board for Wildlife is also expected to frame policies on promoting wildlife conservation, impact assessment of various projects as well as matters relating to resolution of disputes in PAs. The National Wildlife Action Plan, 2002-2016 however discusses eco-tourism but in relation to PAs where it is supposed to be subservient to conservation. However, tourism in forest areas outside the PAs is also gathering momentum and hence the strategy and action plan developed under this document (National Wildlife Action Plan, 2002-2016) may become a guideline for forest tourism albeit with lesser restrictions.

7.5 INJURIES TO WILD LIFE

7.5.1 POACHING:

In spite of stringent provisions as aforesaid, poaching for skin, bones and flesh continues to be the most important reason for destruction of wildlife in the division. Poachers usually shoot the animals when they (wild animals) come to waterhole. Therefore the animals are particularly vulnerable during summer, when number of such water holes is drastically reduced and also water in a water hole recedes to minimum.

It has been recently noticed that a new and very dangerous method of poaching through poisoning of drinking water by mixing urea in large concentration has been innovated by the poachers. When an animal drinks such water, it dies within hours due to intense gas formation in stomach and chocking of breathing organs. The poachers then remove skin or bones of the dead animal for trafficking.

Setting of nets and traps for catching birds, hares and sometimes small animals like deer has been employed in the past but of late the poachers have been found using the improvised traps for killing the large animals like tigers very effectively and regularly.

Electrocuting the animals including tigers by laying electric wires on the tracks followed frequently by wild animals and by drawing electric current from the high tension lines passing through the forests is another new method which is proving to be a potential threat to animals, besides sometimes being hazardous to local people.

7.5.2 DISEASES TO WHICH WILDLIFE IS LIABLE:

The livestock from the villages in the forests regularly frequent the forests and share the water holes used by wild animals. Therefore various diseases common in domestic cattle, and which spread through contact and are water borne (contagious

diseases) are passed from livestock to wild animals. Most frequent is (तोंडखुरी) foot and mouth disease. Other diseases which may occur are (1) (काळपुरी) Anthrax (2) Rabies (3) (घटसर्प) HS (4) (बुळकांडी) (5) Canine distemper. FMD has a potential to wipe out large populations, while rinderpest, anthrax and Rabies are highly infectious and lead to certain death.

7.5.3 FIRES

Fires are major culprit reducing food availability for the herbivores very drastically. Thus, wild animal habitats are very adversely affected due to recurrence of fires every year. Besides fires pose a major danger of wiping out of floral bio-diversity from the region.

7.6 INJURIES DUE TO WILDLIFE

The carnivores, tigers and panthers particularly sometimes kill domestic cattle grazing in the forests. There are also cases of human injury and even death due to attacks from wild animals. The villagers sometimes indulge in poisoning the carcass to take revenge and cases of electrocution of wild animals by the villagers to kill the animal suspected to have killed the cattle have also been reported. In such cases the persons involved in illegal killings of the wild animals do not have any intention of poaching or trade but such activities on the part of local people pose grave danger to animal populations in the forests. The govt. of Maharashtra therefore have evolved a policy of compensating for the loss of livestock as well as for the injury to and loss of human life. This is summarised below:

COMPENSATION FOR THE LOSS OF LIVESTOCK

The scheme, which was introduced for the first time in 1971, covers the loss of Cow, Buffalo, Bullock, Sheep, Goat and other livestock (as per definition given under Section 2(18A)) due to attack of a Tiger, Panther or any other wild animal. The present rates of compensation as per the GR No.WLP-1002/C.No.258/F-1 of 27.1.2003 are as follows and compensation is to be paid within 3 months.

1)	Cow, Buffalo, Bullock	75% of the market price or Rs.9000/- and whichever is less;
2)	Sheep, Goat, other livestock	75% of the market price or Rs.3000/- and whichever is less.

The conditions to be fulfilled are:

1) Death to be reported within 48 hours.
2) Carcass is not to be removed before case is made.
3) No death of any wild animal within 10 km radius area in the next 6 days.
4) Immediate investigation by forest officers as to the wild animal, which killed the cattle as well as likely amount of compensation.
5) Compensation to be sanctioned by an officer not below DCF/DFO.
6) No compensation in case the livestock was grazing illegally.

COMPENSATION FOR THE INJURY TO AND LOSS OF HUMAN LIFE

Introduced through GR dated 27.1.1986, the scheme covers death as well as injury including minor injury caused to any individual in an attack by a wild animal. Any such

attack by Tiger, Panther, South Bear, Bison, Wild Pigs, Wolf, Hyena, Jackal and wild dogs is covered under the scheme. Present rates of compensation have been fixed through GR No.WLP-1002/C.No.258/F-1, dt.17.1.2003 and dt.20.5.2003. These are as follows:

1)	Death or permanent disability (Adult as well as minor)	Rs.2.00 lakhs to legal heir.
2)	Major injury	Rs.50000/- to the individual injured.
3)	Minor injury	Cost of medication preferably in govt. hospital but in case of unavoidable private medication, limit should be up to Rs.7500/- per individual.

Following are the conditions put for claiming and deciding above compensation:

1) Such attack should not have occurred when the individual was indulging in violating the Wildlife (Protection) Act 1972.
2) Relative/friend should report the attack within 36 hours.
3) Police/forest officer to investigate within 3 days.
4) Death/injury due to wild animal is to be certified by the govt. medical officer.
5) Compensation due to death is to be given only to legal heir and compensation due to injury is to be given to individual concerned.
6) Compensation is to be sanctioned by the officer not below the rank of DCF/DFO.

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Chapter 5. PAST SYSTEMS OF MANAGEMENT

5.1. GENERAL HISTORY OF MANAGEMENT

5.1.01. Nagpur was under the control of Maratha till 1854, when the district was lapsed to British under the Doctrine of Lapse. Short-term settlements of land revenue were carried out during the Maratha rule by the appointment of *Mamlatdars* who collected the land revenue. British government conferred *Zamindari* rights on the persons who had held possession of land for a long time and were capable of paying the land revenue.

5.1.02. Forests were open to uncontrolled felling and unregulated grazing by any one paying the prescribed fee to those having the proprietary rights over the land. Though the fee for removal of forest produce fetched considerable revenue however forest management was not introduced by such *zamindars*. Furthermore, the areas near villages were excessively harvested and grazed upon. Practice of shifting cultivation was also common.

5.1.03. Protection of these forests was considered essential and regular forest management began with survey, demarcation and map preparation of forest areas in 1862. The same year was the beginning of the Forest Department in Nagpur.

5.1.04. Forest produce constituted a major source of revenue for the government. After enactment of the Indian Forest Act in 1878 large tracts of good forests in possession of the *malgujars and zamindars* were declared as Reserved Forests in 1879 while the remaining forest areas continued with them for management and use. Trees of superior species like teak, bija, shisham, kusum, haldu and kullu were reserved, and their removal without license was prohibited. The felling of fruit trees was also banned. However, absence of any felling regulation resulted into over-harvesting in accessible areas, while inaccessible areas remained unworked. The working plan for management of Reserved Forests of the Nagpur Division was introduced in 1895 and, since then, six working plans have been implemented in the division **(Table 5.1).**

Table 5.1. List of working plans for the reserved forests of Nagpur Division

S.N	Working plans in chronological order	Plan period
1	Dobbs' Working Plan	1895 – 1912
2	Dunbar Brander's Working Plan	1912 – 1934
3	P. Sagreiya's Working Plan	1935 – 1946
4	R. Mishra's Working Plan	1947 – 1964
5	G. Thosre's Working Plan	1965 – 1980
6	Jwala Prasad's Working Plan	1990 – 2000

5.1.05. Management of the Reserved Forests of the Nagpur Division can be categorised into three distinct periods:

(1) Pre-reservation period from 1853 to 1878,

(2) Early reservation period from 1879 to 1895, and

(3) Forest management under regular working plans since 1895.

5.1.06. With enactment of the Madhya Pradesh Abolition of Proprietary Rights (Estates, Mahals and Alienated Lands) Act, 1950, rights over private forests under zamindars were vested in the state government with effect from 1st April 1951. Good forest patches in ex-proprietary lands were subsequently transferred to the Forest Department for the management. Such forests were notified as Protected Forests under Section 29 of the Indian Forest Act, 1927. Subsequently, some of these Protected Forests were notified as the Reserved Forests under Section 20 of Indian Forest Act, 1927. While the Reserved Forests were scientifically managed for more than a hundred years, the Protected Forests were brought under working plan management at a much later stage.

5.2. FIRST WORKING PLAN BY DOBBS: 1895 TO 1912

5.2.01. The first Working Plan for management of 718 square miles of forests of the Nagpur division was prepared by Dobbs in 1895. The Nagpur Division was divided into five ranges, and separate plans were prepared for each range. Working circle allocation was based on stocking and accessibility of the forest crops. Degraded areas having scanty tree growth near villages were set aside as permanent pasture. The remote forests were opened for removal of poles and the areas having demand for timber, firewood and grazing were divided into different felling series, each containing 30 compartments serving as annual extraction coupe. Removal of bamboo, dry firewood and grass was permitted on license. The management aimed at providing a regular supply of straight and sound poles of valuable species. To this end, improvement fellings were prescribed. The system of improvement fellings was changed to coppice-with-standard system In 1906-07.

5.2.02. Only half of the coupes could be worked during the currency of the plan. Cultural operations prescribed in the plan were not carried out in the worked coupes. Due to excessive removal of poles from the coupes, growing stock became considerably irregular and deficient in stocking. Attempts to restock blank areas, especially, in the Pench range by sowing grass seeds and teak seeds were found unsuccessful.

5.3. SECOND WORKING PLAN BY DUNBAR BRANDER: 1912 TO 1935

5.3.01. Dunbar Brander revised the Dobbs plan for the Reserved Forests of the Nagpur Division. He divided the entire forest into three working circles, namely, the Teak Working Circle, the Mixed Working Circle and the Grazing Working Circle.

Teak Working Circle

5.3.02. The forest comprising of good quality teak forests in the trap zone were assigned to this working circle and were divided into 8 felling series having 45 coupes in each. The treatment prescribed was to reserve atleast 20 promising trees per acre and to coppice the rest of the crops.

Mixed Working Circle

5.3.03. All the areas containing tree growth of miscellaneous species, poor teak areas and scattered patches of better teak were allotted to this working circle. Coppice with standard was the silviculture system adopted. Out of the 21 felling series formed; 5 felling series were not worked due to lack of demand; while each of the remaining felling series was divided into 30 coupes. The treatment prescribed was to reserve at least 30 of promising trees per acre as standard and to clear fell the rest of the crop. However, the following conditions were prescribed for strict compliance.

- In felling series I to VII of East Pench ranges, all well grown salai trees of 4 ½ ft girth and under were not be felled. These salai trees were not to be included within the prescribed number of standard.
- In felling series I to V and VIII to X of East Pench ranges and in felling series II to V of West Pench ranges, teak trees in these areas were not be felled under the ordinary coppice felling. The felling of teak in these areas was to be confined to a purely cultural operation with the object to increase the stocking of teak in the crop.

5.3.04. Sowing of teak seed in the medium and well-stocked areas of the mixed forests in the Pench range was also prescribed to increase the proportion of teak in the stocking.

Grazing Working Circle

5.3.05. The degraded areas incapable of producing good timber as well as isolated patches of forests near the villages were allotted to this working circle to meet the increasing demand for grazing. No fellings were prescribed in this working circle, but it was laid down that if demand arose, the tree growth could be harvested with the sanction of the Conservator of Forests.

Modification In The Prescriptions Of Main Felling

5.3.06. The felling rules were modified in 1922-23 when it was found that it was not desirable to leave a minimum no of trees per acre as standard in the teak and mixed working circles. Retention of trees was considered necessary only as seed bearers and for obtaining increment in the standards and it was prescribed that only vigorous saplings of the more valuable species under a prescribed girth limit should be reserved. In 1927-28, it was found that the annual yield in certain felling series was exceeding the demand, especially, for fuel wood in the areas. It was also feared that the short cycle of 30 years, on which some of the forests were being exploited, might

weaken the stools to produce vigorous coppice reproduction in the next rotation. The prescriptions were therefore, modified as follows;

(1) Kondhali mixed felling series I, worked on a cycle of 30 years, was split into two felling series with 45 annual coupes.
(2) In West Pench felling series II, only half a coupe was to be worked each year.
(3) In Hingna teak felling series II, mixed felling series I, West Pench felling series the Arvi-Kondhali, and I felling series only two third of a coupe was to be worked each year.
(4) Umrer mixed felling series II was divided into two felling series with 30 annual coupes in each. At the same time the system was changed from coppice with-standard to simple coppice in Teak.

5.3.07. No clear rules were laid down for the transition felling but the inspection of worked areas, showed that they aimed at the removal of malformed, dead and dying trees to improve the hygiene of the crops.

5.3.08. In 1928-29, prescriptions for the forest of the East Pench Ranges were again modified. Dense and moderately dense patches of teak, bija and ain, attaining a height of more than 50 at maturity, were to be subjected to crown thinning. All groups of advance growth of areas of teak and mixed forest were to be clear-felled as far as the demand justified it but no felling were to be made in poor open forests.

INTRODUCTION OF THINNING

5.3.09. During a review held in 1924-25, it was found that some of the forests were becoming too dense. Thus it was decided to introduce thinning as a silvicultural measure. 10-year thinning cycle was prescribed before and after main felling at the ages 10, 20 and 30 year in the teak forest worked on 45 years rotation. Of these thinning those prescribed 10 years before the main felling in the mixed forests and those at the age of 20 years in teak forests were optional and were to be carried out only if silviculturally necessary while the other were compulsory. The prescriptions given in the plan helped to improve the forest but there were some shortcomings.

(a) In coppice-with-standard system the reservation of a prescribed minimum number of uniformly distributed standard was not always possible and this resulted in the retention of many unsuitable stems in the poorer forests and the sacrifice of many immature trees of valuable species in better forests. Also the standard retained occupied more growing space and developed knotty boles and epicormic branches.

(b) Simple coppice system tried in teak and mixed forests led to sacrifice of a large number of young and middle aged trees unduly exposed the soil leading to growth of grasses and weeds. Moreover, incidences of serious fires resulted in severe damage to the regeneration and the growing stock.

(c) Transition felling though gave satisfactory results but as the prescriptions were vague, the fellings were not done in a uniform manner. Thinning introduces since

1924-25, had been heavy and in some areas amounted to regeneration felling and exposed the soil.

5.4. THIRD WORKING PLAN 1935-36 TO 1946 47

5.4.01. The first systematic Working Plan based on the result of stock mapping was written by K.P. Sagreiya. The entire forest was stock mapped on 4"=1 mile scale and classified into tree, scrub and miscellaneous forests. The entire area was divided into five (5) working circles. A few compartments in each working circle were kept un-allotted over which no coupes were laid out either to provide facilities for grazing or because of lack of demand. The distribution of area by working circle is given in the Table 5.2.

TABLE 5.2. Distribution of areas in various working circles in Sagreiya's Plan

(i)	Improvement working circle	13396.451 ha.
(ii)	Conversion working circle	14888.948.ha.
(iii)	Coppice-with-Reserve working circle	85128.226 ha
(iv)	Open Pasture working circle	11648.956 ha
(v)	Miscellaneous working circle (a) Grass birs (b) Forest villages	 3701.896 ha 3939.088 ha.
(vi)	Bamboo (overlapping) working circle	
(vii)	Semal (overlapping) working circle.	
	Total Area	**132703.559 ha.**

5.5. TREATMENTS PRESCRIBED

IMPROVEMENT WORKING CIRCLE

5.5.01. Area under this working circle was confined to the remote and hilly tracts of forests in both the Pench ranges. The treatment prescribed was to improve the crop by removing the unsound and malformed trees along with the inferior species interfering with the growth of valuable species. The working was to be mainly confined to the teak patches and to such areas of miscellaneous forests as can be profitably exploited. The felling cycle was fixed as 24 years. No cultural operations were prescribed after felling.

CONVERSION WORKING CIRCLE

5.5.02. All areas containing teak of site quality III and IV (a) were included in this working circle. A rotation of 72 years was fixed and each felling series was divided into 72 coupes. The first 24 coupes from (1 to 24) containing mainly mature trees were to be taken up for main-felling. If the coppice was sufficient to restock the area, the clear felling was prescribed while retaining the young recruits and advanced growth. In areas lacking established regeneration, thinning was to be carried out. The balance 48 coupes which were not allotted to the regeneration block were called the unallotted areas. Coupes 25 to 48 contained middle age crop while coupes 49 to 72 contained young crop. In one coupe from both these groups improvement felling

and light crown thinning were to be carried out annually in favour of the age class to which the group belonged.

5.5.03. The improvement cum thinning operations prescribed in the unallotted areas resulted in over felling and adversely affected the future crop. While the rotation of 72 years was found to be shorter for forests in the Pench ranges it was found to be higher for the forest tracts in Kondhali, Hingni and Umrer ranges.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.5.04. All quality IV areas suitable for the production of firewood and poles were allotted to this working circle. A rotation of 48 years was prescribed and the felling series were classified as mixed or teak.

5.5.05. All the trees except the following reserved trees, existing individually or in groups, were prescribed for felling in these areas.

(a) In poor and open area all healthy trees of any species were to be retained.

(b) All healthy fruit species were to be retained.

(c) All seedlings and saplings of the species except garari up to 23 cm in girth were to be reserved.

(d) Groups of well grown, healthy immature trees of timber species were to be reserved and thinned, wherever, necessary.

(e) A belt of trees along nalas and rivers were to be retained.

(f) Well grown poles of miscellaneous species were to be retained in areas where teak tended to be pure.

5.5.06. In teak felling series two thinning were to be carried out in the 16^{th} and 32^{nd} year after main felling. The first thinning operation consisted of light crown thinning, climber cutting and removal of inferior species interfering with teak except where teak tended to be pure. In the second thinning, the aim was to induce rapid girth increment on the stems retained for the future and for this purpose, heavy crown thinning was to be carried out. The crown of all well grown teak trees had to be freed but no growth below the level of this crown was to be thinned as congestion in the lower canopy was desirable to prevent the growth of epicorpic branches in the dominant trees. In the mixed felling series one thinning at half the rotation age viz. 24 years was prescribed, as miscellaneous species were slow growing. A light crown thinning was to be carried out to favour the vigorously growing poles of the more valuable timber species and coppice shoots were to be reduced to one or two per tool. However it was prescribed that these thinning were to be carried out only in these areas where it was absolutely necessary. Cutting back operation in the year following the main felling was also prescribed.

PASTURE WORKING CIRCLE

5.5.07. The forest areas close to habitations and incapable of producing valuable timber were included in this working circle. The main object was to improve the pasture by periodic closure to grazing assisted by felling. In total 27 grazing units were

formed; out of which only 23 were divided into 4 coupes each, namely, A B, C and D. After carrying out felling with the object of improving the pasture and of removing over mature trees if present, each worked coupe was to be successively closed to grazing for a period of 4 year. All dead, dying and over mature trees prone to decay were to be removed by working ¼ of the coupe every year. D grade thinning was to be carried out in the dense patches of forests found in these coupes.

5.5.08. The temporary gain obtained by periodical closure was lost soon after the area was opened to grazing because of excessive grazing. This led to the growth of weeds like tarota, rantulsi and poor quality grasses.

MISCELLANEOUS WORKING CIRCLE

5.5.09. All grass birs and forest villages were included in this working circle. The forest villages were to be managed as per the prescription in the paragraph 68 and 69 of Central Provinces Forest Manual.

BAMBOO (OVERLAPPING) WORKING CIRCLE

5.5.10. Bamboo occurs in appreciable quantity only in the Pench Ranges and hence Bamboo overlapping working circle comprising of these areas was formed. An area of 30185.12 ha in the East Pench Ranges and 28722.99 ha have in the West Pench Ranges, were divided into 4 coupes each. Cutting cycle of 4 year was prescribed. The felling rules prescribed were, as follows;

(a) No culms, less than one year old, were to be felled.

(b) The height at which culms were to be cut should not exceed 45 cm from the ground.

(c) A minimum of 8 culms over one year of age was to be retained in each clump.

(d) As far as possible no dead bamboo was to be left in any clump.

(e) The digging of rhizomes was prohibited.

SEMAL (OVERLAPPING) WORKING CIRCLE

5.5.11. Due to the increase in demand for semal wood for match industries, an overlapping working circle was created in the East Pench Range except in compartment number 405. The whole area was divided into 20 coupes, which were to be worked on a 20 years felling cycle. Semal trees above 40 cm diameter were to be marked for felling. However no coupes could be worked as the contractors were not ready to fell a few trees occurring on vast areas. Due to the sudden increase in demand for semal trees in 1943-44, the semal trees were harvested departmentally and supplied to contractors at railheads.

5.5.12. The on going world war II caused a heavy demand for timber and, hence, heavy thinning were carried out over larger areas and as a consequence best stems were harvested to meet the demand during the period from 1940-41 to 1945-46.

5.6. FOURTH WORKING PLAN 1947-48 TO 1964-65

5.6.01. The Sagreiya's Plan was replaced by the B. R. Mishra's Plan. As the stock maps were found to be accurate after carrying out field inspection, they were adopted after changing only the age classes. The entire forest areas was classified on functional basis as per Chief Conservator of Forests, Madhya Pradesh Memo no. 5079 dated 28/9/1946 into Protection forests, Trees forests, Minor forests, Pasture forests and Miscellaneous forests. The following working circles were prescribed for treatment of forest crops;

Table 5.3. Distribution of working circles in Mishra's Plan

Name of Working Circles	Area (Ha)	Number of felling series formed
Protection Working Circle	9428.411	5 F.S. to be worked under a felling cycle of 24 years.
Pench High Forest Conservation Working Circle	24042.691	5 F.S. to be worked under a conversion period of 80 years
General High Forest Working circle.	6339.573	2 F.S. to be worked under conversion period of 60 years.
Coppice-with-Reserve Working Circle.	76050.179	32 F.S. (30 full and 2 part) to be worked on rotation of 48 years. (The other part of the 2 F.S. lies in the Wardha Division).
Pasture Working Circle.	8511.324	10 grazing units.
Miscellaneous Working Circle. {a} Grass birs. {b} Forest villages	 3722.736 4024.521	 To be permanently closed to grazing. No regular working was prescribed
Total	132169.435	
Overlapping Bamboo Working Circle.	---	12 F.S. to be worked on a felling cycle of 4 years.
Overlapping Semal Working Circle.	---	1 F.S. to be worked on 20 years felling cycle.
Overlapping Khair Working Circle.	---	6 F.S. to be worked on 20 years felling cycle

THE PROTECTION WORKING CIRCLE

5.6.02. This working circle included all hilly compartments of the West Pench and Deolapar ranges containing precipitous and steep slopes and a few other compartments for the convenience of management.

THE SELECTION-CUM IMPROVEMENT WORKING CIRCLE

5.6.03. The objective behind the creation of this working circle was to preserve and improve the growing stock; and in consonance to this objective obtain maximum sustained yield from these areas. To this end, the Selection cum improvement system with felling cycle of 24 years was prescribed. The following guidelines were prescribed to be followed under this working circle.

{1} Inaccessible areas, areas having precipitous and very step slopes and under-stocked areas were excluded from working. In such areas only improvement felling was prescribed.

{2} Along the river banks, no trees were to be felled up to a width of 30 m.

{3} After making reservation as in (1) and (2) from the remaining areas all dead and half of the teak trees 120 cm and above at gbh were to be removed, if silviculturally available.

{4} Improvement felling consisting of removal of miscellaneous species interfering with teak and suitable thinning in even aged patched of teak were proposed.

{5} Advanced growth of teak (up to 30 cm in girth) which was malformed was to be cut back.

PENCH HIGH FOREST CONVERSION WORKING CIRCLE

5.6.04. All the areas having good quality teak and mixed forests (III and IV) except those included in the protection working circle were allotted to this working circle. The system prescribed was conversion to uniform with adequate safeguards to retain a suitable mixture of teak and miscellaneous species. However, no felling were to be carried out in the steep and precipitous slopes as well as in the under-stocked areas. Conversion period of 80 years was adopted and the entire area was divided into 4 PBs depending on the age of the crops. All the 4 PBs were allotted. One twentieth of the workable area of PB-I was to be taken up for conversion each year. Cultural operations and thinning were to be carried out on 1/20 of the workable areas of the PBS II, III and IV. Regeneration of PB -I was to depend mainly on the existing NR to be supplemented by the coppice seedlings. However as a safeguard in PB-I coupes groups of well-grown advance growth and poles were to be retained as part of future crop. SCI felling was to be carried out in the hilly and inadequately stocked areas. Climber cutting was to be carried out 3 years in advance of main felling and the coupes were to be closed to grazing a year after felling. Climber cuttings, cleaning and suitable thinning were to be carried out when the forest crops attained the age of 5 and 10 years.

THE GENERAL HIGH FOREST WORKING CIRCLE

5.6.05. The better quality forests in the trap zone of Hingna, Kondhali and Umrer ranges were included in this working circle. Conversion to uniform was the treatment prescribed with a conversion period of 60 years. Safeguard measures like retention of a mixture of teak with miscellaneous species in ratio of 50:50, no felling on steep slopes and precipitous areas as well as in under-stocked area were provided. To improve the natural regeneration in the coupes, climber-cutting 3 years in advance of main felling as well as closure of coupes to grazing was also provided. In addition to all these, well-grown poles up to 45 cm in girth of all miscellaneous species except garari subject to a minimum of 40 per acre was to be retained in the mixed forests. In areas having pole crop, poles up to 60 cm in girth and 45 cm in girth were to be retained in good quality and poor quality areas, respectively, as part of future crop. Improvement fellings were to be carried out on steep slopes, poorly stocked areas and

area having inadequate regeneration. The subsidiary silvicultural operations such as CBO one year after main felling, climber cutting and cleaning at the age of 5 year and thinning at 10, 20 and 40 years were also prescribed.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.6.06. The forests capable of producing small to medium sized timber, poles and firewood were put in this working circle. The rotation of 48 years was continued as was in Sagreiya's plan. Mature trees were prescribed for felling, all advance growth up to 23 cm GBH except of garari were to be retained. Healthy well grown poles up to 60 cm were to be reserved to the extent of 30 poles per acre. The CBO, after one year of main felling was prescribed. Climber-cutting and cleaning after 8 years and thinning after 24 years were also prescribed.

PASTURE WORKING CIRCLE

5.6.07. Areas incapable of producing timber or fuel wood and where grazing pressure was high were put in this working circle. No felling unless required for the improvement of pasture was to be carried out. Fodder yielding species like *anjan, mowai and bija along with grasses like sheda, paonia and marvel* were prescribed to be planted. Closure for grazing was proposed in alternate years to provide time for establishing the fodder yielding species.

MISCELLANEOUS WORKING CIRCLE

5.6.08. The grass birs and the forest villages were included in this working circle. The grass birs were created with the intention of providing good fodder to the nearby villages and hence were permanently closed for grazing. For the purpose of improvement of the grass birs, periodical burning once in 5 years, sowing of seeds of high yielding grasses like paonia, sheda, marvel etc, alongwith the removal of weeds and climbers were proposed. The areas of the forest villages were meant for cultivation and also for meeting the nistar requirements of the villagers.

OVERLAPPING BAMBOO WORKING CIRCLE

5.6.09. The workable bamboo areas of Pench range were included in this working circle. The 12 felling series formed were worked on 4 year felling cycle.

OVERLAPPING SEMAL WORKING CIRCLE

5.6.10. One felling series in East Pench range was formed. The felling cycle was fixed at 20 years. All Semal trees above 135 cm gbh were to be exploited departmentally. However as the Semal trees occurred scattered over the entire felling series, extraction became uneconomical and hence after the 12th coupe the work was stopped.

OVERLAPPING KHAIR WORKING CIRCLE

5.6.11. Six felling series were formed over the entire division as the Khair occurred scattered or in pure patches in teak and mixed forests in all the ranges. The felling series was fixed as 20 years. The Khair trees above 45 cm girth at BH were to be

exploited for manufacturing katha. However as the Khair trees mainly occurred in degraded areas, not much working was carried out to prevent further degradation of the areas.

RESULTS OF THE WORKING

5.6.12. The prescription of this plan helped to improve the forests in general. Natural regeneration except in the dry localities also improved. The semal and khair working circles could not be properly worked as the trees were scattered over the entire area. Some of the short comings of the plan were as listed below:

{1} Procedure for demarcating the various areas as well as the method for marking and recording the trees to be felled or reserved were not specified.

{2} No soil conservation measures were proposed for erosion prone areas.

{3} The method of carrying out the cultural operation was not prescribed.

{4} Retention of miscellaneous species in the areas having profuse reproduction of teak was not proposed.

{5} No prescription was given for raising plantations of valuable species in the good areas of Pench ranges.

5.7. FIFTH WORKING PLAN: FROM 1965-66 TO 1975-76

5.7.01. The Fifth Working Plan was prepared by J.G. Thosre. The period of the plan was from 1965-66 to 1975-76 for twenty years but was subsequently extended up to 1987-88. The entire forest was restock mapped on 4"=1 mile scale maps. As per the resolution of the M.P. Govt. no. 3952-2624-XI, dated 10/12/1952 the forests were classified on functional basis as below.

Table - 5.4 Functional classification of the forests in Thosre's Plan

Classes of forests	Area in Hectares
Tree Forests.	30382.264
Minor Forests.	76050.179
Protection Forests	9429.411
Pasture Lands.	8511.324
Remaining Forest	
(a) Grass birs	3615.673
(b) Forest Villages	4024.521
(c) Seminary hills	67.410
Total	**1,32,080.782**

5.7.02. The following working circles were created taking into account the silvicultural requirement of the forest crops as well as the demand for timber, fuel wood and grazing in the division.

Table - 5.5 Distribution of working circles in Thosre's Plan

S.N	Working Circle	Area (in ha)	Nos of FS formed
1	Protection working circle	9429.411	5 F.S. to be worked under a

			felling cycle of 24 years.
2	Pench High Forest conversion working circle.	24042.691	5 F.S. to be worked under 80 year conversion period.
3	General High Forest working circle.	6339.573	2 F.S. to be worked on a rotation of 60 years
4	Coppice-with-Reserve working circle	76054.229	33 F.S. (30 full and 3 part) to be worked on a rotation of 48 years.
5	Pasture working circle.	8799.542	Pasture series.
6	Miscellaneous working circle. Grass birs. Seminary hills. Forest villages	3615.673 67.410 4024.521	Permanently closed to grazing.
	Total	132080.782 ha	
S.N	**Working Circle**	**Area (in ha)**	**Nos of FS formed**
7	Overlapping Bamboo working circle	--	16 F.S. to be worked under 4 year felling cycle.
8	Overlapping Khair working circle.	--	6 F.S. to be worked on a felling cycle of 20 years.

PROTECTION WORKING CIRCLE

5.7.03. The forests in the hilly and undulating areas on both sides of the Pench River as well as the areas having sandy to sandy loam soils prone to erosion were included in this working circle. The crops consisted of mainly middle-aged trees with a large number of unsound old teak trees in the remote areas. The special objects of management were (1) conservation of soil and moisture by retaining tree cover (2) preservation and improvement of existing growing stock (3) to increase the value of forests by increasing the proportion of valuable species and (4) to achieve maximum sustained yield. SCI silviculture system was adopted to meet these objectives. The exploitable girth for the different species was fixed, as follows:

- **Teak & Haldu – 120 cm,**
- **Bija & Ain – 135 cm,**
- **Dhaora, Shisham, Tendu & Bhirra – 90 cm,**
- **Tinsa – 75 cm.**

5.7.04. Area was divided into 5 Felling Series and 24 years felling cycle was prescribed. As a safety measure it was proposed that the trees required for protection as well as for seed purposes along with healthy trees of species like moha, tendu, achar, harra, kullu and khair were to be retained all over the area. In the steep slopes, under-stocked areas as well as areas prone to erosion no living trees were to be felled. In the frost prone areas, frost hardly species like *ain, dhaora, moha, kusum and mowai* were to be retained. In the workable areas one out of two mature teak

trees and all mature trees of other valuable species were to be marked for felling. Other operations prescribed were light crown thinning in the immature crop, removal of dead, dying and diseased trees as well as inferior trees interfering with the growth of teak and other superior species. The subsidiary silvicultural operations prescribed included anti-erosion measures in the erosion prone areas, CBO, climber cutting and addressing of stools. In the 6th year cleaning, climber cutting, cutting back of malformed saplings, singling of coppice shoots and removal of inferior species interfering with the growth of superior species were also prescribed. Thinning, in the 13th year, as per the formula; **D = 3/2 (d+3)** was also prescribed.

PENCH HIGH FOREST WORKING CIRCLE

5.7.05. The good quality forests of Khapa and Deolapar ranges except those allotted to the Protection working circle were allotted to this working circle. The crop was mainly of teak and mixed forests of III and IV a quality. The special objects of management were to convert the forests to a normal series of age classes, to produce big sized timber of teak and other superior species, to extent the area under teak by planting and also to maintain a suitable mixture of teak and miscellaneous species in the areas tending to be pure teak forests. The silvicultural system adopted was conversion to uniform. The conversion period was fixed as 80 years and 4 PBs were created each having 20 coupes. The clear felled areas were to be regenerated artificially.

5.7.06. In the protection and unworkable areas in the PB I coupe improvement felling were prescribed. Minimum 10 acres of area were to be clear felled and planted with teak. Areas having young pole crop of teak were to be thinned so as to bring the inter spacing distance to 1/3rd of the height. The dead, dying, diseased and malformed poles were also to be removed. Improvement felling consisting of removal of dead, dying, unsound and over-mature trees were proposed in areas having density between 0.4 and 0.6. C/D grade thinning was proposed in congested patches. In the other areas, well grown poles of teak and other valuable species up to 60 cm gbh, healthy fruit trees and all semal, khair and kulu trees were to be reserved and the balance trees were to be felled. Climber cutting was proposed at the time of making.

5.7.07. In the PB II areas light crown thinning, climber cutting and removal of dead trees were proposed. In PB III areas thinning to maintain a mixture of teak and miscellaneous species as well as improvement fellings were prescribed. In PB IV areas climber cutting and cleaning operation were prescribed in the 6th year. Light crown thinning to attain a spacement of 3m x 3m was proposed in the 20th year.

GENERAL HIGH FOREST WORKING CIRCLE

5.7.08. The better quality forest areas of Umrer, Kondhali and Hingni ranges were included in this working circle. The crop was mainly teak of quality IVa and IVb. The special objects of management were (1) conversion of the forest to a normal series of age classes. (2) production of large size timber (3) improvement of the crop by planting as well as by taking up suitable cultural operations. 60 years rotation was fixed and 60 annual coupes were formed.

5.7.09. The well stocked areas (>0.6) were to be clear felled after retaining (a) well grown poles up to 30m, 45cm and 60cm gbh in IVb, IV and quality III areas respectively (b) trees of any size necessary for silvicultural purposes (c) all healthy fruit bearing trees (d) Khair, Kulu and well grown Salai trees. Teak plantation was to be taken up in open patches where teak was absent.

5.7.10. Subsidiary silvicultural operations like gully plugging and CBO in the 1st year of main felling, cleaning in the 6th year and thinning in the 11th year were prescribed.

COPPICE- WITH- RESERVE WORKING CIRCLE

5.7.11. The areas capable of producing mainly small timber, poles and fuel wood were included in this working circle. Rotation was fixed as 48 years and yield was regulated by area. Coupes were to be demarcated 3 years in advance to be followed by climber cutting. It was prescribed that in Khapa, Deolapar and Ramtek ranges minimum 10 acres of suitable areas were to be clear felled followed by planting while in other ranges a minimum of 5 acres was proposed for clear felling. Subsidiary silvicultural operations like gully plugging and CBO in the 1st year, cleaning in the 6th year and thinning in the 12th and 24th years were also prescribed.

PASTURE WORKING CIRCLE

5.7.12. Areas where demand for grazing was high and which were not capable of producing timber were put in this working circle. No commercial felling was prescribed here. Leaf fodder species like *anjan, mowai and bija and edible grasses like sheda, paonia and marvel* were recommended for planting in these areas.

MISCELLANEOUS WORKING CIRCLE

5.7.13. The various grass birs, forest villages and the compartments number 715 of Seminary Hills were included in this working circle. In the plantations raised in the compartment number 715, the DFO was authorized to do improvement felling and thinning on 10 years cycle. The forest villages were to be managed as provided in the MP Forest Manual, while the grass birs were closed for grazing. Only works required for the improvement of the grasses was prescribed in the grass birs.

OVERLAPPING BAMBOO WORKING CIRCLE

5.7.14. The forest areas of Ramtek, Deolapar and Khapa, where bamboos were present in workable quantity were included in this working circle. 12 felling series were formed and a cutting cycle of 4 years was fixed. 4 coupes viz. A, B, C, & D were formed in each felling series. Clumps having less than 10 culms were not prescribed for exploitation. Bamboo planting was also prescribed in suitable areas.

OVERLAPPING KHAIR WORKING CIRCLE

5.7.15. As Khair was found scattered in all ranges, six felling series were formed to be worked on 20 years felling cycle and exploitable girth at b.h. was fixed as 38 cm. However most of the coupes could not be worked as it became uneconomical for commercial exploitation due to the scattered presence of Khair in the coupes.

5.8. SIXTH WORKING PLAN 1990-91 TO 1999-2000

5.8.01. The working plan under revision was written by Jwala Prasad. On the basis of the general principles for functional classification of forests and also on the basis of the silvicultural requirement of the forest crops, the following, working circles were formed. In this working plan, areas of both Reserved Forests (RF) and Protected Forests (PF) were included for management purposes together, for the first time. Area statement, showing various working circles in Prasad's Plan, is given in Table 5.6 below.

Table - 5.6. Distribution of working circles in Prasad's Plan

S N	Name of working circle	Area in ha.
1	Protection working circle	7960.04
2	Selection cum Improvement working circle	1628.40
3	Shelter wood plantation working circle	13797.16
4	Coppice-with-Reserve working circle	72900.58
5	Reforestation and soil conservation working circle	62699.46
6	Pasture working circle.	3443.93
7	Wild life and nature conservation working circle	18124.08
8	Grass-bir working circle	11567.38
9	Miscellaneous working circle	29770.22
10	Bamboo (overlapping) working circle	…..
11	Bamboo under planting (overlapping) working circle	--
	Total area	221891.25 ha

PROTECTION WORKING CIRCLE

5.8.02. In addition to the area included in the Protection Working Circle under Thosre's plan compartments 517, 526 and 528 of Bodelzira Coppice-with-Reserve felling series, 515, 516 and 529 of Kutumba Coppice-with-Reserve felling series, 523 to 525 of Salama and 666, 668 to 670 of Kolitmara Pench High Forest Conversion felling series having steep slopes and forming a compact block were included in this working circle along with PF compartments 240 to 242 and NRF compartments 735. As the areas allotted to this working circle formed part of the core areas of the proposed Pench National Park the main object behind forming this working circle was

to preserve and improve the existing growing stock for conserving soil and moisture, the total area allotted to this working circle was 7960.04 ha.

5.8.03. Conforming to the objective, no tree felling was prescribed in this working circle. The emphasis was laid on soil conservation and erosion prevention measures. In the degraded areas dibbling of seeds of suitable species as well as bush sowing of the seeds of *neem, bakain, maharukh and sandal* was proposed to be carried out by the concerned Beat Guard.

5.8.04. The whole area was divided into 4 working series each containing 10 coupes to be worked on 10 years working cycle. The coupes to be worked were to be demarcated one year in advance and a treatment map showing (a) the areas eroded or liable to erosion (b) road passing through the area and (c) under-stocked areas was to be prepared, climber cutting was also to be done at the time of demarcation. In the year of working, the following operations were prescribed to be carried out in the different types of areas. In the A type areas nala bunding and gully plugging were to be carried out. In B type areas only maintenance works were to be carried out. In the C type areas seeds of *neem, maharukh, salai, dhaora, sitaphal* and other local species was were to dibbled at 2m x 2m spacing

SELECTION CUM IMPROVEMENT WORKING CIRCLE

5.8.05. The compartments of Deolapar range having density > 0.4 and lying between 15° and 25° slopes were included in this working circle. The object of management envisaged under this working circle were (1) to reduce soil erosion and run off water along the hilly slopes by improving the soil cover (2) to enrich the growing stock by tending the NR or by planting (3) to obtain the maximum sustained yield of timber. The total area allotted to this working circle was 1628.40 ha.

5.8.06. Only one felling series was formed and the felling cycle was fixed as 20 years. The exploitable girth for various species was retained as prescribed in Thosre's plan, as given under.

Bija and Ain – 135 cm.	**Shisham, Dhaora, Bhirra – 90 cm**
Teak and Haldu – 120 cm.	**Tinsa – 75 cm.**

5.8.07. The silvicultural system adopted was group selection system. The coupes due for working were to be demarcated one year in advance and a treatment map showing the (a) protection areas (b) under-stocked area and (c) area containing pre-selection and exploitable trees was to be prepared. C type areas were further proposed for division as follows;

(i) Areas containing pole crop and middle aged crop to the extent of 300 stems / ha and natural regeneration up to 750 / ha.

(ii) Areas containing pre selection and selection girth trees but not young crop.

5.8.08. In the 'C' type areas marking was to be done in-groups of the size 5 chain x 1 chain. The distance between the 2 groups was kept as 100m. In the groups selected for felling all exploitable trees were to be marked for felling, while the pre-selection trees were to be marked rarely if found necessary to aid regeneration. All malformed stems were to be cut back. To prevent over marking it was prescribed that number of trees to be marked should not exceed the prescribed limit of number of trees per coupe. The total area of the group selected will not exceed the area worked out under the Safe - guard Formula. Trees of Tendu, Hara, Kullu, Semal and Khair were to be reserved. To supplement the natural regeneration, planting was also proposed by pit-trench method at the rate of 1100 plants / ha. Subsidiary silvicultural operation like CBO one year after main felling, cleaning in the 6^{th} and 11^{th} years; and thinning in the 20^{th} year was also proposed.

SHELTERWOOD PLANTATION WORKING CIRCLE

5.8.09. The better quality forest of Deolapar, Ramtek, South Umrer, Kondhali and Narkhed ranges were included in this working circle. While Akola, Bandhara and Manegaon felling series are made up of mainly miscellaneous forests. Dhamangaon and Kodimet - Parsodi felling series containing mainly teak forests. The total area included in this working circle was 13797.16 ha.

5.8.10. THE SPECIAL OBJECTS OF MANAGEMENT OF THIS WORKING CIRCLE: Production of large sized timber of teak and other miscellaneous species. Enrichment of crop by planting teak and other valuable species.

5.8.11. The silvicultural system adopted to achieve these objectives was modified shelter wood system using floating P.B. method. The working circle was divided into 3 PBs. The areas having mature crop were put in PB I (Regeneration PB) while the compartment containing young crop and which had been regenerated during the last 20 years were put in PB III (PB Young). The remaining areas of this working circle were put in PB II (PB Intermediate). On the basis of the stump analysis carried out, the rotation was fixed as 60 years

THE OPERATIONS PRESCRIBED FOR THE 3 PBs

5.8.12. PB I: In the coupes allotted to P.B I the operations were to be carried out in 3 phases, viz. primary felling, artificial regeneration works and final felling. During primary felling the crop was to be exploited so as to bring the over wood density up to 0.4 for this purpose the forest was to be divided into parallel strips of width 20 mts in East-west direction. Along the center of each strip all the trees were to be felled on both sides up to the width depending on the crown density as specified. In the second phase, teak was to be planted on the felled strip while shade bearing species were to be under planted in the rest of the areas. The final felling, during which the entire over wood was to be removed, was to be carried out after 4 years, over those areas only where regeneration had established successfully.

5.8.13. P.B II: Only cultural operations like climber cutting and removal of undergrowth to improve the regeneration of teak and other valuable species were prescribed in the areas allotted to this PB.

5.8.14. P.B.III: Thinning to benefit the young crop and removal of malformed and decaying stems interfering with the growth of teak and other valuable species were proposed to improve the young crop present in this P.B. Climber cutting was proposed on a 5 year cycle.

5.8.15. The areas in which main felling had been carried out were to be artificially regenerated by digging 1660 staggered trenches / ha.

5.8.16. The subsidiary silvicultural operations prescribed were CBO in the year after main felling, soil and moisture conservation works in the year following primary felling, cleaning operation in the 17th, 30th, 35th, 40th and 45th year after felling and thinning in the 12th and 25th years.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.8.17. The forest of Narkhed, South and North Umrer, Khapa, Kuhi, Ramtek, Hingna, Deolapar and Kondhali ranges having density greater than 0.4 and of quality IVa and IVb which were capable of producing small to medium sized timber, poles and firewood were put in the working circle. The total area included was 72,900.58 ha.

5.8.18. THE SPECIAL OBJECTS OF MANAGEMENT: {1} Production of maximum sustained yield of small sized timber, poles and fuelwood. {2} Improvement of the forests by carrying out under planting and tending operations.

5.8.19. The entire area was divided into 42 felling series. The rotation was fixed as 48 years for Reserved Forests areas and 40 years for the Protected Forests areas. Taking into account the poor status of regeneration in the areas allotted to this working circle, it was proposed that the areas should be regenerated in advance i.e. before felling, by resorting to under planting in the under-stocked areas while gap planting to be carried out in trench pits. The planted coupes were to be closed for grazing for 3 years after planting.

5.8.20. Main felling was to be carried out in the 4th years only in those patches, which had been successfully regenerated. Trees like Semal, Kulu healthy Salai trees up to 90cm, Moha, Achar, Tendu, Aonla along with well grown advance growth of Teak, Shisham, Bija, Bhirra and Ain were to be reserved.

5.8.21. Subsidiary silvicultural operations like anti-erosion works, CBO, cleaning of coupes in the 6th year and thinning in the 12th and 24th years were prescribed. Old plantations were also to be thinned along with main felling so as bring the spacement between adjacent trees to 1/3rd of the average height of these trees.

REFORESTATION AND SOIL CONSERVATION WORKING CIRCLE

5.8.22. All poorly stocked areas having density below 0.4 were put in this working circle. The total area included in this working circle was 62,699.46 ha. The special objects of management envisaged are as follows:

(a) Conservation of soil and moisture by taking up plantation and other suitable measures

(b) Enhancement of the productivity of the forest lands and availability of fuel, poles, bamboo and small timber for the local populations and fodder for their livestock.

(c) Restoration of ecological balance by increasing the vegetal cover.

5.8.23. To improve the condition of the crop, cutting back of malformed stems as well as improvement felling on well-stocked areas was proposed. Hardy species were to be planted in the under-stocked and degraded areas. Soil conservation measures were also proposed to improve the moisture regime and to check soil erosion.

5.8.24. As plantation was the main operation prescribed in this working circle, the demarcation of coupes was to be carried out least 2 years before planting. A treatment map showing the various types of areas as well as zonations based on soil depth was also to be prepared. In the patches of forests having density greater than 0.4, improvement felling as well as singling of coppice shoots was proposed. Thinning was also proposed in the patches of congested advance growth. The felling and extraction operations were to be completed in the same year in which demarcation was to be done. Different plantation techniques were proposed depending on the zonation.

5.8.25. Apart from the customary casualty replacement, weeding and soil working in the plantation was prescribed. Cleaning operations were proposed in the 5th year. Ordinary D-grade thinning was proposed in the zone III area if the number of plants / ha was more than 1250.

PASTURE WORKING CIRCLE

5.8.26. The degraded forest areas incapable of producing either timber or fuelwood; and which were subject to heavy grazing demand were included in this working circle. The total area allotted to this working circle was about 3443.93 ha in extent.

5.8.27. These forests were to be managed primarily with the aim of meeting the grazing demand of the livestock of the local people. Thus it was proposed to improve the quality of fodder by introducing better variety of grasses, legumes and fodder trees.

5.8.28. Only dead trees were to be removed from the under-stocked areas while over mature and malformed trees were to be removed from the better patches. Water absorption trenches (WATs) and grass beds were to be prepared in these areas followed by the sowing of seeds of superior variety of grasses and legumes. In the under-stocked areas having more than 30 cm deep soil, plantations of suitable fodder species were to be taken. After carrying out special improvement works for the development.

Grass-birs Working Circle

5.8.29. Areas under permanent grass-birs and kurans as well as some areas from other working circles which are good for conversion into grass birs were included in this working circle. The total area allotted to this working circle was 11567.38 ha.

5.8.30. These areas as they were near to villages and towns were set apart so as to cater to the fodder needs of the local livestock. Thus the objects of management were (1) to improvement of the fodder quality by introducing better and high yielding grasses, (2) to protect vulnerable areas by maintaining suitable soil cover and to increase fodder yield.

5.8.31. The works proposed in the grass birs are, as follows:

(a) Fencing of the grass birs in a phased manner of 10 years.

(b) Taking up adequate soil and moisture conservation measures.

(c) Ploughing the areas followed by sowing of improved variety of grasses.

(d) Planting of fodder tree species.

(e) Climber cutting as well as removal of weeds.

MISCELLANEOUS WORKING CIRCLE

5.8.32. The Reserved Forests and Protected Forests areas not included in any other working circle but which were set apart for certain specific purposes were included in this working circle. The total area allotted to this working circle was 29,770.22 ha (Table 5.7).

Table - 5.7. area allocation in Prasad's miscellaneous working circle

Areas earmarked for FDCM Ltd	27,169.19 ha
Compartment No. 715 of Seminary Hills	67.41 ha
Compartment No. 421.	98.34 ha
Area under submergence of various irrigation projects.	2435.28 ha
Total	**29770.22 ha**

BAMBOO (OVERLAPPING) WORKING CIRCLE

5.8.33. Eighty compartments of Ramtek, Parseoni and Deolapar ranges where bamboo was available in adequate workable quantities were included in this working circle. The total area allotted to this working circle was 22,999.58 ha. The entire area divided into 6 felling series was to be worked on a 3 -year cutting cycle. The object of management was to harvest bamboo in a scientific manner to get maximum sustained annual yield. Special precautions to be taken while harvesting bamboo as well as during gregarious flowering if it occurred were prescribed.

BAMBOO UNDER PLANTING (OVERLAPPING) WORKING CIRCLE

5.8.34. All the areas suitable for under planting bamboo were included in this working circle. The total area allotted to this working circle was 15,867.75 ha. The special object of management was to increase the percentage of bamboo in the

selected areas by resorting to plantation by digging pits of size 45 cm^3 at 6m x 6m spacing.

5.9. EX-PROPRIETARY FORESTS

5.9.01. These forests were initially under the ownership of the *malgujars and Zamindars*. These forests were not scientifically managed and the owners used to sell the forest produce as they think fit. However, villagers were allowed to take the forest produce or graze their cattle on payment. The proprietary rights over these forests were abolished in 1951 and, thereafter, these forests were brought under systematic management. The history and management of these forests can be divided into three distinct periods.

- Management during the pre-abolition period i.e. from 1854 to 1950.
- Management during early post-abolition period i.e. from 1951 to 1970.
- Period of regular working under Working Scheme from 1970-71 onwards.

MANAGEMENT BEFORE THE PRE-ABOLITION PERIOD 1854 TO 1950

5.9.02. The private forests were not managed scientifically prior to the abolition of the proprietary rights. The proprietors who were given the *Zamindari* rights used to manage the forests according to their whims and fancies. In some *Zamindari* areas Ranwa system was followed while in others Batai system was in practice. Though the local people had different kinds of nistar rights yet they could exercise them only as per the wishes of the malguzars. In the Central Provinces districts a village administration paper called *'Wazib-ul-arz'* was prepared which showed the rights the local people could exercise over the land. The increased demand for timber, fuelwood etc. during the Second World War led to unregulated heavy felling in these forests. The malguzars resorted to indiscriminate felling of major timber species during the pre-abolition period viz. from 1948 to 1950; as there were rumours about the abolishment of proprietary rights over the lands

POST ABOLITION PERIOD 1951 TO 1970

5.9.03. After the abolition of the proprietary rights in 1951; about 6,98,572.80 acres or 2,79,476.81 ha of private forests in Nagpur district were vested in the State Government. Out of these, around 96,857.04 ha of forests were transferred to the Forest Department for management from 1951 to 1954 as per the instructions contained in MP Revenue Department order no. 2249-286-XII dt 6th April 1951 and No. 7177-CR-617-XII dt 24th Dec, 1951.

5.9.04. The process of take over was completed by the year 1954. These forests were subsequently declared as PF under section 29 of I.F.A. 1927 vide Govt. of MP Notification No. 3057-853-XII dt 4/6/1955. The Notification reserving trees u/s 30 and 32 of IFA 1927 was issued and subsequently rules were framed by the Government of Bombay vide notification No. FLD-4657/103065-E, dated nil December 1958 and 19th Dec, 1958, respectively.

5.9.05. Due to the indiscriminate felling carried out by the *malgujars* just before the abolishment of proprietary rights, the forests vested in the government were devoid of any mature and valuable tree growth and hence the crop was made up of mainly young coppice crop. As government became the owner of all the vested lands, in order to determine the existing nistar rights and to allot the vested areas for different purposes. Nistar officers were appointed in the year 1954, who after carrying out necessary inquiries, prepared Nistar Patraks for each village. In the Nistar patraks the khasra number of the areas set apart for grazing as well as for the collection of timber and fuelwood were mentioned. Villages having forests in excess were linked with villages which were deficit in forests thereby creating grazing and nistar zones to cater to nistar needs of the local people.

5.9.06. During this period efforts were made to protect the area from theft and fire while plantations were also raised in suitable pockets. Due to the combined effect of protection and rest to the forests the crop conditions in these forests were improved.

PERIOD OF REGULAR WORKING 1970-71 TO 1979-80

5.9.07. The protected forests of Nagpur Division were brought under scientific management for the first time during 1970-80 when the working scheme prepared by S.S. Parasnis was approved. For management purposes, these forests were classified as:

- Minor forests for meeting the demand of small timber, poles and firewood.
- Pasture lands for meeting grazing demands.
- Remaining forests were set apart for meeting the demand for cut grass.

5.9.08. Taking into account the condition of the crop, needs of the people and demand for grazing the following working circles were formed.

Table - 5.8. Working Circles in protected forests

Coppice-with-Reserve working circle	20496.97 ha.
Improvement working circle	32978.80 ha.
Pasture working circle.	21615.38 ha.
Miscellaneous working circle.	21482.74 ha.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.9.09. The forests which were capable of producing small timber, poles and fuelwood were included in this working circle. The main objective behind the formation of this working circle was to get sustained annual yield of small sized timber, poles and firewood and also to provide fodder and grazing facilities to the local cattle.

5.9.10. The rotation was fixed as 40 years and the entire area was divided into 10 full and 27 half felling series. The coupes were to be demarcated one year in advance of felling. A treatment map, showing the unworkable areas, patches of poles crop, inadequately stocked areas; and the remaining areas were to be prepared. From the unworkable areas only dead and dying trees were to be removed, cutting back of high stools was also proposed. The patches containing the pole crop were to be thinned so as to bring the spacement equal to 1/3 of the average height of the trees.

5.9.11. Improvement felling consisting of the removal of dead, dying, diseased and malformed trees was to be carried out in, inadequately, stocked forest areas.

5.9.12. From the remaining areas all the trees except the trees to be reserved were to be felled. The trees to be reserved were (a) Trees required for silvicultural purposes (b) All healthy fruits trees along with Kullu and Khair (c) All advance growth except that of garari up to 23 cm gbh (d) All well grown poles of teak and other valuable species up to 45 cm in quality III areas and 30 cm in quality IV areas.

5.9.13. The subsidiary silvicultural operations like CBO and climber cutting in the year following the year of main felling, cleaning of coupes in the 6th year and thinning in the 20th year were prescribed.

IMPROVEMENT WORKING CIRCLE

5.9.14. The degraded forests as well as the hilly areas with steep slopes were included in this working circle. The forests were characterized by large number of malformed, diseased, crooked and unsound trees.

5.9.15. The main object behind the formation of this working circle were (1) the improvement of the growing stock (2) meeting the demand of nistar and grazing and (3) to check soil erosion and conserve moisture.

5.9.16. A felling cycle of 20 years was fixed and the entire area was divided into 21 felling series. In order to meet the object of management, the following, operations were prescribed.

- All dead, dying, diseased and malformed trees were to be removed.
- The inferior species interfering with the growth of teak and other valuable species were to be removed.
- Thinning was to be done in congested patches.
- Singling of coppice shoots.
- Cutting back of stumps of illicitly felled trees
- Trees along the nala banks were to be retained up to a length of 20 m.
- All fruit trees were to be retained.
- Subsidiary silvicultural operations like CBO and climber cutting were to be carried out one year after the working of coupes.

PASTURE WORKING CIRCLE

5.9.17. The forest areas which were incapable of producing timber of fuelwood and where grazing demand was high were put in this working circle. This working circle was formed mainly with the objective of providing maximum grazing facilities to the local cattle as well as to improve the pasture. Each grazing series was divided into 4 coupes, each of which was to be closed in rotation for 3 years. The operations prescribed were climber cutting, improvement felling in the protection and unworkable areas, heavy thinning in the dense crop to encourage the growth of grasses as well as retention of fruit, folder and shade bearing trees. Climber cutting and uprooting of weeds all over the coupes were to be followed by ploughing on the patches containing good soil before monsoon. Seeds of high yielding grasses like sheda, Paonia, marvel etc. were to be sown on the ploughed areas after the onset of monsoon.

MISCELLANEOUS WORKING CIRCLE

5.9.18. Scattered patches of forests less than 200 acres, grass birs and the areas to be handed over to Revenue Department were included in this working circle. In the scattered patches thinning and improvement felling were prescribed to meet the local demand for fuel and poles. Grass birs were to be managed for the supply of fodder grasses on cut and carry basis. Thus they were permanently closed to grazing. Sowing of the seeds of good variety of grasses was prescribed after light soil working in these areas.

5.10. REGULATION OF GRAZING

RESERVED FORESTS

5.10.01. PRIOR TO 1875: Prior to the reservation of the forests, as there was no grazing control, a large number of animals used to graze in the accessible areas. However, during the early reservation period grazing by goat and sheep was stopped. No restriction however was imposed on cattle till 1875.

5.10.02. FROM 1875 TO 1895: As unregulated grazing began to take their toll on the forests, the need to protect forests from heavy grazing was felt. As a consequence in 1875 about 66.5 sq. miles of forest in the East Pench and in 1881,63 sq miles of forest in the West Pench were closed to grazing.

5.10.03. FROM 1895 TO 1912: With the increase in the extent of cultivation followed by the reduction of grazing grounds, the pressure on the forests increased. Moreover, it was noticed that continuous grazing was not favourable for the reproduction of valuable species. Hence in the 1st Working Plan, it was prescribed that coupes after working will be closed to grazing for 10 to 15 years and could remain open to grazing for the rest of the rotation.

5.10.04. FROM 1912 TO 1934: In the Working Plan prepared by Mr. Dunbar Brander, grazing was regulated as per the scheme prepared by Mr. Leftwitch, I.C.S. in 1912-13. This was the first grazing scheme prepared and served as a basis for the subsequent settlements. As per this scheme, the forests of the division were divided

into 34 grazing units and in each grazing unit, the grazing was regulated so as to preserve the tree growth and improve pasture. While preparing the grazing units, the grazing requirement of the villages was examined and the villages were attached to the different units depending upon their proximity to the forests. In order to restrict the number of cattle they were categorized into privileged, ordinary and commercial cattle depending on their use and different rates were fixed for grazing for each category. Preference was to be given to privileged and ordinary cattle while issuing grazing passes

5.10.05. The grazing restrictions imposed by this scheme were slightly reduced in 1928 owing to the pressure from the local villagers due to the increase in the number of cattle.

5.10.06. From 1935-36 to 1946-47: In the Working Plan prepared by Sagreyia, the grazing settlement was done as per the new grazing policy issued in the year 1933.

5.10.07. **TREE FOREST:** This was further divided into (i) Moist type (annual rainfall above 114.3 cm): grazing incidence was fixed as 1.6 ha per animal unit, and (ii) Dry type (annual rainfall below 114.3 cm): grazing incidence for this type was fixed as 0.8 ha per animal unit.

5.10.08. **SCRUB FOREST**: This included forests primarily meant for grass and grazing. This was further divided into: (i) Pasture forests: This included wooded forests which were capable of producing some poles and fuelwood also, besides grasses. The incidence of grazing for this type was fixed as 0.4 ha per animal unit. (ii) Open forests: These forests were primarily meant for grazing. No limit was fixed for grazing in these areas. As the primary aim of above classification was to meet grazing demand, the forests subjected to heavy grazing were classified as scrub forests.

5.10.09. The grazing settlement was prepared by Y.C. Sukhtankar I.C.S. in the year 1934. The size of the grazing units was reduced while the number was increased from 34 to 70, excluding, 26 units of the forest villages and 14 units of the grass birs.

5.10.10. FROM 1947-48 TO 1964: In 1946, the Chief Conservator of Forests C.P and Berar issued a memorandum No.5079 Dt 28/9/1946 classifying the forests on functional basis. On the basis of this memo, the forests were classified as Protection forests, Tree Forests, Minor Forests, Pasture Forests and Miscellaneous Forests. The grazing incidences, for various types of forests were, as follows.

Protection Forests – no grazing was permitted,

Tree Forests – 3 acres per cow unit

Minor Forests – 2 acres per cow unit,

Pasture forests – 1 acre pre cow unit.

5.10.11. FROM 1965-66 TO 1974-75: In the Working Plan prepared by J.G. Thosre functional classification of forests followed in the previous plan was adopted in

toto. The grazing incidences and closure of the working coupes to grazing were, as below.

5.10.12. TREE FORESTS: Grazing incidence was restricted to 3 acres per cattle units. The coupes were to remain closed for grazing 2 year in advance of main felling followed by a closure for 6 years.

5.10.13. MINOR FORESTS: The maximum grazing incidence permitted was 2 acres per cattle units. All worked coupes were to remain closed for grazing for a period of 6 year after felling.

5.10.14. PASTURE FORESTS: The maximum grazing incidence permitted in the areas was one acre per cattle unit.

5.10.15. The grass birs were permanently closed to grazing

5.10.16. FROM 1990-91 TO 1999-2000: In the Working Plan written by Jwala Prasad, the grazing incidence for various types of forests were foxed according to the grazing policy of 1968.

5.10.17. In the protection as well as Wild life and Nature Conservation Working Circle grazing was prohibited as the forests allotted to this working circle were classified as Protection Forests.

SECLECTION CUM IMPROVEMENT WORKING CIRCLE

5.10.18. In this working circle maximum grazing incidence permitted was 1.2 ha/cattle unit. The worked coupes were to be closed for a period of 7 years after working with a provision to extend the closure if the status of NR was found unsatisfactory.

SHELTERWOOD PLANTATION WORKING CIRCLE

5.10.19. As the forests allotted to this working circle belonged to the type tree forests, maximum grazing incidence permitted was 1.2 ha per cattle unit. After primary felling, the coupes were to remain closed for a period of 10 years from the year of primary felling.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.10.20. The maximum grazing incidence permitted in this working circle was 0.4 ha per cattle unit. The worked coupes were to remain closed to grazing for a period of 10 years.

5.10.21. The grass birs were to remain permanently closed to grazing

5.10.22. As the Protected Forests areas were included in the plan for the first time, the grazing units were revised and in all 125 grazing units were formed of which 40 are in the Reserved Forests and 80 in the Protected Forests

B - PROTECTED FORESTS (PF)

5.10.23. PRIOR TO 1951: Before the abolition of the proprietary rights, the malgujars permitted unlimited grazing by charging fees.

5.10.24. BETWEEN 1951 TO 1970: After the abolition of the proprietary rights, Nistar Officers were appointed in 1954 to determine the existing rights over the land. From 1954 to 1956, they carried out inquiries and prepared "Nistar Patraks" for each village. In the Nistar Patraks, Khasra numbers allotted for grazing of cattle, were mentioned. In the villages where grazing land was just sufficient for the need of the cattle of that village no right of persons residing in other villages to graze their cattle was recognized unless already recorded in 'Wazib-ul-arz'. Villages in which the areas of grazing land were less than half acres per head of cattle in cotton-jowar tract and one acre in the remaining tracts were clubbed with the neighbouring village in which such area exceeded the above standard. Villages so clubbed constituted a grazing zone. The clubbing of the villages was done in such a way that the villagers were not required to take the cattle to a distance longer than the distance the cattle can easily cover in a day. Within a specific zone all persons were at liberty to graze their cattle free until otherwise ordered by the Deputy Commissioner.

5.10.25. FROM 1970-71 TO 1979-80: In the Working Scheme written by Parasnis, the grazing control was affected as follows

COPPICE-WITH-RESERVE WORKING CIRCLE

5.10.26. All coupes after final felling were to remain closed to grazing for a period of 5 years beginning with the year of working. After mid rotational thinning the coupes were to remain closed to grazing for a period of 3 years from the year in which thinning was carried out.

FROM 1990-91 TO 1999-2000

5.10.27. As the Working Plan prepared by Jwala Prasad was a comprehensive plan comprising of both Reserved Forests and Protected Forests; a unified grazing control was effected for all the entire forest areas.

5.11. RESULTS OF PAST WORKING

RESULTS OF TREATMENTS PRESCRIBED IN JWALA PRASAD PLAN

5.11.01. As the present Working Plan was sanctioned in the year 1991 and the implementation was started in the year 1992, only eight years have passed since the coupe working was started. Hence it is too early to objectively comment about the effects of treatments prescribed in this plan. However, the observations made, during the field visits, on the treatments prescribed in Jwala Prasad's plan is given, as follows.

PROTECTION WORKING CIRCLE

5.11.02. Treatment maps dividing the areas into 3 categories were not prepared at all. The soil and moisture conservation measures prescribed in the working plan have not been fully carried out in the coupes allotted to the working circle. Dribbling of seeds of local species in the under-stocked areas has not been carried out.

SELECTION CUM IMPROVEMENT WORKING CIRCLE

5.11.03. The areas allotted to this working circle were to be worked under Group Selection System by dividing the workable areas into areas containing (a) pole crop and middle aged crop and (b) pre selection and exploitable trees. The both type of areas were to be divided into groups of size 100m x 100 m; keeping the distance between the two groups as 100m. Only the groups containing mature trees were to be selected for felling. However, this type of working was not at all followed. Marking was done without properly adhering to the marking rules and many pre-selection trees were also felled. The plantations taken up have not been really successful mainly due to wrong selection of species, grazing and recurrent fires. Cutting back operations have not been carried out in many cases due to paucity of funds.

SHELTER WOOD PLANTATION WORKING CIRCLE

5.11.04. Better quality forests other than those allotted to SCI working circle were allotted to this working circle. The silvicultural system prescribed was modified shelter wood system using floating periodic blocks by dividing the area into 3 PBs i.e., P.B.I (regeneration P.B.), P.B.III (P.B. Young) and P.B.II (P.B. intermediate). In P.B.I coupes, the fellings were to be carried out in two stages i.e. primary felling and final felling. The primary felling during which the crop was to be opened up to approximately 0.4 density was to be followed up by artificial regeneration using a mixture of teak and other valuable species. Final felling was to be carried out only if the felled areas had been successfully regenerated. As the yield was to be regulated by volume, coupe boundaries had not been demarcated and shown in the maps. The areas included in this working circle were predominantly teak areas and as teak is a light demander species were not suitable for the system adopted. Due to complex nature of the prescriptions there were large-scale deviations from the prescriptions. Instead of adopting strip felling (width of strip to vary with the density) during the primary felling stage, mature trees were marked for felling, as is done in other systems from all over the coupe. Artificial regeneration which was another major objective of the system was not carried out in many areas. Even in coupes where it was carried out final felling was resorted to without caring for the state of regeneration in spite of the prescriptions that final felling should be deferred till such time the crop is regenerated fully. The subsidiary silvicultural operations and soil and moisture conservation works were not carried out in many coupes due to lack of funds. Due to heavy grazing regeneration status in many coupes has become poor.

COPPICE-WITH-RESERVE WORKING CIRCLE

5.11.05. The areas (both the Reserved Forests and the Protected Forests) which had been previously worked mainly under Coppice-with-Reserve Working Circle as well as Improvement working circle were included in this working circle. The prescriptions that planting should be carried out 4 years prior to felling were not at all carried out. For e.g. coupe No. 4 of Ahemednagar felling series in Kondhali range was worked in 1997 while coupe No. 5 was worked in 1998. But planting was done in both these coupes in the year 1998 only; though as per the working plan prescriptions,

plantations should have been taken in the years 1994-95, 1995-96, respectively. On account of conservative marking, in some of these coupes, large number of mature trees is still left in the coupes. Moreover, due to continuos working under one form or the other of coppice system, the trees have lost their coppicing vigour due to which the coppice shoots have become crooked and malformed. The C.B.O and cleaning operations were not properly carried out. Thinning of old plantations though prescribed was not carried out as a result of which some of the old plantations have become congested. The trees, which do not coppice, have been enumerated.

REFORESTATION AND SOIL CONSERVATION WORKING CIRCLE

5.11.06. This working circle was created with the intention of improving the soil and moisture regime by taking up suitable measures to be supplemented by plantations. Not much yield was expected from the coupes as most of the areas allotted to this working circle were supposed to be under-stocked and devoid of good tree growth. In most of the areas plantations have become a failure due to wrong species selection coupled with heavy grazing. The status of natural regeneration is poor in most of the areas.

PASTURE WORKING CIRCLE

5.11.07. Due to excessive grazing the pasture development works have not become successful. The forest areas that were incapable of producing timber or fuel and where grazing demand was high were put in this working circle. The main object behind the creation of this working circle was the improvement of the quality and quantity of fodder grasses by taking out plantations and by imposing strict control over grazing. However the works as proposed in the working circle were not carried out in most of the coupe citing lack of funds as the main reason. Wherever, some Plantation works were carried out, that have become a failure due to heavy grazing and recurrent fires.

GRASS BIR WORKING CIRCLE

5.11.08. Some of the areas allotted to this working circle are unfit for being retained in the working circle due to the fact that the areas are not open due to the presence of large number of trees e.g. **Basbodi grass-bir** in Kondhali range. In grass bir areas no works, as prescribed in the plan, have been carried out due to the paucity of funds.

BAMBOO (OVERLAPPING) WORKING CIRCLE

5.11.09. Not much works was done in this working circle as the occurrence of bamboo is sporadic in the allotted coupes. However, as no cleaning work was provided for the naturally occurring bamboos, congestion has taken place in the clumps in the areas that were not allotted to this working circle.

BAMBOO (UNDERPLANTING) WORKING CIRCLE

5.11.10. Bamboo plantations have come up very well in some of the areas where timely operations were carried out. However damages due to the attack of wild boar was observed in many areas.

SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN

5.11.11. The special works of improvement undertaken in the past are: (1) Cultural operations (thinning, cut-back operation, climber cutting and cleaning), (2) fire protection, (3) protection from illicit felling, illegal timber transport and encroachment, (4) construction of roads, buildings, tanks, wells, etc., and (5) plantations and afforestation works.

CULTURAL OPERATIONS

5.11.12. (a) Thinning: In the Reserved Forests a scheme of thinning was introduced in the year 1925. Before the introduction of Sagreiya's plan thinning had been very heavy and almost all the valuable and accessible forests had been gone over at least once. The thinning in the Pench ranges was so heavy that they amounted to almost regeneration felling. During the currency of Sagreiya's plan, thinning prescribed in the unallotted areas of conversion working circle and in the Coppice-with-Reserve working circle, was to be carried out only, if necessary. During the period of Second World War (1940-41 to 1945-46), heavy thinning was carried out to meet the requirement of the Defence Department. This resulted in the removal of the best stems of the future crop to a great extent. In the working plan by B.R. Mishra and J.S.Thosre thinning operations were prescribed for forests allotted to Protection Working Circle. Pench High Forest working circle, General High Forest working circle and Coppice-with-Reserve working circle. In the Working Scheme for the ex-protected forests by Shri S.S. Parasnis, thinning operations were prescribed in the Coppice-with-Reserve working circle. After inspection of some of the thinned coupes it is found that heavy thinning have been carried out at a number of places. At some places, these thinning are even heavier than the main felling. This had depleted the growing stock and it is feared that at the time of next main felling lesser out turn will be available. To guard against this, marking shall be strictly done departmentally and under close supervision as prescribed under para 20.3 of the miscellaneous regulations.

5.11.13. (b) CUTTING BACK OPERATIONS, CLIMBER CUTTING AND CLEANING: These operations have not been carried out over major part of the area during the currency of present working plan. These are very important operations leading to inducement of natural regeneration and any negligence in theses operations may result in not getting the areas regenerated properly. These operations requires due importance and focus in the subsequent plans.

FIRE PROTECTION

5.11.14. An elaborate scheme of fire protection was introduce in East Pench Range (Deolapar and Ramtek ranges) in 1875. According to this the forests were divided into blocks of convenient size by cutting and cleaning external and internal fire lines of 12m width. These lines were kept clear of inflammable material throughout the fire season and special staffs of fire watches were employed. The scheme worked well and was gradually extended to the rest of the division: (a) East Pench covering

present Deolapar and Ramtek Ranges in 1875, (b) Kondhali in 1894, (c) West Pench covering present Parseoni and Khapa in 1878 and (d) Umrer in 1895. In 1911, the scheme was modified. Complete protection was restricted to areas closed to grazing and early burning was allowed elsewhere. From 1935 Central Provisions and Berar Forest Manual under which the forests are divided in to the following three classes:

- Class-I (Complete or Special protection): It involves isolation of the protected areas by fire lines and cut guidelines which are patrolled watchers.
- Class-II (General Protection): It involves isolation of the areas from the surrounding areas by fire lines and its divisions into convenient blocks by inter fire lines. No guide lines are cut.
- Boundary of the Reserved Forests and closed coupes in them, plantations and roads passing through the Reserved forests are included in class-I area and the Protected forests, roads passing through them and also the coupes in the Protected forests are included in class-II areas.

PROTECTION FROM ILLICIT FELLING AND ENCROACHMENT

5.11.15. There is one Mobile squad unit consisting of a Range Forest Officer and 2 Foresters, working in the division whose main task is to prevent and detect the cases of illicit felling and transport. Besides this, there are 40 Forest Check - Nakas which are erected with the purpose of preventing the illicit transport of forest produce. In addition to this, a battalion of SRP has been placed at the disposal of the Deputy Conservator of Forests whose main job is to provide assistance of the field staff for forest protection. The Table 5.9, indicates the extent of illicit felling cases recorded in the area.

TABLE - 5.9. Statement of Offence Cases in the Nagpur Division

Year	Offence cases	Trees in offence cases			Values (Rs.)	Material seized			Value (Rs.)
		Teak	Non-teak	Total		Timber m^3	Fuel Beat	Other	
1989-90	2,030	–	–	32,080	49,10,205	713.796	1,140	–	32,89,275
1990-91	3,424	–	–	33,785	82,38,133	1254	27 *	1,200 kg#	53,34,897
1991-92	2,876	–	–	25,211	83,53,000	1321	–	–	54,64,774
1992-93	2,980	15,221	15,161	30,382	1,25,51,527	990.561	298.5	696 bamboo	74,95,722
1993-94	2,883	20,568	19,411	39,975	82,29,765	1,753.087	290.5	–	68,06,214
1994-95	2,804	12,189	9,992	22,181	72,73,263	596.466	–	–	49,23,353
1995-96	2,316	9,053	7,324	16,377	42,38,128	519.991	–	–	48,94,064
1996-97	1,639	6,051	4,397	10,448	27,60,175	299	–	–	32,53,625
1997-98	1,677	6,771	6,448	13,219	33,31,685	221.737	–	–	29,35,796
1998-99	1,549	4,184	8,745	7,929	24,75,692	199.441	–	–	21,81,897
1999-2000	NA	NA	NA	NA	NA	NA			NA
2000-01	1801	4166	2759	6925	2051330	146.18	-	--	2377657

2001-02	2178	4885	5331	10216	2430302	188.805	--	--	1966592
2002--03	5076	4819	6713	11532	2722035	224.569	--	--	2127497

Note – * 36 Cart load firewood; # Sandalwood

5.11.16. Though the scheme for 1/5th boundary demarcation exists both for Reserved Forests and Protected Forests and large sums are spent on it each year but hardly any works seem to have been carried out to repair the damaged boundary pillars. The condition is pathetic for the Protected Forests, where over major part of the area even the demarcation is not done. If at all some demarcation is done in such areas, the boundary pillars are hardly traceable. However a decision to demarcate the outer boundaries with fixation of permanent boundary pillars in a phased manner has been taken and Government of Maharashtra has sanctioned a scheme in the year 2002 - 2003 to this effect .

5.11.17. In order to effectively tackle the problem of illicit felling caused by armed gangs, a company of SRP under the control of a Police Inspector is stationed at Umrer. The help of this unit is taken, whenever, necessity occurs in any part of the division.

5.12. CONSTRUCTION OF ROADS, BUILDINGS, TANKS, WELLS & NURSERIES

5.12.01. Details of the roads, **(Appendix 5.1)** buildings, **(Appendix 5.2),** Check Nakas, **(Appendix 5.3),** nurseries **(Appendix 5.4),** and expenditure incurred on roads, buildings, tanks, and wells are given in the **(Appendix 5.5).**

5.13. PLANTATIONS WORKS

5.13.01. The details of the plantation undertaken in the division over the years are given in the **(Appendix 5.6)**

5.14. PAST YIELD

5.14.01. The annual outturn of timber, fuelwood as well as various NWFPs in the division is given in the **(Appendix 5.7 to 5.10)**.

5.15. PAST REVENUE AND EXPENDITURE

5.15.01. The gross revenue and expenditure position including the surplus or deficit, if any, is given in the (**Appendix 5.11)**

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Part-II: Future Management Discussed and Prescribed

Chapter 8. Basis of Proposal

8.1. THE NATIONAL FOREST POLICY:

8.1.1. The National Forest Policy was first enunciated in 1894 and it was revised in 1952 after independence. The National Forest Policy, 1952 was further revised and The National Forest Policy, 1988 was formulated, which is presently in force.

8.1.2. The basic objectives and thrust areas enshrined in the National Forest Policy, 1988 are given as under:

- Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of forests.
- Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biodiversity and genetic resources of the country.
- Checking the soil erosion and denudation in the catchment area of the rivers, lakes and reservoirs in the interest of soil and water conservation for mitigating flood and droughts and for retardation of siltation of reservoirs.
- Checking the extension of sand dunes in the desert areas and along the coastal tracts.
- Increasing substantially the forest/ tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.
- Meeting the requirements of fuel wood, fodder, minor forest produce and small timber of the rural and tribal populations.
- Increasing productivity of forests to meet essential national needs.
- Encouraging efficient utilization of forest produce and maximizing substitution of wood.
- Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimize pressure on existing forests.
- The principal aim of the Forest Policy must be to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium, which is vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim.

8.1.3. Essentials of Forest Management embodied in the National Forest Policy 1988, are given as follows:

- Existing forests and forestlands should be fully protected and their productivity improved. Forests and vegetal cover should be increased rapidly on hill slopes, in catchment of the rivers, lakes and reservoirs and ocean shores and on semi arid, arid and desert tracts.

- For conservation of biodiversity, network of national parks, sanctuaries, biosphere reserves and other protected areas should be strengthened and extended adequately.
- Provision of sufficient fodder, fuel and pasture, especially, in areas adjoining to forests is necessary in order to prevent depletion of forests beyond sustainable limit.
- Minor forest produce provide sustenance to the tribal population and to other communities residing in and around the forests. Such produce should be protected, improved and their production enhanced with due regard to generation of employment and income.
- Schemes and projects, which interfere with forests that clothe steep slopes, catchments of rivers, lakes and reservoirs, geologically unstable terrain and other ecologically sensitive areas, should be severely restricted.
- No forest should be permitted to be worked without the Government having approved the management plan, which should be in keeping with the National Forest Policy.
- The rights and concessions enjoyed by the tribal and other rural poor living within and near the forests should be fully protected. Their domestic requirements of fuel wood, fodder, minor forest produce and construction timber should be the first charge on forest produce.
- Inculcate in the people, a direct interest in forests and make them conscious of the value of trees, wildlife and nature in general through forest extension, education and training.

8.2. **FUNCTIONAL CLASSIFICATION OF FORESTS:**

8.2.1. The broad principles of classification of forests on functional basis have been embodied in Resolution No. MRF-1365/132211-Y, dated December 6, 1968 issued by Government of Maharastra. The following, functional classes have been recognized by the state. The same is reproduced below:

(A) Protection Forests : This category will include steep and precipitous forests (especially those in the catchment areas of important river valley projects and also the denuded lands which are in dire need of soil conservation and afforestation, grazing should be altogether prohibited in these forests save in exceptional cases, when too the incidence should not exceed one cattle unit for 10 acres (a cattle unit is defined in para (2) below).

(B) Tree Forests: This category will include forests where production of timber is the main object of management. The grazing incidence for these forests should be one cattle unit for 3 areas.

(C) Minor Forests: This category will comprise forests in which production of firewood on a sustained basis is the prime object of management. The grazing incidence for these forests should be one cattle unit for 1.5 to 2 acres.

(D) Pasture lands: This category will include openly stocked forests or lands that have ceased to yield even small timber but which are conveniently situated for providing grazing to the adjoining cattle population. The grazing incidence for these lands should be one cattle unit per acre.

(E) Grass reserves: This category will include all forest areas set apart for the production of good fodder grass. Grazing should be completely eliminated from these areas, but cutting of grass may be permitted according to Rules.

The functional classification of forests of Nagpur division under various categories is given in the table 8.1 below:

Table 8.1 Functional categories of forests in the Nagpur Division (in hectares)

Category	Reserved Forests	New Reserved	Protected Forests	Other forests	Total area	Percentage
Tree forests	35742.09		6558.32	–	42300.41	24.57
Minor forests	39030.02		54931.14	–	93961.16	54.58
Pasture forests	2107.20	2640.45	2200.55	---	6948.20	4.03
Protection forests	2473.63		628.26	–	3101.89	1.80
Grass Bir	5859.47		5724.33		11583.80	6.72
Miscellaneous	0			14231.33	14231.33	8.26
(Zudapi jungle)						
Total	**85,212.41**	**2640.45**	**70042.60**	**14231.33**	**1,72,126.79**	**100.0**

8.3. FACTORS INFLUENCING OBJECTS OF MANAGEMENT:

8.3.1 The forests of the division are primarily mixed in nature having low proportion of valuable species, especially, in the Metamorphic Zone and need enrichment by valuable species like teak, in the stocking. In the Trap Zone, however, the forests are primarily poor in quality, having high proportion of teak and need enrichment by miscellaneous species in the stocking. A large chunk of forest tract, is under stocked, open and degraded that needs improvement in stocking through tending of existing natural regeneration and rootstock as well as by plantations.

8.3.2 The coppice vigor of teak and other miscellaneous species have declined due to repeated coppice system for 3 to 4 rotations leading to deterioration in growth and quality of teak and other valuable species. It also has led to increase in proportion of teak in the stocking leading to pure patches of teak, at places, in the trap zone of the division. Hacking of forests particularly near villages for removal of firewood and small timber has also deteriorated the quality of forests appreciably.

8.3.3 The natural regeneration of teak and miscellaneous species is not up to the mark. Seedling and sapling were observed at places but far short of required numbers as the established natural regeneration to serve as the future crop.

8.3.4 A large extent of forest areas falls in the catchments of irrigation projects and water bodies, thereby, need specific treatment in the interest of longevity of these water bodies having focus on soil and moisture conservation to check siltation and to improve the water regime of these tracts.

8.3.5 A large portion of forests of the division adjoins the Protected Areas, namely, Pench National Park and Bor Wildlife Sanctuary, thereby, require treatment in conformity with the wildlife and bio-diversity conservation and eco-tourism.

8.3.6 The forests suffer heavy biotic pressure especially due to uncontrolled grazing, which results in compaction of soil, loss of humus and trampling of the seedlings and saplings. Excessive grazing and uncontrolled fires are the main factors causing degradation of forests. Illicit cutting both for commercial purposes and for removal of firewood and small timber need to be curbed in all its earnestness. Formation of JFMCs and framing of area specific mirco-plans addressing to the bonafide needs of the people as well as to the requirements of controlling illicit cutting are expected to be effective in minimizing the unscientific hacking of forests. Additionally, for controlling commercial illicit cutting, strengthening of protection machinery- providing more vehicles and sufficient funds for running them as well as provision of firearms and concerted training in their use, is suggested. For control of illicit cutting and poaching as well as for efficient fire control measures during the fire season, round the clock patrolling and its effective monitoring through wireless system, which has already been established, needs to be evolved as part of routine duties of the frontline staff. In any case, the situation requires some bold measures to minimize these adverse influences.

8.3.7 The NWFPs species form a substantial proportion of the forest crops that contribute substantially to the livelihood of local communities especially the tribal. The forest areas rich in NWFPs require special thrust for their sustainable management and use in the interest of local communities, by involving them through JFMCs and local NGOs; having the skill of processing and value addition.

8.4 GENERAL OBJECTS OF MANAGEMENT

8.4.1 The following general objectives of forest management have been identified in pursuance of the National Forest Policy, 1988; and other directives issued by the state and the union governments, from time to time:

i) To preserve forest cover on hill slopes, along streams, watercourses and water bodies in order to prevent soil erosion and to check siltation in reservoirs; and to maintain their essential protective and life support functions, including, regulation of the water regime.

ii) To meet expectations of wildlife protection and biodiversity conservation from managed forests.

iii) To restore and augment tree cover in under-stocked and degraded forests, and to improve productivity and growing stock of natural forests using appropriate modes of management and techniques.

iv) To enhance productivity of firewood, fodder, non-wood forest produce, small timber and other construction wood required for meeting local household demands, particularly of the tribal communities.

v) To improve fodder and grazing availability to local communities.

vi) To ensure optimum sustained yield of desirable forest produce and services consistent with other objectives as well as national and State forest policies.

8.5 TREATMENTS PRESCRIBED

8.5.1 Management treatment will depend upon requirements of environment stability, protection of topography, biodiversity conservation, characteristics of the growing stock in the forests and forest produce utilisation.

8.5.2 Existing protection forests will be preserved and augmented. Soil and moisture conservation works have been proposed to improve moisture regime and prevent soil erosion and siltation in the water bodies.

8.5.3 Suitable tending and soil working operations will be carried out to stimulate the growth of the naturally regenerated seedlings.

8.5.4 Timber, if otherwise available, will be extracted from dense tree forests capable of producing large timber on sustained basis.

8.5.5 Open forest areas and traditional pastures will be managed with active participation of tribal and village communities for meeting local domestic needs.

General approach of the treatment has been described, as follows;

8.5.6 The entire forests on steep and precipitous slopes will be protected from harvesting. Thirty (30) meters wide strip on both sides of streams and watercourses will also be protected from harvesting in the similar manner.

8.5.7 Forest areas susceptible to erosion and falling in catchments areas of medium and large irrigation projects and reservoirs shall be protected.

8.5.8 Soil and moisture conservation works have been proposed to restore ecological balance and ensure biodiversity conservation.

8.5.9 Special habitat management for wildlife conservation will receive high priority. Riparian zones and mesic sites, important for wildlife management, will receive added protection and treatment. Adequate buffer will be provided to such sites while preparing treatment maps for coupe extraction. Snag, den trees and down logs shall be sufficiently protected, to meet the habitat requirement of birds and small animals. Wildlife requirements shall be the most important consideration for water hole management in forest areas.

8.5.10 The division will co-ordinate compilation of a comprehensive database of floral and faunal resources as well as ecologically sensitive sites in the division.

8.5.11 Preference will be accorded to natural regeneration and rootstock management. Natural regeneration and promising coppice growth will receive suitable tending and soil working to stimulate growth and development. Areas having good natural regeneration of valuable species shall be protected from fire and grazing. Artificial regeneration will be used as the last resort and supplementary activity at places where natural regeneration is inadequate or is not likely to succeed.

8.5.12 Non-wood timber forest produce (NWFPs) has great potential for sustainable economic improvement of local communities with conservation of forest resources. Sustainable NWFPs production will be given high priority in the forest management.

8.5.13 Sustainability of forest resources serves as the guiding principle for managing demands for forest produce and services. Various government and non-government agencies will be engaged in identification and promotion of ecologically sound and economically feasible alternatives like wood saving technology, stall-feeding and livestock improvement.

8.5.14 Involving local people in managing forests and generating awareness in rural and tribal areas is considered indispensable for the forest conservation.

8.5.15 Reducing biotic pressure on forests, particularly, illicit felling, unsustainable grazing and encroachment near villages will be considered on priority basis.

8.5.16 Forests capable of producing large sized timber will be harvested under the selection-cum-improvement management system.

8.5.17 Boundary demarcation will be carried out in time-bound manner for ensuring territorial integrity of forests. The Revenue and Forest Departments shall ensure maintaining forest boundaries, updating land records and reconciling revenue records in accordance to forest notifications.

8.6 ANALYSIS AND VALUATION OF THE CROP

8.6.1 The first stage analysis of forest crop is based on the species and tree girth distribution obtained from the enumeration data and density distribution observed in satellite imageries.

8.6.2 Areas susceptible to high erosion due to fragile geological formation, steep slopes, areas in close proximity to Protected Areas and those falling in the catchments of medium and large water bodies have been included in the **Protection cum Catchments Area Management Working Circles (P&CAM)**.

8.6.3 Compartments having sufficient dense tree cover and mature trees fit for harvesting are allotted to the **Selection-Cum-Improvement Working Circles (SCI).** This working circle is expected to produce timber and firewood.

8.6.4 Compartments having preponderance of pole crop, dense tree cover without enough mature trees have been assigned to the **Improvement Working Circles (IWC).** These compartments are expected to produce poles, small timber and firewood to cater to local nistar requirements.

8.6.5 Areas having sparse tree crops, open areas without tree growth and isolated small forest patches are included in the **Rootstock Management & Afforestation Working Circle (A&RSM)**. In such areas the focus would be upon tending of existing rootstock supplemented by seedling plantation, wherever necessary. Involvement of the local communities is considered focal for management of such areas as well as afforestation of open forest areas and isolated patches in the division.

8.6.6 The successful old teak plantations of the division have been dealt with under a separate working circle which is named as **Old Teak Plantation working circle.**

8.6.7 The compartments and areas close to the habitations which are unsuitable for raising timber crops due to their refractory nature and grass birs have been proposed to be managed under **Grass & Fodder Resource Management (G & FRM)** working circle to cater to the local needs. The protected forests areas of Narkhed, Kondhali, Hingna, North Umred, South Umred and Kuhi ranges have also been brought under this working circle as they are highly degraded and are unlikely to produce commercial timber. The plantations in these areas in the past have not been successful. However, by allowing regulated grazing in these areas, the grazing pressure on the remaining better quality forests of these ranges may be produced.

8.6.8 Bamboo patches are found dispersed in the division, but mainly found in the North-eastern parts of the division, particularly, in Deolapar, Ramtek and Parseoni ranges. Compartments having more than 5 bamboo clumps per hectare are included in the **Bamboo (Overlapping) Working Circle (BMB).**

8.6.9 Details of compartment allocation in the area-specific working circles have been described in the relevant chapters.

8.7 WORKING CIRCLES AND THEIR DISTRIBUTION

8.7.1 For the purpose of formation of working circles, compartments have been used as units for distribution. The allocation of compartments is based on preponderance of suitability to a specific working circle. Seven area-specific and five overlapping working circles are prescribed **(Table 8.2). (Appendix 8.1).**

Table 8.2. Distribution of forest areas in working circles (Notified Area)

S N	Working circle	Reserved Forests	Protected Forests	New Reserved	Other Forests*	Total area	Percentage
	Area-specific Working Circles						
1	Selection-cum-Improvement (SCI)	47406.01	5598.20		--------	53004.21	30.79
2	Improvement	10960.87	17110.25		--------	28071.12	16.31
3	Afforestation & Rootstock Management (A&RSM)	2998.04	10467.20		-------	13465.24	24.12
4	Protection & Catchments Area Management (P&CAM)	11802.06	3097.67	2640.45		17540.18	10.19
5	Old Teak Plantation (OPWC)	3666.10	1268.14			4934.24	2.87
6(a)	Grass & Fodder Resource Management (G&FRM) (P)	3659.94	26856.57			30516.51	17.67
6(b)	Grass & Fodder Resource Management (G&FRM)(GB)	4719.39	5644.57			10363.96	6.00

7	Miscellaneous area	0	------		14810.22	14810.22	8.27
	Total	**85,212.41**	**70042.60**	**2640.45**	**14231.33**	**172705.68**	**100.0**
	Overlapping Working Circles						
8	Bamboo (Overlapping)	10527.25	------			10527.25	6.12
9	Wildlife (Overlapping)					Entire forest	
10	NWFP (Overlapping) *					Entire forest	

Note: *The other Forests includes area of Zudpi jungle & non Forest Land. * Non-wood Forest Produce and # Joint Forest Management

8.7.2 The reallocation of forest areas under various working circles of Jawala Prasad Plan has been given in Table 8.3. The SCI working circle of this plan has retained the old SCI area, and included about two-third of old Shelter Wood System, one-half of Coppice-with-Reserve (CWR). The IMP working circle has covered areas worked under old Shelter Wood and CWR working circles. Old pasture and Grass bir areas have been included in the Grass and Fodder Resource management working circle. Protected forests of Narkhed, Kondhali, Hingna, North Umred, South Umred and Kuhi ranges under Reafforestation and soil conservation working circle have also been included in G&FRM working circle. The remaining areas of Reafforestation and soil conservation working circle have been retained as Rootstock management and Afforestation working circle. Tending operations of rootstock and afforestation works have been proposed in such areas. Bamboo areas in the previous plan have been retained under the Bamboo (overlapping) working circle.

Table 8.3. Reallocation of areas working circles in this working plan (in ha.)

Working Circle	Selection-cum-improvement (SCI)	Coppice with reserved (CWR)	Shelter wood Planting	Reafforestation & Soil Conservation (RSC)	Pasture	Grass Bir (GB)	Miscellaneous (Misc)	Earmarked to FDCM	Protection	Wild Life (WL)	Total
	Area as per Jwala-Prasad's Plan										
SCI	683.02	36.533.86	12617.46	1371.83			98.34	1,699.70			**53004.21**
IMP		18537.43		9303.18	50.03			180.48			**28071.12**
AFF		1,792.57		8006.48			3627.53		38.66		**13465.24**
PRO	945.38	7,387.04		5833.90	64.61	800.46	1638.25		870.54		**17,540.18**
OPWC		2,750.54	1179.7	986.00		18.00					**4,934.24**
G&FRM					30131.55	10748.92					**40880.47**
FDCM		5,899.14		5,756.97	1249.54			25289.01	1216.31		**39,410.97**
Wild-life				3,389.30					5834.53	18124.08	**27,347.91**
Total	**1,628.40**	**72900.58**	**13797.16**	**34647.66**	**31495.73**	**11567.38**	**5364.12**	**27169.19**	**7960.04**	**18124.08**	**224,654.34**

8.7.3 The SCI areas are largely concentrated in Deolapar, Ramtek, Parseoni, Khapa, S Umrer and Kondhali ranges, while the N. Umrer, S. Umrer, Hingna, Kondhali, Deolapar, Narkhed and Ramtek ranges has the largest area under IMP **(Table 8.3).** Afforestation areas are well distributed among almost all the ranges. Deolapar, Ramtek and Parseoni ranges have the bamboo areas.

Table 8.4. Distribution of Working Circles among ranges (Notified area)

(1) Selection-cum-improvement Working Circle

Range	Reserved Forests (ha)		Protected Forests (ha)		Unclassified Forests (ha)		Total (ha)	
Deolapar	57	11851.74	7	803.39			**64**	**12655.13**
Hingna	32	5964.96	19	2362.99			**51**	**8327.95**
Khapa	5	1028.23	7	1105.98			**12**	**2134.21**
Kondhali	27	5623.78	--	--			**27**	**5623.78**
Kuhi	--	--	--	--			**--**	**--**
Narkher	10	2289.71	2	498.91			**12**	**2788.62**
Parseoni	11	1568.29	9	826.93			**20**	**2395.22**
Ramtek	46	10943.22	--	--			**46**	**10943.22**
N/Umred	--	--	--	--			**--**	**--**
S/Umred	35	8136.08	--	--			**35**	**8136.08**
Total	**223**	**47406.01**	**44**	**5598.20**			**267**	**53004.21**

(2) Improvement Working Circle

Range	Reserved Forests (ha)		Protected Forests (ha)		Unclassified Forests (ha)		Total (ha)	
Deolapar	--	--	3	108.26			**3**	**108.26**
Hingna	2	395.56	6	1033.74			**8**	**1429.30**
Khapa	3	451.08	--	--			**3**	**451.08**
Kondhali	4	787.93	17	2816.06			**21**	**3603.99**
Kuhi	4	842.79	5	1461.94			**9**	**2304.73**
N/Umred	11	2888.66	14	3919.35			**25**	**6808.01**
Narkher	7	1511.94	5	583.95			**12**	**2095.89**
Parseoni	3	1246.75	--	--			**3**	**1246.75**
Ramtek	4	219.59	7	1554.65			**11**	**1774.24**
S/Umred	11	2616.57	20	5632.30			**31**	**8248.87**
Total	**49**	**10960.87**	**77**	**17110.25**			**126**	**28071.12**

(3) Rootstock Management and Afforestation Working Circle

Range	Reserved Forests (ha)		Protected Forests (ha)		Unclassified Forests (ha)		Total (ha)	
Deolapar	8	271.55	17	1370.41			**25**	**1641.96**
Hingna	--	--	--	--			**--**	**--**
Khapa	2	394.97	20	2139.05			**22**	**2534.02**
Kondhali	9	1124.82	--	--			**9**	**1124.82**
Kuhi	--	--	--	--			**--**	**--**
N/Umred	--	--	--	--			**--**	**--**
Narkher	--	--	--	--			**--**	**--**
Parseoni	9	680.32	18	2432.64			**27**	**3112.96**
Ramtek	7	526.38	38	4525.10			**45**	**5051.48**
S/Umred	--	--	--	--			**--**	**--**
Total	**35**	**2998.04**	**93**	**10467.20**			**128**	**13465.24**

(4) Protection & Catchments Area Management Working Circle

Range	Reserved Forests (ha)		Protected Forests (ha)		New Reserved Forest		Total (ha)	
Deolapar	9	2498.31	1	11.21	--	--	**10**	**2509.52**
Hingna	8	1294.61	4	539.16	--	--	**12**	**1833.77**
Khapa	1	188.58	1	172.36	--	--	**2**	**360.94**
Kondhali	--	--	3	816.72	--	--	**3**	**816.72**
S' Hills	1	67.41	--	--	10	2640.45	**11**	**2707.86**
Kuhi	--	--	--	--	--	--	**--**	**--**
N/Umred	2	388.50	3	387.55		--	**5**	**776.05**
Narkher	6	849.43	--	--		--	**6**	**849.43**
Parseoni	15	3605.15	7	1170.67		--	**22**	**4775.82**
Ramtek	8	1695.95	--	--		--	**8**	**1655.95**
S/Umred	4	1254.12	--	--		--	**4**	**1254.12**
Total	**54**	**11802.06**	**19**	**3097.67**	**10**	**2640.45**	**83**	**17540.18**

(5) Old Teak Plantation Working Circle

Sr No	Range	No of sites in Reserve Forest	Compartments (RF)	Area (in ha)	No of sites in Protected Forest	Compartments (PF)	Area (in ha)	Total Plantation sites	Total Area (in ha)
1	Deolapar	54	32	2226.13	11	7	230.14	65	2456.27
2	Ramtek	39	15	917.97	17	10	486.00	56	1403.97
3	Parseoni	9	7	202.00	4	3	124.00	13	326.00
4	Khapa	1	1	20.00	3	2	105.00	4	125.00
5	Hingna	5	5	145.00	2	2	33.00	7	178.00
6	Kondhali	3	3	75.00	2	2	50.00	5	125.00
7	Kuhi	1	1	50.00	6	6	240.00	7	290.00
8	S.Umred	2	2	30.00	-	--	--	2	30.00
	Total	**114**	**66**	**3666.10**		**32**	**1268.14**	**159**	**4934.24**

(6) Grass & Fodder Resource Management Working Circle

Range	Reserved Forests (ha)		Protected Forests (ha)		Unclassified Forests (ha)		Total (ha)	
Deolapar	--	--	--	--			**--**	**--**
Hingna	12	1712.27	21	1681.12			**33**	**3393.39**
Khapa	--	--	--	--			**--**	**--**
Kondhali	--	--	76	7532.46			**76**	**7532.46**
Kuhi	1	105.78	32	4825.00			**33**	**4930.78**
N/Umred	12	2761.91	47	7794.32			**59**	**10556.23**
Narkher	8	1504.32	56	6066.72			**64**	**7571.04**
Parseoni	1	50.03	--	--			**1**	**50.03**
Ramtek	1	196.34	--	--			**1**	**196.34**
S/Umred	11	2048.68	36	4601.52			**47**	**6650.20**
Total	**46**	**8379.33**	**268**	**32501.14**			**314**	**40880.47**

(7) Miscellaneous area (in ha)

Range	Reserved Forests	Protected Forests	Non Forests Land	Zudupi Jungle	Total Area
Deolapar	--	--	--	27.81	27.81
Hingna	--	--	19.52	3241.30	3260.82
Khapa	--	--	211.88	2550.61	2762.49
Kondhali	--	--	62.08	1892.08	1954.16
Kuhi	--	--	--	435.35	435.35
N/Umred	--	--	--	2638.87	2638.87
Narkher	--	--	--	1358.12	1358.12
Parseoni	--	--	--	884.98	884.98
Ramtek	--	--	--	560.34	560.34
S/Umred	--	--	--	317.08	317.08
S' Hills	--	--	--	610.20	610.20
Total	--	--	**293.48**	**14516.74**	**14810.22**

(8) Bamboo (Overlapping) Working Circle

Range	Reserved Forests (ha)	Protected Forests (ha)	Unclassified Forests (ha)	Total (ha)
Deolapar	4,975.68	--	--	**4,975.68**
Parseoni	3,114.29	--	--	**3,114.29**
Ramtek	2,437.28	--	--	**2,437.28**
Total	**10,527.25**	--	--	**10,527.25**

8.8 BLOCKS AND COMPARTMENTS

8.8.1 The balance Reserved Forests of the division has been distributed in 407 compartments. Ten forest blocks contribute 71 compartments, while the remaining compartments fall in different villages. All the compartments in the Reserved Forests have been retained their original numbers, assigned to them serially from 1 onwards.

Table 8.5. Distribution of forest compartments in working circles

Area-specific working circles	Reserved Forests	Protected Forests	Unclassified Forests	Zudupi Jungle	Compartments (total number)
Selection-cum Improvement (SCI)	223	44	---	---	**267**
Improvement (IMP)	49	77	---	---	**126**
Afforestation (A&RSM)	35	93			**128**
Old Teak Plantation(OPWC)	1(Full) 65(Part)	32(Part)	---	---	**1(Full) 97(Part)**
Grass &Fodder(G&FRM)	46	268			**314**
Protection (P&CAM)	64	19			**83**
Miscellaneous (MIS)	0	---	---	621	**---**
	417	**501**	**---**	**621***	**918**

- **Entries are the number of villages under the respective category. Village numbers has not been counted in total number of compartments.**

8.8.2 Protected Forests (PF) covering in 594 villages have been organised in 499 compartments, in such a way that each forest patch has a distinct compartment number irrespective of its size. The notified area of such villages is added to the for the purpose of area accounting. However, numbers assigned to PF compartments belongs to same series as that of the Reserved Forests numbers, which creates problem of duplicity in monitoring and in maintenance of records in the division. These area have been captured in GIS mapping.

8.8.3 In view to this, the Protected Forests have been re-numbered and assigned 4-digit numbers, starting serially from 1001 onwards, to avoid any possibility of assigning same number to the compartments of different forest types viz. the RF and the PF. The distinct patches within these compartment numbers are proposed to be assigned distinct sub-compartment number. For instance, if compartment number 1005; constitutes 5 distinct patches of forests. They would be assigned 1005/1, 1005/2, 1005/3, 1005/4 and 1005/5 numbers, beginning with the largest to the smallest, to facilitate identification and maintenance of records. These area have been captured in GIS mapping.

8.8.4 The Nagpur Division has 2,933.93 hectares as unclassified forests (Non Forest lands) in 22 villages. The division has moved proposal under section 4 of Indian Forest (Protection) Act 1927 for declaring these areas as the Reserved Forests. Compartments have not been formed in these areas. Notional numbers has been assigned to each of these 22 villages, starting serially from 2001 onwards. These area have been captured in GIS mapping.

8.8.5 The Revenue Authorities has handed 140.39 km^2 of Zudupi Jungle in 880 villages to the Nagpur Division in the year 1990. Compartments have not been formed in such areas. Notional numbers has been assigned to each of these 880 villages, stating serially from 2101 onwards. These area have been captured in GIS mapping.

8.9 PERIOD OF THE PLAN

8.9.1 This plan is for 10 years from the year of approval. The operations, however, have been prescribed for a period of 20 years except for the areas allotted to Root Stock Management and Afforestation wherein 40 year cycle has been prescribed. Areas under Grass and Fodder Resource Management working circle are prescribed to be worked on a 4 year rotation. Mid-term review of prescriptions of the plan is proposed in the fifth year of its implementation, on receipt of proposal from the Conservator of Forests, Nagpur Circle. The Add. Principal Chief Conservator of Forests (Production and Management), Maharashtra State may issue necessary supplementary instructions on aspects not covered in the plan.

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Chapter 9. Treatment Types and Common Prescriptions

9.1 DEMARCATION AND MARKING

9.1.1 The annual coupes for harvesting, tending and various other site specific treatment are prescribed to be demarcated one year in advance. Then the treatment Map, as prescribed in the following paragraphs, will be prepared, verified and approved in the same year. The marking of the coupes will also be undertaken one year in advance and it will follow the demarcation.

9.1.2 The detail procedure for demarcation, preparation of treatment map and marking has been given in the chapter on Miscellaneous Regulations.

9.2 TREATMENT TYPES AND PREPARATION OF TREATMENT MAP

9.2.1 For the site-specific silvicultural treatment, annual operations in a coupe are proposed to be carried out after dividing it into various treatment Types on the basis of criteria given in the following table.

Table 9.1 Treatment types for coupe operations and site-specific treatment.

Treatment areas	Symbol	Characteristics	Minimum patch size	GIS Map generated
Protection areas	**A1**–type	Area having more than 25^0 slope	Any size	Yes
	A2–type	30 meter wide strip on both sides of streams		Yes
	A3–type	Area susceptible to excessive erosion		Yes
Open forests	**B1**–type	Open forests (density < 0.4) with rootstock	**5** hectare	Only density
	B2–type	Open forests (density < 0.4) without rootstock		
Pole Crop	**C**–type	Pole crop of the identified valuable species, suitable for retention as future crop, having density 0.4 or more.	**1** hectare	No
Well-stocked area	**D1** type	Area fit for teak plantation after canopy removal i.e. areas with deep, well-drained loamy soil containing well-stocked mature forests with scanty natural regeneration.	**5** hectare	Yes
	D2 type	Remaining well stocked areas having density 0.4 and over.		
Forest blanks	**E** type	Forest blanks	**5** hectare	Yes

9.2.2 Distinct patches of the B, D or E-type areas shall have minimum area of 5 (five) hectares in extent. The minimum extent prescribed for the C-type areas is 1 (one) hectare. The A-type- Protection areas would be delineated irrespective of the patch size. Smaller patches proposed to be merged with the adjoining larger areas having similar crop conditions.

9.2.3 The treatment maps are proposed to show areas having adequate regeneration (400 or above established seedlings) as B1 type, those suitable for planting of teak, bamboo and miscellaneous species as B 2 and forest blanks as E type. Natural blanks (under E type areas) however are not to be considered for plantations as rocks, soil and water regime their generally does not support tree growth.

9.2.4 **Delineation of areas of various treatment types** will be in accordance with the following general guidelines:

- An area having more than 25º slope and more than ¼ of a hectare in extent is proposed to be delineated as the *A1-type: steep slope*. The maps showing such areas have been generated through GIS.
- 30 meters wide buffer along streams will be measured from the bank or the high flood mark. Rivers or streams shown on the base maps of the compartments or on topo-sheets of the Survey of India at 1:15,840 or smaller scales (such as 1:50,000) would suffice the purpose. Similar buffer of the A2-type areas will be marked along water bodies and tanks. Such areas are shown in the maps generated through GIS.
- The A3-type (excessive erosion prone) includes seasonally flooded. Such areas are shown in the maps generated through GIS
- Natural regeneration would be considered adequate if at least 400 saplings per hectare are present. This criterion will be applied while delineating B1 type areas.
- The C type areas would include groups of naturally grown trees having 15 to 45 cm GBH.
- The E-type areas (forest blanks) are areas devoid of trees and those having with crown density as 0.1 and below.

9.3 ***COMMON PRESCRIPTIONS FOR VARIOUS TREATMENT TYPES***

Following prescriptions are common to all treatment types except A-type: protection areas:

9.3.1 Soil and Moisture Conservation works: Soil and moisture conservation works such as Check-dams, Gully plugging, etc. shall be carried out as prescribed in the chapter of Miscellaneous Regulations.

9.3.2 **Coppice Management**: Dressing of high stumps and other methods of coppice management are not suggested in SCI because the selection system is expected to facilitate high forest character of the crop. However, coppice shoots will be allowed in open areas lest the large openings may lead to deterioration of site and weed infestation. In other working circles, it will have to be generally allowed. Natural regeneration through coppice management in the following ways is prescribed:

- **Dressing of live high stumps of valuable species:** It will be done in areas devoid of natural regeneration and where it needs to be covered with tree growth. The purpose of dressing will be to encourage coppicing close to the ground so that they will not topple after gaining height, will be able to develop root system of their own and will grow into a promising tree.

- **Singling of coppice shoots**: One healthy and promising coppice shoot will be retained per stump. Coppice shoots interfering with promising seedlings and saplings of seed origin will be removed.
- **Coppice management of damaged and malformed saplings**: The saplings and poles up to 45 cm GBH having one third of the stem damaged and malformed shall be coppiced by cutting flush to the ground. Such coppicing, however, should not expose the ground, cause erosion and lead to soil loss. Poles having at least 2.50 meter of clean bole will be not be treated as malformed.

9.3.3 **Climber cutting and shrub clearance**: Climber cutting of Chilati, Eruni, Kukudranji, Mahulbel, Palasbel, Nagvel and Gunj and shrub cutting of Lantana, Rantulsi, Bharati, Nirgudi, Kharata, Kuda, Jilbili, Neel, Kharasani and Phetra may be carried out wherever the operation is warranted for the development of tree crop. Partial removal of Dikamali may be allowed unless local villagers regularly collect its gum and desire to protect it. Cutting of climbers and shrubs should generally be avoided within 30 m strips from the edge of the forests and along the roads.

However, no climber having medicinal value will be removed even if it is hindering tree growth.

9.3.4 **Bamboo working outside Bamboo (Overlapping) Working Circle** : Bamboo clumps in areas outside Bamboo (overlapping) working circle will also be worked in the manner prescribed in Bamboo harvesting under Bamboo (overlapping) working circle.

9.3.5 **Control data**: Pre-treatment and the post-treatment basal area as well as other relevant parameters from the well dispersed sample plots will be recorded in the Divisional register by an officer not below the rank of Range Forest Officer.

The Prescribed Type-specific Treatment:

Specific prescriptions for various treatment types will be as follows:

9.4 TREATMENTS IN A-TYPE AREAS

9.4.1 **Soil and moisture conservation**: Gully plugging and other soil and moisture conservation works, as described in the chapter of Miscellaneous Regulations will be taken in the A3-type areas. Such works may be taken up in the A2-type areas, but without damaging the riparian ecosystem.

9.4.2 **Bush sowing**: Bush sowing of Khair, Neem, Maharukh, Salai, Dhaoda, sandal and other local seeds is prescribed to be carried out by the regular forest staff and Van Majoors. Any one species should not constitute more than one-third of the total seed sowing.

9.4.3 **Stake planting**: In the A3-type areas, vegetative propagation of suitable soil binding species may be attempted. Stake planting of Vad, Umber, Pimpran etc. is suggested.

9.4.4 **Harvesting prohibited**: Generally the harvesting of standing trees is prohibited in the A-type areas. Wind fallen trees of the valuable species such as Teak, Shisham and Bija will be removed as a protection measure against illicit cutting.

9.5 TREATMENTS IN B-TYPE AREAS

9.5.1 **Rootstock management**: Tending of rootstock in the B1-type will be carried out in accordance the guidelines for the rootstock management described in **section 9.10** of this chapter. Necessary soil working and mulching will be carried out to promote rootstock growth.

9.5.2 **Plantations**: Suitable sites of the B2-type areas in afforestation working circle may be brought under the plantations. Choice of species, planting and other operations will be in accordance with the plantation guidelines given in the chapter on Miscellaneous Regulations.

9.6 TREATMENT IN C-TYPE

9.6.1 The successful old teak plantations have been separately covered under Old Teak Plantation Working Circle. However, for removal of congestion, groups of advance growth of teak and valuable non-teak species in a coupe will be thinned to 1/3 of the top height of predominant trees present in the group and as per the thinning guidelines. Adequate retention of non-teak poles will be ensured in clusters containing more than 20% Teak. The valuable species given in the list under paragraph 9.9.1 will be followed for retention.

9.6.2 **Preference of girth class**: Marking in the C-type areas for the purpose of spacing out saplings and poles will be carried out from lower girth class upward.

9.7 TREATMENT IN D-TYPE

9.7.1 **Enumeration in annual coupes**: Species and girth-class of all trees above harvestable girth be enumerated.

9.7.2 **Marking for harvesting**: Mature trees (those above harvestable girth) to the extent fixed in the relevant working circles will be marked for felling. Well-formed and vigorous trees will be preferred for retention. Species listed as valuable species given in the **paragraph 9.9.1** will determine the order of priority for retention.

9.7.3 **B-grade Thinning:** If the congestion is expected to persist in some patches after the harvesting, the B-grade thinning will be carried out in such patches. *B-grade or moderate thinning is defined as removal of dead, dying, diseased, suppressed, defective dominated stems and whips in this order*[1]*.* Removal of inferior individuals will start from suppressed class and then to some of the dominated class of the crop. Advanced growth having too many branches not desirable to prune or lop may also be removed.

9.7.4 **Tending of natural regeneration**: Singling and spacing out of the established seedlings/ saplings of teak and other valuable species will be carried out much in the same way as in case of the rootstock management. It should leave nearly 400 saplings per hectare. Soil working and mulching around these saplings will be also be carried out in accordance with the guidelines for the rootstock management.

[1] FRI. 1983. Abridged Glossary of Technical Terms. Forest Research Institute & Colleges, Dehra Dun. Page 224.

9.7.5 **Preference of girth class**: Marking of trees in the D-type areas above harvestable girth and those which are silviculturally available will be done from the higher girth class downwards.

9.8 TREATMENT IN E-TYPE

9.8.1 **Plantation**: Plantation of suitable species as indicated under the plantation guidelines will be taken up. However, natural blanks, wherein rocks, soil and water regime is such that does not support tree growth, should not be covered under plantation programme.

9.9 VALUABLE SPECIES FOR RETENTION

9.9.1 Order of priority among desirable species for retention is prescribed as: *Teak, Tiwas, Shisham, Haldu, Bija, Saja, Karam, Khair, Siwan, Kasai, Dhaora, Bhirra, Rohan, Tendu, Mowai, Salai, Surya, Mokha, Dhaman, Bhilawa, Chichwa, Bhorsal, Lendia and Garari.* The species with population less than 1% in the coupe will not be marked for felling.

9.10 GUIDELINES FOR ASSISTING NATURAL REGENERATION

It will constitute identification of established seedlings/ saplings and nursing them as well as coppice management in areas devoid of natural regeneration in the form of seedlings/ saplings but containing plenty of rootstock which needs tending.

9.10.1 **Nursing of seedlings/ saplings of seed origin**: All seedlings and saplings of valuable species (listed in the following section for the rootstock management) more than 60 centimetre in height will be nursed as future crop. Spacing operations, if required, will be carried out to leave nearly 400 saplings per hectare at an average of 5 metre spacing. The growth of the naturally occurring seedlings will also be assisted and encouraged by soil working and mulching around them. Following yearwise operations are prescribed:

- **First year operations**: Weeds in one-meter diameter around saplings of valuable species should be cleared during the first week of July. Uprooted weed, grasses and leaf-litter should be mixed in the upper layer of soil as the organic mulch and facilitate loosening and aeration of the soil by worms and insects. One soil working should be carried out in October.
- **Second year operations:** Singling of coppice shoots, if any, management of damaged and malformed saplings, climber cutting and shrub clearance of unwanted species are prescribed.

9.10.2 TENDING OF ROOTSTOCK

It involves dressing of live high stumps, singling of coppice shoots and coppice management of damaged and malformed saplings as well as climber cutting and shrub clearance, which will be done in the same way as prescribed as common treatment under para 9.3 above.

9.11 CUT BACK OPERATIONS (CBO)

9.11.1 Cut back operations are prescribed to be carried out in the annual coupes in the year following the main felling.

9.11.2 All the left over marked trees during the main coupe operations shall be harvested. Such trees, if less than 2 percent of original marking, can be felled after inspection of the Range Forest Officer. Deputy Conservator of Forests may sanction felling up to 5 percent of the original marking, and a higher proportion would require prior permission of the Chief Conservator of Forests (Territorial) Nagpur.

9.11.3 All trees damaged during the main coupe felling shall be marked for removal.

9.11.4 All left over multiple poles shall be reduced to one per stool.

9.11.5 Coppice shoots shall be removed to encourage establishment of seedling regeneration.

9.12 GUIDELINES FOR CLEANING IN THE SIXTH YEAR

9.12.1 Cleaning will be carried out in the annual coupes in the sixth year of the coupe working and in plantations in the sixth year of its formation. No cleaning is prescribed in failed plantations which are treated so as per Evaluation Code.

9.12.2 All inferior species including the unwanted undergrowth interfering or likely to interfere with the growth of NR of teak and other valuable species shall be cut back.

9.12.3 It will include climber cutting, shrub clearance, dressing of high stumps, extraction of marketable down logs, and cleaning of bamboo clumps (in areas outside Bamboo (overlapping) working circle). These operations will be carried out as prescribed above under common prescriptions.

9.12.4 Coppicing of damaged and malformed saplings and singling of coppice shoots shall be carried out. All newly risen teak coppice shoots shall be removed.

9.12.5 Established seedling regeneration of teak and other miscellaneous species shall be spaced out suitably. Spacing of dense growth will follow the stand table of the concerned species. In absence of the stand table, thumb-rule of keeping the spacing at one-third of the average height will be followed.

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Chapter 10. Selection-cum-Improvement Working Circle

10.01 GENERAL CONSTITUTION OF THE WORKING CIRCLE

10.1.1 The areas capable of producing good quality timber and poles are allotted to this working circle. The aim is to gradually convert the coppice into high forests by tending natural regeneration and supplementing it by artificial regeneration. They include areas which support straight boled and sound trees of both seedling and coppice origin. The teak trees of coppice origin are however malformed and its regeneration is absent. They may therefore degrade further unless teak is planted after removal of canopy.

Following criteria has been used for allocation of compartments to this working circle:

- ☑ Compartments suitable for producing medium and large sized timber and are not critically important for the protection of topography.
- ☑ Compartments having dense teak forest of IVa quality having patches of quality III and IVb inextricably mixed in the crop.
- ☑ Areas previously under SCI, Shelterwood and bulk of old CWR Working Circle capable of producing straight and sound timber and poles.
- ☑ Compartments containing crop having basal area above 10 sq.m. per ha.

10.1.2 Area statement for the SCI working circle is given in the Table 10.1.

1) Table 10.1. Range-wise Compartments and Area allocation to SCI Working Circle (in ha)

Range	Compt.	Dense Forests	Open Forests	Blanks	Grass Lands	Sub--merge	Plantations	Total Area
Deolapar	64	7922.23	3943.89	24.78	0.00	25.93	738.3	**12655.13**
Hingna	51	7557.20	359.15	5.27	170.12	0.00	236.21	**8327.95**
Khapa	12	2099.21	0.00	0.00	0.00	0.00	35	**2134.21**
Kondhali	27	4932.86	482.02	8.90	0.00	0.00	200	**5623.78**
Kuhi	--	--	--	--	--	--	--	**0.00**
Narkher	12	2396.86	288.58	70.00	0.00	0.00	33.18	**2788.62**
Parseoni	20	1841.00	419.02	25.20	0.00	0.00	110	**2395.22**
Ramtek	46	10115.52	597.50	25.90	0.00	20.23	184.07	**10943.22**
N/Umred	--	--	--	--	--	--	--	**0.00**
S/Umred	35	5757.06	1872.46	14.54	0.00	47.61	444.41	**8136.08**
Total	**267**	**42621.94**	**7962.62**	**174.59**	**170.12**	**93.77**	**1981.17**	**53004.21**
Percent		**80.41**	**15.02**	**0.33**	**0.32**	**0.18**	**3.74**	**100.00**

Thus, this working circle includes a total of 53,004.21 ha of area, which comprises 47,406.01 ha of Reserved Forests and 5,598.20 ha of Protected Forests. Thus, this working circle forms 30.79% of the total forest area of the division.

10.02 GENERAL CHARACTER OF THE VEGETATION

10.2.1 As per the enumeration results, composition and structure of forest crop in SCI areas is given in **Table 10.2** below. The forests are mixed in nature and contain all-aged

trees. They are rich in floral diversity and include many NWFP species of great significance to the local communities.

Table 10.2 Species and girth distribution from enumeration data in the SCI areas .

Species	Stems Per Hectare in girth - classes (GBH range in centimeter)									Total	B.A. (Sq.m)
	16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-above		
Char	2.53	1.58	1.01	0.65	0.56	0.31	0.16	0.06	0.07	**6.92**	**0.16**
Chichwa	2.66	2.03	0.98	0.66	0.27	0.15	0.05	0.01	0.01	**6.82**	**0.11**
Dhaman	0.77	0.74	0.50	0.28	0.17	0.07	0.03	0.02	0.02	**2.60**	**0.06**
Dhawada	4.07	3.10	1.75	0.97	0.53	0.30	0.11	0.05	0.05	**10.93**	**0.20**
Garadi	5.09	2.87	1.30	0.76	0.46	0.25	0.08	0.03	0.01	**10.85**	**0.17**
Haldu	10.17	8.60	2.49	0.90	0.34	0.14	0.07	0.02	0.02	**22.75**	**0.27**
Hirda	1.45	0.68	0.26	0.08	0.04	0.01	0.01	0.01	0.01	**2.54**	**0.03**
kalam	6.54	5.00	2.42	1.16	0.72	0.37	0.20	0.08	0.13	**16.62**	**0.30**
Kasai	0.13	0.07	0.06	0.03	0.02	0.01	0.01	0.01	0.02	**0.36**	**0.01**
Khair	2.50	1.64	0.88	0.46	0.37	0.25	0.15	0.09	0.06	**6.39**	**0.14**
Kullu	2.40	2.31	1.51	0.70	0.30	0.07	0.05	0.01	0.02	**7.37**	**0.13**
Lendia	10.90	6.66	3.14	1.41	0.52	0.16	0.08	0.04	0.05	**22.96**	**0.31**
Moha	9.84	4.82	1.35	0.56	0.23	0.12	0.07	0.04	0.07	**17.10**	**0.19**
Mokha	1.40	0.85	0.46	0.28	0.20	0.18	0.10	0.05	0.06	**3.59**	**0.09**
Mowai	2.97	1.97	1.22	0.80	0.61	0.40	0.28	0.11	0.18	**8.53**	**0.23**
Palas	30.25	19.87	7.97	3.60	1.83	0.85	0.48	0.25	0.43	**65.53**	**0.98**
Rohan	6.32	4.51	2.21	1.18	0.54	0.26	0.11	0.03	0.05	**15.20**	**0.24**
Salai	3.15	2.20	1.41	1.14	0.78	0.57	0.29	0.17	0.16	**9.87**	**0.28**
Semal	0.37	0.36	0.31	0.33	0.29	0.25	0.19	0.09	0.09	**2.28**	**0.11**
Shisam	0.44	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	**0.79**	**0.01**
Shiwan	0.08	0.07	0.05	0.05	0.02	0.02	0.02	0.00	0.01	**0.31**	**0.01**
Teak	24.85	22.42	16.54	11.15	6.35	3.50	1.38	0.96	0.75	**87.89**	**2.14**
Tendu	36.28	25.34	14.83	10.42	6.29	3.36	1.78	0.70	0.49	**99.47**	**2.11**
Tiwas	3.22	0.81	0.36	0.27	0.15	0.09	0.06	0.02	0.01	**4.99**	**0.07**
Bhirra	5.65	3.61	1.69	1.09	0.64	0.25	0.16	0.05	0.03	**13.18**	**0.23**
Ain	11.04	4.19	1.83	1.10	0.82	0.43	0.30	0.10	0.10	**19.90**	**0.31**
Bija	3.54	1.89	1.00	0.62	0.35	0.18	0.12	0.04	0.03	**7.78**	**0.14**
Surya	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	**0.03**	**0**
Behada	1.93	1.16	0.60	0.62	0.25	0.14	0.06	0.01	0.06	**4.84**	**0.10**
Aonla	9.79	7.38	3.94	2.58	1.32	0.59	0.29	0.10	0.13	**26.11**	**0.49**
Biba	5.82	4.40	2.26	1.40	0.80	0.43	0.26	0.09	0.08	**15.55**	**0.31**
Other	9.51	5.85	3.54	2.79	1.90	1.09	0.54	0.29	0.27	**25.78**	**0.61**
Total	**215.69**	**147.11**	**77.94**	**48.08**	**27.70**	**14.83**	**7.48**	**3.53**	**3.47**	**545.82**	**10.54**

10.2.2 The forests are mainly Dry Teak and Southern Dry Mixed Deciduous type and support high proportion of teak especially in the former type. The forest crop is mainly middle aged with occasional mature and over matured trees. Majority of these areas have been worked 2 to 3 times under coppice system. Hence, the crop is primarily of coppice origin. However, the trees are largely straight and sound. Natural regeneration of teak

and its prominent associates is found at places but it is far from adequate. Establishment of natural regeneration is an issue of concern due to fires and heavy grazing.

10.2.3 Teak is the predominant species, which is found in well-drained areas having good loamy soil. It constitutes over 60 to 80 percent of crop and forms pure patches at places. The common associates of teak are; Bija, Tinsa, Rohan, Kalam, Haldu, *Bhirra, Dhaora, Lendia, Saja, Tendu, Mowai, Kalam, Bel and Aonla. Tendu, Moha, Achar, Aonla, Bel and Chinch* is common edible fruit-bearing species.

10.2.4 The crop contains mostly the middle-aged trees but mature and over-mature trees are found occasionaliy. Dominant site quality is IVa but areas of site quality III and IVb are also found mixed in the crop. The density varies from 0.4 to 0.8.

10.2.5 Natural regeneration of teak and other common species, which is mostly of coppice origin, is scanty and is found in well-drained areas having good soil and less biotic interference. Depending upon the extent of damage due to fire and grazing, establishment of NR varies from place to place. Proportion of teak has increased because of its prolific coppicing nature and fire hardiness as well as the past system of working favouring teak. However, crop has undergone 2 to 3 rotations under coppice system leading to reduction in coppice vigour. Also regeneration of miscellaneous species requires focus for restoring mixed nature of the crop.

10.3 BLOCKS AND COMPARTMENTS

Allotment of compartments to this working circle has been given in **(Appendix 10.1)**

10.4 SPECIAL OBJECTS OF MANAGEMENT

The special objects of management of forest areas under SCI Working Circle are as follows:

i) The coppice crop of teak is generally stunted and has lost its vigor. Hence, it is to be gradually converted into 'high forest' by appropriate silvicultural techniques, which will include tending of existing natural regeneration of seed origin.

ii) To obtain sustained supply of medium and large-sized timber and poles.

iii) To plant teak from genetically superior stock in suitable areas with an objective of improving productivity.

iv) To involve local people in the management and protection of forests through JFMC's.

10.5 ANALYSIS AND VALUATION OF THE CROP

Stock mapping: The extensive enumeration exercise and crown density mapping through image analysis of satellite imageries has been employed for the stock mapping. This is described in Chapter 6. Enumeration details have been shown in the GIS generated maps.

Age and density: The crop is mostly middle aged to mature having density varying from 0.4 to 0.8. The dense forest areas form about ¾th of the crop in SCI areas.

Site quality: Site quality governs the harvestable girth. It has been mapped by Geomatics Centre, Nagpur. It can be determined by average height of about 100 mature dominant trees of Teak or its associates in the forest patches of consistent characteristics. However, site quality dose not change much in the time span of 20 years and hence the information from the previous plan has been used to delineate and digitise the various site quality classes.

Enumeration: Enumeration for the collection of data on forest crop has been carried out by laying plots of the size of 0.36 ha (60M X 60M) on the 600 metre X 600 metre grid lines. This data has been analysed to obtain parameters like basal area, number of mature trees per ha. and girth class wise stocking. These parameters have been used for allocating compartments to various working circles and for setting out prescriptions for the forests in those compartments.

Regeneration: While doing the enumeration work described as above, the data on regeneration status has been collected by laying 0.04 ha sub-plots within the enumeration plots. The seedlings have been enumerated in three categories**.** This data has been analysed and used to prescribe methods for regeneration of forest areas both by natural and artificial means. The focus of these methods will be on tending of existing natural regeneration and rootstock management. Plantation has however been proposed to improve stocking of commercially important species as well as to increase the capital value of the forests. For this purpose, it has been proposed that teak will be planted in small patches after creating gaps by removal of over wood (canopy removal). This has been dealt with in detail under para 10.12.

Table 10.3 Average Seedlings and saplings per hectare in the SCI areas

Range	Seedlings (R1) 0.3–1.0 meter	Saplings (R2) 1.0–3.0 meter	Saplings (R3) > 3.0 meter	Total
Deolapar	279.58	235.56	230.39	**745.53**
Khapa	16.17	222.17	106.08	**344.42**
Kondhali	95.18	152.74	26.79	**274.71**
Narkher	126.00	171.85	46.62	**344.46**
Parsioni	33.90	72.25	69.30	**175.45**
Ramtek	258.73	327.85	134.73	**721.31**
Hingna	182.94	170.56	29.71	**383.21**
Kuhi	0	524.50	244.38	**768.88**
N/Umred	90.68	436.84	124.68	**652.21**
S/Umred	62.83	161.212	51.95	**276.00**
Average	**154.88**	**222.91**	**103.91**	**481.70**

10.6 SILVICULTURAL SYSTEM

It is selection-cum-improvement system and planting of teak from genetically superior stock in patches of suitable size after creating openings in the canopy through removal of overwood. The selection girth (harvestable girth) has been fixed after stem analysis for teak in different site quality as well as other valuable species. The tree species are classified in five groups as follows for the convenience of working. However, in case of the species which are less than 1% in their stocking as per the enumeration data, no felling has been prescribed and also, in order to have an insurance for future, only 50% of trees above the harvestable girth have been prescribed for removal.

Table 10.4. The harvestable girth/ultimate girth for various species in the Nagpur Forest Division

Group	Species	Harvestable Girth
Group 1	**Teak**	**135 cm. for quality II** **120 cm. for quality III** **105cm. for quality IV**
Group 2	**Saja, Bija, Karam, Haldu**	**135 cm.**
Group 3	**Dhaora, Tiwas, , Rohan, Bhirra, , Mokha, Palas, Siwan, Bhilawa, Chichwa, etc**	**105 cm**
Group 4	**Garari, Lendia, Khair**	**60 cm**
Group 5	**Species protected from felling (Shisham, Semal, Kulu, Kasai, Surya, Beheda, Dhaman,**	**No felling** (Less than 1%)

10.7 YIELD CALCULATION

The yield calculation is based on Sagreiya's mathematical approach to concepts underlying Brandis method and it has been calculated separately for teak (group 1), group 2, group 3 and group 4 species. Yield for group 5 species has not been done as these species are reserved against felling **(Appendix 10.2)**.

The number of stems per ha reaching the harvestable size have been calculated on the basis of de Liocourt's law, that is, first r and a are calculated and then no of trees in higher girth classes in each cycle have been found out. The working is prescribed to be carried out on a 20 year felling cycle and hence the yield available in each felling cycle throughout the rotation period has been calculated. The stock in hand has been presumed to be liquidated through out the rotation period and thus the yield available in various cycles is harmonised for the rotation period.

1. On this basis, the annual yield per ha is 0.0532 trees. The per tree volume from the local volume table of teak in Nagpur forests may be taken as 1.03 m^3. Thus, annual yield for teak in a coupe will be as follows:

$$\frac{0.0532 \times 1.03 \times 53000}{24} = 121.008\ m^3$$

As only 50% of trees of the harvestable class are to be removed, 60.504 m^3 material of teak will be available.

2. Similarly, yield for Group 2 species is as follows

$$\frac{0.0062 \times 1.03 \times 53000}{24} = 14.102\ m^3$$

That is, 7.051 m^3 of material of Group 2 species i.e. Bija, Ain, Kalam, Haldu will be available.

3. In case of Group 3 species i.e. Dhawda, Tiwas etc., the harvestable girth is fixed at 105 cm and, hence, per tree volume from the local volume table is 0.555, Therefore, the yield available is as follows:

$$\frac{0.04145 \times 0.555 \times 53000}{24} = 508.022\ m^3$$

That is, the yield available should be 254.011 m^3. Such a huge quantity can be explained in the light of lower harvestable girth due to which number of trees available have suddenly increased. Such a heavy felling is not advisable and hence 1 out of every 3 available trees of this class are prescribed to be removed.

4. In case of Group 4 species i.e. Garadi, Lendia and Khair, the harvestable girth is 60 cm. Therefore, per tree volume from the local volume table is 0.14 and the available yield is:

$$\frac{1.33 \times 0.14 \times 53000}{24} = 411.192\ m^3$$

That is, the yield available should be 205.596 m^3. Such a huge quantity can be explained in the light of lower harvestable girth due to which number of trees available have suddenly increased. Such a heavy felling is not advisable and hence 1 out of every 3 available trees of this class are prescribed to be removed.

10.8 CHOICE OF SPECIES

Teak will receive top priority for retention. When it, however, makes more than 50% of stems above 120 cm GBH, other healthy stems of valuable species will be considered for retention. The order of priority for non-teak species will be *Tiwas, Bija, Haldu, karam, Saja, Siwan, Dhaora, Bhirra, Mowai, Salai, Dhaman, Lendia, Rohan, Khair, etc.* and the order may be fixed/ altered from time to time by CCF(T) Nagpur. All fruit trees and those whose population in forest crop is less than 1% will always be retained. When we, however, attempt to create normal forests by altering the method of working as described under para 10.6.2, choice of species has a lesser significance as all the species and girth classes will get attention according to their weightage worked out but whenever a choice will have to be made, the above prescriptions will be followed.

10.9 FELLING CYCLE, FELLING SERIES AND ANNUAL COUPES

Felling Cycle: The common species in the area are light demander in nature, and the higher proportion of teak suggests the need for creating greater openings to introduce other valuable species in stocking. Further, long spell of dry months also intensifies competition in these forests. In view to this, 20 *(twenty) years* felling cycle of has been retained.

Felling series and annual coupes: The entire area of this working circle has been divided into 24 **felling series**, and each felling series will have **20 annual coupes**. **(Appendix 10.3)**

Regulation of yield: The yield is prescribed by number/ volume and regulated by area and therefore coupes broadly of equal area have been formed.

10.10 COUPE DEMARCATION, TREATMENT MAP AND MARKING

10.10.1 The coupe demarcation, preparation of treatment maps and marking will be according to prescriptions incorporated in the chapter of Miscellaneous Regulations.

10.10.2 Main annual coupes shall be demarcated one year in advance along with coupes due for cleaning and thinning. The coupe shall be divided into four sections, if necessary, to effectively control the various coupe operations.

10.10.3 **Treatment Map** shall be prepared by the RFO and verified by the ACF. This will be in accordance with the criteria and prescriptions of the Chapter 9. Areas under various treatment types shall be shown distinctively on the map, and those, which are suitable for planting, and also those, which have adequate and promising NR and rootstock, shall be shown prominently.

10.10.4 **Treatment Prescribed**: The treatment map will be prepared showing the following categories of area.

A Type Areas (Protection Areas)

They will include-

- ☑ A1 type areas, which have slope more than 25°,
- ☑ A2 type areas, i.e. 30 m wide strip on both sides of streams,
- ☑ A3 type areas, which are susceptible to excessive erosion.

B Type Areas (Under-stocked Areas)

The open forests with root stock as well as without root stock shall be shown in the treatment map.

C Type Areas (pole crop)

Areas with sufficient pole crop of valuable species which can be retained as future crop shall be marked separately.

D Type Areas (Well-stocked Areas)

The well-stocked areas will be shown in the treatment map to facilitate teak plantation in identified patches and selection working in the rest of the area. Hence, delineation of following 2 categories in felling series identified for this purpose are prescribed.

- ☑ D1 type areas: well-stocked areas, predominantly having coppice crop of third rotation or more and also the areas having mature trees with scanty regeneration, with deep and well drained soil having site quality IVA or above, to the extent of 20 ha in a coupe in one or more patches, which are fit for overwood removal and planting with teak.

  In addition following points shall also be kept under consideration while selecting and delineating these areas.

  - Areas adjoining (in the vicinity of) to successful old plantations.
  - Forests containing scattered teak and its associates indicating potential for good teak growth.
  - Sites in steep slopes and flat plateau and soils containing quartzite / sandstone are to be avoided.

  Hence, the treatment map for areas suitable for teak plantation will indicate steep slopes, eroded areas and water logged and blank areas as unworkable.

☑ D2 type areas: the remaining well stocked areas will be worked under selection system.

E -Type Areas (Blank Areas)

Blanks will be separately shown in the treatment map.

10.11 MARKING RULES AND PRESCRIPTIONS

10.11.1 Marking technique and prescriptions described in the chapter of the Miscellaneous Regulations shall be followed, with modifications, described in the following paragraphs.

10.11.2 Marking shall be carried out under the close supervision of the RFO and under guidance of ACF concerned. DCF shall himself inspect majority of coupes to ensure proper marking and to guard against excessive marking, if any.

10.11.3 The following rules shall be observed strictly for marking in various treatment type areas prescribed in chapter 8:

A Type Areas No tree shall be marked for felling.

B Type Areas

1 All dead and malformed over mature trees, retaining 2 trees / ha as snags and dens for nesting and resting of wildlife.

2. All live high stumps shall be marked.

3. All multiple coppice poles; retaining only one, the most promising / stool, shall be marked.

C Type Areas

1. The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3rd of the crop height and/or to bring down stem number as per the yield table.

2. The dead, dying and malformed poles shall be marked for thinning

3. Unwanted undergrowth interfering or likely to interfere the seed based NR of teak and other valuable species shall be removed.

D Type Areas

D1 (areas suitable for overwood removal)

Mature well stocked forests (to be decided on the basis of critical crop girth) are to be selected for the purpose and overwood from these areas will be cleared to create sufficient openings for growth of teak. For this purpose all except the following categories of teak shall be marked for removal.

i. All young to middle aged fruit bearing trees upto 20 trees per hectare will be retained.

ii. Young middle aged trees of Semal, Khair, Rosewood and superior misc. trees upto 20 trees per hectare uniformly spread over the area will be retained.

iii. No removal of overwood upto 20 m on either side of nalas, streams and riverbanks is to be done.

Only dead trees from such strips shall be removed.

iv. 20 m. wide strip of natural forest is to be retained on all sides of the section and between such section.

D2 (areas suitable for selection working)

1. All Teak *(group1)*, Ain, Bija, Karam, Haldu *(group 2*) and the *Group 3 (listed species)* trees above the harvestable girth and approach class are prescribed to be enumerated in 15 cm girth-classes before marking.
2. All edible fruit bearing species yielding species, such as, *moha, achar, tendu, aonla, sitafal, chinch, bel, etc, and* minor forest produce species such as *kullu, Semal, Salai, etc.* shall be reserved against felling.
3. All dead and malformed trees, retaining 2 trees per hectare, shall be marked for felling. To avoid excessive felling it is prescribed that malformed trees having straight clear bole exceeding 2.5 metre height from ground level shall not be marked for felling.
4. All live high stumps and all but one vigorously growing coppice pole per stool shall be marked for felling.
5. Marking of trees for felling will be limited to only 50% of the enumerated trees over harvestable girth. Trees of seedling origin shall be preferred for retention.
6. Marking is prescribed to proceed from highest girth-class to lower girth-classes; and no tree shall be marked for felling unless silviculturally available.
7. 'Malformed tree': A tree with a badly shaped and defective stem and occupying more space than its future value warrants.

This type of working is also prescribed for the strips left under D1 areas. However, strips along the nalas are not to be worked except for the removal of dead trees.

E Type Areas: Blank Areas- Marking is not prescribed.

10.11.4 CUTBACK OPERATIONS, CLEANING AND THINNING

Cutback operations as prescribed in Chapter 9 shall be carried out in the 2nd year after the main felling in the annual coupe.

Cleaning in the 6th year after main felling in the annual coupes and also in the 6th year after planting in D 1 type areas will be as per prescriptions given in Chapter 9. **(Appendix 10.4).**

10.12 METHODS OF REGENERATION

10.12.1 It will be to facilitate the natural regeneration for maintaining the 'high forest' status of the crop. Therefore, tending of the future crop and rootstock management is to be given preference over plantations. The areas having promising NR and rootstock will be identified, marked and treated as described in chapter 9.

10.12.2 ARTIFICIAL REGENERATION OF TEAK FROM GENETICALLY SUPERIOR STOCK

Artificial plantations of teak however have been prescribed in D1 type areas to maximise productivity of forests from commercial angle. This has particularly been considered essential because forests in the division do not have adequate natural regeneration of teak but performance of the old teak plantations is encouraging. Current coupes of SCI (also some IMP coupes) have been considered for this purpose. A 20 ha patch at an average in such coupes found suitable for growth of teak shall be taken up for creating teak plantations from genetically improved stock.

The Deputy Conservator of Forests, Nagpur will personally select suitable areas to create such plantations in approximately 2500 ha in the plan period (at an average 250 ha per year). The various felling series (Appendix 10.4) under SCI working circle in Deolapar, Ramtek, Parseoni and South Umred ranges are considered suitable for this purpose. This is because firstly, as mentioned above, these are generally the ranges having successful old plantations of teak and secondly past results relating to management of teak in Central India indicate that plantations in dry teak areas like Hingna and Kondhali ranges are not successful. The dry teak areas, that is, majority of the area in Hingna, Narkhed, Kondhali, North Umred are therefore not considered suitable for the foregoing prescriptions.

The felling series provisionally identified for this purpose are:

i. Bandra
ii. Goreghat
iii. Deolapar
iv. Bawanthadi
v. Belda
vi. Chorbaoli
vii. Khubala
viii. Belarpar
ix. Dhamangaon

Planting stock raised from the genetically superior source will be used for artificial regeneration. Teak will be planted at a spacing of 2Mx2M but care shall be taken that no tree which has been retained (as described under paras (i) and (ii) under D1 Type) falls within a distance of 1M.

It is suggested that Old teak plantations as discussed under chapter 12 and the new ones to be raised after over wood removal should be managed to form a uniform system containing various age gradations and such system is intended to supply commercial timber perpetually. Therefore, when sufficient information for both old

plantations regarding past performance of teak and newly established ones regarding their survival is available, the two are to be merged under one working circle in the succeeding working plans. However, new sites for plantations are to be selected in the next rotation.

10.13 CLOSURE TO GRAZING AND FIRE PROTECTION

Protection from fire and grazing is essential for success of natural and artificial regeneration. All annual coupes shall remain closed to grazing and shall be provided strict fire protection till completion of coupe cleaning operations in the 6th year.

10.14 AGENCY FOR EXECUTING WORKS

The annual coupes in the division are traditionally harvested by FLCS. In view of the present guidelines for the joint forest management, harvesting along with other coupe works –CBO as well as rootstock management in understocked areas, may be done through JFMCs. This may need alterations in the area of operation of various FLCS as well as changes in certain rules governing their (FLCS) working. These changes should allow usufruct sharing and benefits of coupe working to the village community. Also, through their respective JFMCs, the villages in general will be entitled for being engaged on the employment generated in the coupe operations. The prescriptions under this chapter and FLCS working need to be dovetailed with those necessary for management and protection of forests through JFMCs. Hence, this aspect is to be covered and elaborated in the village wise micro-plans.

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Chapter 11. The Improvement Working Circle

11.1. GENERAL CONSTITUTION OF THE WORKING CIRCLE

11.1.1. The Improvement Working Circle (IMP) covers 28071.12 hectares comprising 10960.87 ha of Reserved Forests and 17110.25 ha of Protected Forests and forming 16.31% of total forest areas the division.

11.1.2. It includes a bulk of forests under old Improvement and Coppice with Reserve Working Circles of the plan under review**.** It also includes areas of successfully converted crop under the High Forest Working Circle during earlier plans. It mainly comprises forests that need rest for sometime and the pole crop.

11.1.3. This working circle is expected to serve as transition to SCI. Forest areas capable of producing medium to large-sized timber but not considered fit for harvesting due to preponderance of young crop has been included in this working circle.

11.1.4. Following criteria have been used for allocation of compartments to the IMP working circle.

- The compartment should not be critical for protection of topography and in catchments of prominent water bodies.
- Although meeting criteria for SCI areas in regard to density, composition and site quality, compartments do not have harvestable crop or alternatively, have preponderance of pole crop and mixed plantations.
- Compartments having teak and miscellaneous forests of quality IV with more prominent gaps in the canopy.
- The average basal area per hector for the crop in the compartments allotted to this working circle is 7.

Table 11.1 Compartments allocation to IMP Working Circle

Range	Compt.	Dense Forests	Open Forests	Blanks	Grass Lands	Sub--merge	Plantations	Total Area
Deolapar	3	20.7	75.98	11.58	0	0	0	**108.26**
Hingna	8	1142.66	88.00	131.32	0	0	67.32	**1429.30**
Khapa	3	229.95	221.13	0	0	0	0	**451.08**
Kondhali	21	2332.72	1102.57	75.06	0	88.64	5.00	**3603.99**
Kuhi	9	1990.2	18.62	0	0	50	245.91	**2304.73**
Narkher	12	856.65	1239.24	0	0	0	0	**2095.89**
Parseoni	3	1073.2	163.09	0	0	0	10.46	**1246.75**
Ramtek	11	1057.9	482.14	149.2	0	0	85.00	**1774.24**
N/Umred	25	5153.01	1361.59	33.04	8.09	50.18	202.10	**6808.01**
S/Umred	31	6320.69	1741.78	110.67	19.28	26.45	30.00	**8248.87**
Total	**126**	**20177.68**	**6494.14**	**510.87**	**27.37**	**215.27**	**645.79**	**28071.12**
Percent		**71.88**	**23.13**	**1.82**	**0.10**	**0.77**	**2.30**	**100**

11.2. GENERAL CHARACTER OF THE VEGETATION

11.2.1 On the basis of enumeration results the species composition and their girth distribution in forest areas under this working circle is given in **Table 11.2**

Table 11.2 Species and girth distribution in the IMP areas per ha.

Species and girth distribution in the IMP areas per ha.											
	16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-above	Total	B.A. (Sq.m)
Char	2.76	2.02	1.52	0.79	0.47	0.29	0.11	0.05	0.04	**8.06**	**0.17**
Chichwa	0.38	0.16	0.29	0.09	0.07	0.06	0.03	0.03	0.03	**1.13**	**0.03**
Dhaman	0.33	0.27	0.11	0.12	0.06	0.04	0.05	0.00	0.00	**0.98**	**0.02**
Dhawada	5.97	3.43	1.27	0.58	0.61	0.34	0.10	0.04	0.02	**12.36**	**0.19**
Garadi	2.95	1.46	0.39	0.25	0.18	0.03	0.02	0.02	0.01	**5.31**	**0.07**
Haldu	0.47	0.34	0.32	0.30	0.16	0.13	0.03	0.01	0.00	**1.77**	**0.05**
kalam	2.73	1.35	0.77	0.50	0.28	0.22	0.11	0.11	0.05	**6.13**	**0.13**
Kasai	0.07	0.02	0.02	0.01	0.00	0.01	0.01	0.00	0.01	**0.14**	**0.00**
Khair	3.14	2.39	0.91	0.70	0.44	0.30	0.08	0.07	0.10	**8.14**	**0.17**
Kullu	0.32	0.61	0.45	0.16	0.08	0.04	0.01	0.00	0.00	**1.65**	**0.03**
Lendia	9.78	6.53	2.53	0.96	0.25	0.11	0.07	0.05	0.08	**20.36**	**0.26**
Moha	4.93	2.84	0.79	0.32	0.25	0.10	0.07	0.02	0.16	**9.49**	**0.14**
Mokha	0.01	0.01	0.03	0.02	0.02	0.01	0.01	0.00	0.01	**0.11**	**0.01**
Mowai	4.34	1.83	1.53	1.12	0.87	0.58	0.35	0.19	0.17	**10.98**	**0.29**
Palas	22.16	15.74	6.13	2.66	1.31	0.89	0.43	0.25	0.36	**49.93**	**0.78**
Rohan	7.98	3.95	2.25	1.03	0.46	0.27	0.11	0.17	0.08	**16.29**	**0.26**
Salai	0.95	0.59	0.63	0.72	0.51	0.25	0.39	0.18	0.22	**4.44**	**0.20**
Semal	0.10	0.15	0.08	0.04	0.01	0.01	0.01	0.01	0.00	**0.42**	**0.01**
Shisam	0.00	0.01	0.05	0.10	0.08	0.02	0.01	0.00	0.00	**0.26**	**0.01**
Shiwan	0.13	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	**0.15**	**0.00**
Teak	11.84	11.20	7.06	4.43	2.56	1.42	0.75	0.37	0.25	**39.89**	**0.91**
Tendu	23.74	16.57	9.75	5.40	3.21	1.48	0.60	0.43	0.24	**61.41**	**1.15**
Tiwas	0.85	0.25	0.15	0.12	0.04	0.02	0.03	0.01	0.00	**1.46**	**0.02**
Bhirra	1.85	1.31	0.68	0.48	0.32	0.23	0.18	0.07	0.04	**5.16**	**0.12**
Ain	3.82	2.51	1.27	0.84	0.49	0.30	0.16	0.10	0.08	**9.57**	**0.20**
Bija	0.77	0.54	0.47	0.54	0.47	0.31	0.14	0.11	0.00	**3.35**	**0.12**
Behada	0.30	0.39	0.30	0.32	0.22	0.11	0.02	0.02	0.01	**1.67**	**0.05**
Aonla	1.76	1.29	0.64	0.47	0.29	0.19	0.07	0.07	0.05	**4.83**	**0.11**
Biba	1.85	1.61	0.77	0.51	0.37	0.20	0.10	0.02	0.02	**5.45**	**0.11**
Other	7.66	3.51	1.77	1.53	1.14	0.58	0.36	0.25	0.41	**17.21**	**0.41**
Total	**123.94**	**82.88**	**42.91**	**25.13**	**15.24**	**8.54**	**4.40**	**2.63**	**2.42**	**308.08**	**6.02**

11.2.2 The crop consists of mixed type varying from pure teak to pure miscellaneous forests and varies considerably in composition, density and growth. The prominent associates of *Teak are; Saja, Bija, Dhaora, Lendia, Tinsa, Semal, Mowai, Salai, Tendu,*

Rohan, Char, Haldu, Karam, Khair, Bhirra, Bel etc. Proportion of teak is high varying from 20 to 80 percent. The areas are potentially suitable for teak forests and other valuable miscellaneous species. Natural regeneration of common species is present, but its establishment varies, depending upon fire and grazing damage. Natural regeneration is poor for teak as well as for its associates.

11.2.3. The site quality ranges from IVa to IVb. The density of forests varies from 0.4 to 0.8. The crop is young to middle aged with occasional mature trees. Stems in lower girth classes are proportionately higher in number.

11.3 BLOCK AND COMPARTMENTS

11.3.1 Details of the IMP compartments have been given in **(Appendix 11.1)**

11.4. SPECIAL OBJECTS OF MANAGEMENT

11.4.1. The special object of management for this working circle is to improve the existing crops by tending operations and supplementary plantations. Improvement measures aims at nursing back these forests to normalcy.

11.4.1 To check soil erosion and conserve soil moisture, essential for creating conditions conducive for rejuvenation and growth of NR and rootstock.

11.4.2 The hygienic tending and thinning operations are expected to provide small timber, poles and firewood to meet bona fide needs of the local people.

11.5 ANALYSIS AND VALUATION OF THE CROP

11.5.1 **Stock mapping:** The stock mapping has been proposed to be done by the extensive enumeration exercise and crown density mapping through image analysis of satellite imageries as described in para 6.4 of Chapter 6.

11.5.2 **Age and density**: The crop is mostly young to middle with scattered mature trees aged having density 0.4 to 0.6.

11.5.3 Enumeration: Enumeration has been carried out as per systematic line-plots sampling on 600 metre grid lines. The data has been analysed through computerised Inventory Management System.

11.5.4 **Regeneration**: Average numbers of seedlings and saplings per hectare in the IMP areas were found out from regeneration survey which was carried out along with the enumeration of the crop. This analysis has been arranged and given in **Table 11.3.**

Table 11.3. Regeneration recorded in the Improvement Working Circle (per ha)

Range	Seedlings (R1) 0.3–1.0 meter	Saplings (R2) 1.0–3.0 meter	Saplings (R3) > 3.0 meter	Total
Deolapar	396.00	66.67	12.67	**475.33**
Khapa	195.67	244.67	102.00	**542.33**
Hingna	315.38	206.00	33.38	**554.75**
Kondhali	25.87	150.07	106.67	**282.60**
Kuhi	0	145.00	25.00	**170.00**
N/Umred	1.33	330.17	153.83	**485.33**
Narkher	86.25	329.08	78.33	**493.67**
Parsioni	487.67	456.00	303.67	**1247.33**
Ramtek	109.20	172.60	109.20	**391.00**
S/Umred	48.33	58.33	3.33	**110.00**
Total	**133.61**	**225.66**	**94.34**	**453.61**

11.6 SILVICULTURAL SYSTEM

The object of this working circle is to achieve an all classed selection forests.

11.6.1 The good quality dense forests having young to middle aged crop are aimed at to mature as future productive selection forests, if hygienic operation of improvement felling is carried out and adequate growing space is provided to trees of valuable species like Chichwa, Dhaman, Haldu, Kasai, Kullu, Mokha, Semal, Shisam, Shiwan, Tiwas, Beheda and the like, whose population in the stand dynamics is less than 1% shall be retained till they reach the rotation age. Supplementary plantations of suitable species in open forests and forest blanks would result in improvement of stocking. The best suited system of treatment is improvement felling supplemented by tending of naturally generated crop and rootstock along with plantations of suitable species in under stocked areas. The future crop has been visualized to have mixed composition, having ***Teak as 50 percent, and Miscellaneous species as 50 percent in the stocking***.

11.7 HARVESTABLE GIRTH

11.7.1 This working circle aims at improvement of the crop, and therefore, regular harvesting is not visualised in the area. However, for the purpose of managing a few dense patches of over-mature trees the harvestable girth adopted for the SCI areas will be adopted this will also lead to opening of canopy resulting in regeneration of light demander species.

11.7.2 In view to ensure safeguard against future eventualities, only, 50 percent of silviculturily available trees are proposed for harvesting. In case of *Group 3* species, only,

Ain, Bija, Kalam, *dhaora, lendia, rohan, mowai, bhirra, etc.* are proposed for harvesting. The trees which are not likely to survive till the next felling cycle should be removed first.

11.7.3 CHOICE OF SPECIES

11.7.4 The choice of species for retention in order of importance will be *Teak, tiwas, bija, saja, shisham, karam, haldu, siwan, bhirra, dhaora, lendia, salai, mowai, etc.* No fruit trees will be cut.

11.7.5 The choice of species for plantation will depend on the soil suitability is proposed to include *Teak, siwan, maharukh, kinhi, semal, shisham, bija, ain, babool, neem, khair etc*. For fodder grasses, such as, *paonia, marvel and sheda* are proposed. Bamboos are proposed for planting at suitable sites in the entire areas.

11.8 FELLING CYCLE, FELLING SERIES AND ANNUAL COUPES

11.8.1 **Felling cycle**: The entire area in this working circle is proposed to be covered for prescribed treatment in **20 (twenty)** years.

11.8.2 **Felling series and annual coupes**: The entire area of this working circle has been divided into 14 felling series. The area of each felling series is proposed to be further divided into 20 (twenty) annual coupes**. (Appendix 11.2).**

11.8.3 **Regulation of yield**: The treatment is not adapted for yield. The silvicultural tending operations will be regulated by area.

11.9 COUPE DEMARCATION, TREATMENT MAP AND MARKING

11.9.1 The coupe demarcation of annual coupes shall be carried out one year in advance of main working as per prescriptions described in the Chapter of Miscellaneous Regulations.

11.9.2 **Treatment Map** has been provided by GIS cell, Nagpur. This will shows non-workable areas like those having slope more than 25^{o} and a 30m belt on both sides of perennial nallah (the nalas flowing upto January); crops having crown density < 0.4 as well as > 0.4 with a sub class between 0.6 to 0.8 and the forest blanks. Such maps are required to be updated by showing regeneration status manually and such a treatment map shall be cartographically accurate.

11.9.3 **Treatment Prescribed** : The treatment proposed for various treatment type areas marked on treatment map will be, as follows:

A Type Areas (Protection Areas)

They will include-

- ☑ A1 type areas, which have slope more than 25°,
- ☑ A2 type areas, i.e. 30 m wide strip on both sides of streams,
- ☑ A3 type areas, which are susceptible to excessive erosion.

B Type Areas (Under-stocked Areas)

The open forests with root stock as well as without root stock shall be shown in the treatment map.

C Type Areas (pole crop)

Areas with sufficient pole crop of valuable species which can be retained as future crop shall be marked separately.

D Type Areas (Well-stocked Areas)

The well-stocked areas containing comparatively young crop (less number of stems of higher girth class as well as of harvestable girth which is indicated by lower basal area) will be shown in the treatment map to facilitate improvement fellings as well as teak plantation in identified patches. Hence, delineation of following 2 categories is prescribed.

D1 type areas: Dhamna (North Umred) and Karandala (Kuhi Range) felling series only.

Well-stocked areas predominantly having coppice crop of third or more rotations and mature trees with scanty regeneration. Such areas should have deep and well drained soil with site quality IVA or above to the extent of 20 ha in a coupe in one or more patches and which are fit for overwood removal and planting with teak.

In addition following points shall also be kept under consideration while selecting and delineating these areas.

- Areas adjoining (in the vicinity of) to successful old plantations.
- Forests containing scattered teak and its associates indicating potential for good teak growth.
- Sites in steep slopes and flat plateau and soils containing quartzite / sandstone are to be avoided.

Hence, the treatment map for areas suitable for teak plantation shall indicate steep slopes, eroded areas and water logged and blank areas as unworkable.

☑ **D2 type areas**: improvement fellings will be carried out in the remaining well stocked areas containing comparatively young crop.

E -Type Areas (Blank Areas)

Blanks will be separately shown in the treatment map.

11.10 MARKING RULES AND PRESCRIPTIONS

11.10.1 Marking technique and prescriptions described in the Chapter of the Miscellaneous Regulations shall be followed.

11.10.2 Marking shall be carried out under the close supervision of the RFO and under guidance of ACF concerned. DCF shall himself inspect majority of coupes to ensure proper marking and to guard against excessive marking, if any.

11.10.3 The following rules are proposed to be observed strictly for marking in various treatment type areas;

A Type Areas: Protection Areas: No tree shall be marked for felling.

B Type Areas: Under stocked Areas:

1 All dead and malformed over mature trees, retaining 2 trees / ha as snags and dens for nesting and resting of wildlife.

2. All live high stumps shall be marked.
3. All multiple coppice poles; retaining only one, the most promising / stool, shall be marked.

C Type Areas: groups of young poles:

1. The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3rd of the crop height.
2. Unwanted undergrowth interfering or likely to interfere the seed based NR of teak and other valuable species shall be removed.

D Type Areas: Well-stocked Areas:

D1 Type areas: Dhamna (North Umred) and Karandla (Kuhi) felling series only.

Mature well stocked forests (to be decided on the basis of critical crop girth) are to be selected for the purpose and overwood from these areas will be cleared to create sufficient openings for growth of teak. For this purpose all except the following categories of teak shall be marked for removal.

i. All young to middle aged fruit bearing trees upto 20 trees per hectare will be retained.
ii. Young middle aged trees of Semal, Khair, Rosewood and superior misc. trees upto 20 trees per hectare uniformly spread over the area will be retained.
iii. No removal of overwood upto 20 m on either side of nalas, streams and riverbanks is to be done.
Only dead trees from such strips shall be removed.
iv. 20 m. wide strip of natural forest is to be retained on all sides of the section and between such section.

D2 (areas suitable for improvement working).

1. All *Teak, Ain, Bija, Dhaoda, kalam, Bhirra, Garadi, Khair, Mowai, Palas, Rohan, Salai, Biba,* trees are prescribed to be enumerated in 15 cm girth-classes before marking.
2. Trees having population less than 1% will not be felled.
3. All healthy edible fruit bearing species, such as, *moha, achar, tendu, anola, sitafal, chinch, bel* and minor forest produce yielding species *kullu, semal and salai* shall be reserved.
4. All dead and malformed over-mature trees after retaining 2 trees per hectare and all live high stumps shall be marked for felling.
5. Mature trees (above harvestable girth as defined in SCI) that have developed hollowness and show visual sign of decay will be marked for felling if silviculturally available.
6. All but one vigorously, growing coppice pole per stool shall be marked for felling.
7. Marking is prescribed to proceed from highest girth-class to lower girth-classes; and no tree shall be marked for felling unless silviculturally available.

E-Type Areas: Blank Areas- No marking is prescribed

11.11 METHODS OF REGENERATION

Natural regeneration shall be given preference over the plantations. The existing NR and rootstock shall be tended as per prescriptions on rootstock management. Teak plantations however are prescribed in 2 felling series - Dhamna (North Umred) and Karandala (Kuhi) because soil in these areas is very much suited for the growth of teak and supports some good teak plantations of the past.

Planting stock raised from genetically superior source (known and certified source) will be used for artificial regeneration of teak. Prior to that, overwood will be removed from the identified areas to create gaps of appropriate size in the canopy so that growth of teak is facilitated by allowing sufficient sun light to reach the forest floor.

Such plantations are to be merged with the old teak plantations already existing under the same system in due course of time and such system is expected to give yield of the commercial timber on sustained basis.

11.12 CUTBACK OPERATIONS, CLEANING AND THINNING

11.12.1 The cutback operations shall be a part of the coupe working and will be carried out in the 2nd year of coupe working, as prescribed in Chapter 9.

11.12.2 Cleaning in 6th year in the annual coupes will follow the prescriptions as described in Chapter 9. **(Appendix 11.3).**

11.13 CLOSURE TO GRAZING AND FIRE PROTECTION

11.13.1 Protection from fire and grazing is essential for success of natural and artificial regeneration.

11.13.2 All annual coupes will be provided strict fire protection and will remain closed to grazing, till completion of the 6th year cleaning operations.

11.14 AGENCY FOR EXECUTING WORKS

The annual coupes in the division are traditionally harvested by FLCS. In view of the present guidelines for the joint forest management, harvesting along with other coupe works –CBO as well as rootstock management in understocked areas, may be done through JFMCs. This may need alterations in the area of operation of various FLCS as well as changes in certain rules governing their (FLCS) working. These changes should allow usufruct sharing and benefits of coupe working to the village community. Also, through their respective JFMCs, the villages in general will be entitled for being engaged on the employment generated in the coupe operations. The prescriptions under this chapter and FLCS working need to be dovetailed with those necessary for management and protection of forests through JFMCs. Hence, this aspect is to be covered and elaborated in the village wise micro-plans.

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Chapter 12. Old Teak Plantation Working Circle

12.1 General Constitution

12.1.1 Teak and other plantations have been raised in Nagpur Forest Division in the past and as the teak plantations require altogether different treatment and periodical cultural, thinning and tending operations for the optimum commercial production on a sustained basis, old and successful teak plantations are proposed to be dealt with under a separate working circle. These efforts together with creation of new plantations proposed under chapter 10 para 10.12.2 and chapter 11 para 11.11 are expected to result in normal growing stock of even aged forests. However, as the plantations have not been done successively but intermittently, and, as all plantations have not been successful, attempt to achieve normal distribution of age classes has not been made in this working plan. The areas of old teak plantations seem to have been irregularly selected and hence the plantations are found scattered through out the division.

12.1.2 The list of various plantations was compiled by the Nagpur Forest Division for submission before the Supreme Court.**(Appendix 5.6)** This list indicates year wise teak plantations raised from the year 1960 to 1998. The stock maps as indicated in working plan written by Shri Jwala Prasad also show old plantations prior to 1990. Taking this list as the basis, efforts were made to obtain up to date maps of old teak plantations needing attention under this plan. The information about these plantations is given under appendix 5.6 and the range wise abstract is as follows:

Sr No	Range	No of sites in Reserve Forest	Area (in ha)	No of sites in Protected Forest	Area (in ha)	Total Plantation sites	Total Area (in ha)
1	Deolapar	54	2226.13	11	230.14	65	2456.27
2	Ramtek	39	917.97	17	486.00	56	1403.97
3	Parseoni	9	202.00	4	124.00	13	326.00
4	Khapa	1	20.00	3	105.00	4	125.00
5	Hingna	5	145.00	2	33.00	7	178.00
6	Kondhali	3	75.00	2	50.00	5	125.00
7	Kuhi	1	50.00	6	240.00	7	290.00
8	S.Umred	2	30.00	-	--	2	30.00
	Total		**3666.10**		**1268.14**	**159**	**4934.24**

12.1.3 As per the list mentioned above, plantations till the year 1996 were raised in 40595.14 ha. This includes teak plantations of 10,815.88 ha. This information was discussed in the various meetings with the staff of Nagpur division and attempts were also made during the field visits to get the maximum information about old teak plantations in the division. As an outcome, maps of 4934.24 ha of such plantations at 159 locations in 8 ranges were made available. Thus, for the purpose of this chapter, only these teak plantations have been considered. No prescriptions have been given for the remaining plantations because of the lack of information.

Plantations proposed to be raised during the plan period under Selection-cum-Improvement and Improvement working circles (Chapter 10 para 10.12.2 and chapter 11 para 11.11) are, for the purposes of their silvicultural management, also to be included under this working circle during the next revision.

12.1.4 Considering the above situation regarding the lack of clarity about the plantations in the division, it is felt necessary to create database of the old and successful plantations and to begin this work with teak plantations. Teak plantations, which could not be included under this chapter due to the lack of information, shall be identified on the ground and mapped accurately during this plan period. It may be worthwhile to locate and map the plantations with the help of GPS. Nagpur forest division will, with the help of Nagpur Working Plan division, jointly endeavour to reconcile the records and create an accurate database of the successful plantations during the course of implementation of this plan. The teak plantations not included in this working circle due to lack of information shall also be thinned according to the thinning regime prescribed in this chapter.

12.2 General Character of the vegetation

The plantations are located scattered in the various compartments. Separate enumeration of the plantations was not done. The various compartments in which these plantations are located contain the representative forest crop of the particular working circle, which that compartment has been allotted to.

12.3 Blocks and compartments

12.3.1 Details of these plantations have been given in **Appendix 12.1.**

12.4 Special object of Management

To maintain perpetual growth in the plantations throughout their growing phase by carrying out silvicultural thinnings as per the thinning regime prescribed for the purpose.

12.5 Analysis and valuation of the crop

These plantations have been shown on the map generated through GIS.

12.6 SILVICULTURE OF TEAK

12.6.1 Teak (Tectona grandis Linn.f.) belongs to the family Verbenaceae and is mostly distributed in the peninsular parts of India. The first teak plantations popularly known as Conolly's teak plantations were raised in 1846 in the state of Kerala. Teak tree is strong light demander and it requires for its proper development complete overhead as well as fair amount of side ways light. Teak does not tolerate suppressed light at any stage of its life. There is a direct relationship between light and growth, branching and flowering of teak. Single tree or trees bordering the plantations produce profuse branching, but in close stands, flowering occurs only in dominant and co-dominant trees, and is confined to the upper parts which are exposed to bright sunlight; i.e. other trees and lower branches of dominant trees do not produce inflorescence because they do not get direct sunlight. Curtailment of light also delays development of fruits. Seedlings require over 90 per cent light intensity. Saplings are often found growing under the light shade of bamboos, and even to some extent under other trees, but the growth of such plants is generally found to be slower than the plants with complete overhead light. Saplings growing under bamboos endeavor to make their way through but they are often found with their leading shoots damaged or killed. This is because bamboo acts as a 'whip'. Leading shoot of the teak is very intolerant to irritation of any kind.

12.6.2 Teak is capable of thriving on variety of soils and geological formations, but it requires good sub-soil drainage. It produces large and deep root system. At first a long and thick taproot is formed. This may persist or may disappear, but in either case strong lateral roots are produced. Teak is sensitive to frost. Seedlings and coppice-shoots are particularly liable to frost injury. In its natural habitat, however, severe frost seldom occurs. Frost results in poles being killed at the top or down up to the ground level but experiments carried out showed that trees badly damaged by frost were capable, when coppiced, of producing vigorous stool-shoots. Teak is also sensitive to drought. In the abnormal droughts, which occurred from time to time in the Peninsula, it suffered more severely than any other species.

12.6.3 Teak coppices and pollards vigorously. Coppice shoots originate in two ways-

(1) Callus growth that develops inside the bark and between the bark and the wood. In such a development of the coppice shoot, it emerges from the edge of the cut surface. 'Callus shoots' are of adventitious origin.

(2) From the side of the stool below the cut surface, new shoots appear through the bark. 'side shoots', appear to originate from dormant buds.

High coppicing appears to prevent the formation of callus shoots owing to the rapid drying and shrinking of the wood at the cut surface. The shrinking of wood separates bark from it. Also, subject to further confirmation, present evidence seems to show that it is best to coppice teak low shortly before the commencement of vegetative activity (growing period). However, if the felling is required to be done during the season

of rest (that is before the start of the growing season), high felling may be preferred so that the base of the stump will remain alive even if the upper part dies.

12.7 FLOWERING, FRUITING AND SEED SET IN TEAK:

12.7.1 Flowering in teak is always terminal and limited only to sunlit branches. The species is naturally adapted with very low fruit to flower and seed to fruit ratio. Flowers are bisexual. Fruiting is mostly limited to 1-3% and seed filling is limited to 1-2 seeds per drupe. This is basically a complex biological adaptation to procure highly out-crossed seeds. Thus, there are limitations in improving fruit set. There are no significant differences in regard to flowering and fruiting in natural and artificially raised teak.

12.7.2 Most of the early flowers within an inflorescence produce better fruit and seed and thus for teak seed collections meant for genetic trials, fruit harvesting can be limited to first three inter-nodes of the inflorescence. In this way, maximum out-crossed seed can be obtained.

12.7.3 Flowering in teak is of two major types. In the first type, inflorescence is of different age group and different inflorescence matures at different time. In the second type inflorescences are of the same reproductive age and mature simultaneously.

12.7.4 Teak trees have clear male and female functions. Thus, it is important, while managing breeding populations such as CSOs and SSOs, to quantify reproductive output of a clone or a family. This aspect is extremely important as it results in fertility variation within orchards.

12.7.5 Seed emptiness is mainly due to self-pollination that occurs within a crown. A major reason for high abortiveness is due to endosperm related abnormalities. However, this problem is inherent (physio-genetic) and therefore it cannot be overcome.

12.7.6 Synchrony in flowering between clones need to be worked on the basis of number of flowering days overlapping between clones.

12.7.7 Minimum spacement between fruiting trees should be 10Mx10M. Application of nitrate fertilisers for at least 4-5 years (100-250 gms of urea/ plant with 2 waterings) is recommended during pre-monsoon showers. In general, larger inflorescence size leads to exponential increase in pollen production. Pollarding of the main stem results in physiological shock.

12.8 NATURAL REGENERATION OF TEAK

12.8.1 In the moist type of forests, that is, where canopy is complete, teak forms a small proportion of crop alongwith tall well formed and scattered bamboo clumps. This is mainly because the closed canopy does not allow a teak seedling to grow. Natural regeneration of teak is poor or wanting in the dry type areas, where it is found in association with Anogeissus latifolia. The factors affecting natural regeneration are climate, soil, altitude and aspect, germination capacity of the seed, conditions favouring establishment of seedlings and the methods of management. The climate in India, is distinguished into dry

and wet seasons which is beneficial for the regeneration of teak. The seeds shed in drier season soak moisture from the pre-monsoon rains of April and May, get dried before arrival of monsoon and are again soaked in water when monsoon breaks. Because of the natural and alternate soaking and drying in this way, hard seed coat gets broken and seed germination is facilitated.

12.8.2 Physical structure of the soil especially its porosity is responsible for success of natural regeneration. Granite, gneiss and trap formations produce favorable soils. Basalt and sandstone develop adequate porosity in the soil but the humus disintegrates very rapidly in such soils. Teak regeneration does not thrive in laterite soils because humus is leached out rapidly from such soils and also due to their high acidic nature. In metamorphic soils, which are predominantly present in the area, the characteristic of the rock beneath plays an important and decisive role in determining the nature of surviving forests and the future crop. Trap is a natural home of teak and such area are present at many places. Teak grows well when the soil conforms to certain physical and chemical properties and therefore the soil should be tested before taking up teak plantations. Teak prefers slightly basic to neutral soils with high exchangeable calcium and magnesium. It grows well in humus rich sandy loam soils due to plasticity index. Northern and eastern aspects are favourable for teak growth.

12.8.3 In moist deciduous forests, the forest floor is covered with dense undergrowth and therefore prevents the radicle to reach the ground and thus the seedlings fail to establish. The opening of the forest canopy may lead to increase in the growth of grasses and other weeds, which will again prevent establishment of natural regeneration.

12.8.4 In natural forests, the annual ground fire scorches the seeds and helps in natural regeneration. The establishment of teak seedlings depends on sunlight but sudden exposure may cause death of the young seedlings. The drip from the trees also adversely affects the young plants. The early development of strong taproot requires a soft friable soil.

12.8.5 The natural regeneration in teak is better in cooler northern and eastern aspects. Deficiency of soil moisture is one of the hurdles in the establishment of natural regeneration. Weed growth and ground vegetation are the greatest obstacles in the establishment of natural regeneration.

12.8.6 Shoots of the seedlings are killed by frost but stock remains alive and therefore a stronger shoot is formed each season until it is able to rise above the ground level.

12.9 SILVICULTURAL OPERATIONS

12.9.1 The Silvicultural operations are the regular thinnings and the schedule is 10^{th}, 15^{th}, 25^{th}, 35^{th}, 45^{th}, 55^{th} and 65^{th} year of formation of the plantation. The first thinning, that is, in the 10^{th} year is supposed to be mechanical followed by silvicultural thinnings. However, it is seen that the plantations in Nagpur Division have not been thinned in the past and therefore a thinning regime different from the traditional one is required to be

developed. This is also important because sudden and large openings in the canopy due to heavy thinning in old plantations may have adverse effect on growth. Hence, the schedule has been altered accordingly and 1st thinning in plantations except those which are formed in the year 1993 and afterwards will be B grade silvicultural thinning. This will be followed by C grade thinnings every 10th year subsequently till the plantations attain the age of 65 years. In case of plantations raised in 1993 and afterwards, the first thinning, which will be done in the 10th year of its formation, will be mechanical followed by first silvicultural thinning (C grade) in the 15th year and every 10th year subsequently. This schedule is given in **Appendix 12.2.**

(A) MECHANICAL THINNING: Teak is traditionally planted at a spacing of 2m x 2m i.e. 2500 seedlings per hectare and, in ideal conditions, it would have required a thinning at an age of 5 years of its formation. Two mechanical thinnings of removing alternate rows before the start of C (low) grade silvicultural thinning were prescribed earlier. The Indian Forest Record 1957 mentions two mechanical thinnings at the age of 5 and 10 years. It prescribed following standard:

Year	No/ha (for site quality-III)	Spacement
1st year	2500	2m x 2m
5th year	1767 (after 1st Mechanical thinning of removing alternate diagonal)	2 x 2√2 m
10th year	1250 (after 2nd Mechanical thinning of removing alternate diagonal)	2√2 x 2√2 m

It has however been experienced that the teak plantations do not follow the growth in a copybook fashion. The plantation of teak, which is supposed to have survived 100% till its 5th year of its existence, actually contains only 65-75% seedlings. Rest are eliminated in their race for survival. The canopy competition in real sense does not start at this stage. There are limiting factors like moisture availability and root competition. The sigmoid growth curve between Age (on X axis) and Volume (on Y axis) for teak indicates that its growth follows a moderate slope till 10th year and then it picks up and forms a steep curve upto 50 years. Hence, first mechanical thinning at the age of 10 years of the plantation has been prescribed. As a result, the stems will be free from canopy interference and also the poles produced from the thinning operations shall be saleable.
The mechanical thinning will be done by considering a cluster of three poles in diagonals. One of them will be removed. However, if one of the poles in this cluster is absent removal may be differed.

(B) PRESCRIPTIONS FOR SILVICULTURAL THINNINGS

The various operations required for thinning in a teak plantation are summarised below.

1. Stock mapping and delineation of the area of different site quality classes of the plantation to be thinned will be done before actual operations are started.

2. Cleanings to remove undesirable undergrowth which hinders proper growth of planted teak and which may obstruct the thinning work is to precede actual thinning operations. Extent of cleaning as well as the species to be removed is to be decided by the Deputy Conservator of Forests himself. Cleaning should include systematic climber cutting.

3. Sample plots will be laid for detail measurements and total enumeration in such plots to work out entire growing stock (planted as well as naturally regenerated trees) will be carried out girth class wise. Basal area per ha. of such plots shall also be measured. Also average crop diameter shall be calculated.

4. Yield and stand tables will be used to compare girth class wise actual stocking and basal area of the plantation under consideration. If such comparison indicates that basal area measured exceeds that given in the yield table for the same site quality, this would necessitate removal of material to the extent basal area given in the yield table is achieved. What girth classes and their extent to be removed can be ideally found out by comparing actual stocking with the stand table (main crop) for the particular site quality and age.

5. The average crop diameter may be taken as guiding rule to decide the individual trees to be marked for removal, that is, trees below average crop diameter only are to be marked for removal and only when they are silviculturally available. Following order of marking regarding silvicultural availability of a tree shall be maintained.

   - Non-teak coppice trees are first to be marked.
   - Teak coppice trees till all are marked.
   - Non-teak trees of seed origin till all are marked.
   - Trees of Shisham, Bija, Semal and other trees, which are less than 1 % in their stocking in the forests and fruit bearing trees, are not to be marked for felling.
   - Sound teak trees of seed origin to be marked for felling only in the last.

6. (1) As mentioned above, since no tending and thinning have been done in the plantations in the past, the first thinning (B grade) in plantations raised before 1993 will therefore include the removal of the following:

      - Dead, dying, diseased and suppressed trees.
      - Defective, dominated stems and whips.

- Branchy and badly shaped advance growth, which cannot be, or is undesirable to be, pruned.
- Trees having defective stems or crowns, that is, those trees whose crown space is cramped by neighboring trees; those trees whose main stem is forked or has other defects. Such category of trees do not have much promise for future due to above defects and hence they shall be removed.

2. Subsequent thinnings will be done every 10 years after B grade thinning prescribed above and these will be according to prescriptions in paras 1 to 5. In the younger plantations, that is, those formed in the year 1993 and afterwards, however, all the silvicultural thinnings will be according to prescriptions in paras 1 to 5 above.

General guidelines for thinning and description of technical words and operations have been incorporated under miscellaneous regulation.

12.10 Agency of Exploitation: The operations for tending and thinning of teak plantations are highly skilled and require regular monitoring through recording and analysis of growth measurements periodically. The working therefore is proposed to be done strictly through departmental agency.

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Chapter 13. The Rootstock Management and Afforestation (RSM&A) Working Circle

13.1. GENERAL CONSTITUTION OF THE WORKING CIRCLE

13.1.1. The open forest areas having density less than 0.4 and with rootstock and shrubby growth as well as open forests without rootstock, where artificial regeneration appears necessary to restore productivity, are included in this working circle.

13.1.2. The Rootstock ManagementAfforestation Working Circle (AFF) forms about 24.12% of the entire forest areas of the division. It includes 13465.29 ha of the forest areas comprising both the Reserved Forests to the extent of 5138.79 ha and Protected Forests to the extent of 8326.5 ha **(Table 13.1).**

13.1.3. The following criteria has been proposed for allocation of compartments to the AFF Working Circle:

☑ Compartments having large proportion of area under forest blanks.

☑ Compartments having poor quality open forests, which need some tending operations to be productive.

☑ Compartments showing potential for natural regeneration indicated by the presence of good shrubby vegetation.

☑ Average basal area of the crop in the compartments allotted to this working circle is 4 per ha.

Table 13.1 Compartments allocation to RSM & AFF Working Circle

Range	Compt.	Dense Forests	Open Forests	Blanks	Grass Lands	Sub-merge	Plantations	Total Area
Deolapar	25	257.92	761.23	6.72	294.05	59.48	262.56	**1641.96**
Khapa	22	291.96	1596.19	177.96	0.00	0.00	467.91	**2534.02**
Kondhali	9	857.78	199.50	10.59	0.00	0.00	57.00	**1124.87**
Parseoni	25	366.72	2343.97	299.58	0.00	0.00	102.69	**3112.96**
Ramtek	45	1174.27	2998.96	126.52	476.73	0.00	275.00	**5051.48**
Total	**126**	**2948.65**	**7899.85**	**621.37**	**770.78**	**59.48**	**1165.16**	**13465.29**
Percent		**21.90**	**38.67**	**4.62**	**5.72**	**0.44**	**8.65**	**100.00**

13.2. GENERAL CHARACTER OF THE VEGETATION

13.2.1. This working circle generally comprises of degraded open forest areas interspersed with forest blanks or brushwood. The blank areas have dominance of shrubby growth and inferior grasses. The common grasses include *Ghonad, Kusal, Bhurbhusi, Marvel and Sheda*. While *Ghot, Khair, Eruni, Bharati, Ber, etc.* are the common thorny or brushwood species. *Tarota, gokhru and bantulsi* are the common weeds. Lantana has infested in many places. The detailed description of the vegetation of

the areas falling in this Working Circle is dealt with local sub type 'Poor quality teak forest' and 'Degraded scrub forests' of the Chapter II 'The Forest'.

13.2.2. The allotted areas in general are under stocked and open with crop density usually less than 0.4, through patches of better stocked areas are also met with, in some compartments. The PF areas allotted to this WC, especially, those near the habitations, are degraded to the extreme condition and lays bare without any significant tree crop.

13.2.3. The crop consists mainly of scattered trees or patches of open forests. The principal species is Teak and its common associates are *Saja, Dhaora, Bhirra, Rohan, Tendu, Lendia, Salai, Mowai, Char, garari, kalam, khair and Palas, etc. Anjan, Jamun and Ficus* are found along streams **(Table 13.2).**

Table 13.2 Species and girth distribution in the AFF areas per ha

Species and girth distribution in the AFF areas per ha.											
Species	**16-30**	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**136-above**	**Total**	**B.A. (Sq.m)**
Char	2.25	0.99	0.39	0.16	0.04	0.01	0.00	0.00	0.00	**3.85**	0.04
Chichwa	0.12	0.18	0.16	0.04	0.04	0.01	0.03	0.02	0.02	**0.63**	0.02
Dhaman	0.05	0.03	0.03	0.01	0.01	0.00	0.01	0.00	0.00	**0.14**	0.00
Dhawada	6.27	2.92	1.34	0.70	0.29	0.11	0.06	0.05	0.00	**11.74**	0.15
Garadi	2.98	0.71	0.24	0.08	0.07	0.03	0.02	0.00	0.00	**4.13**	0.04
Haldu	0.56	0.20	0.14	0.05	0.03	0.05	0.02	0.02	0.01	**1.08**	0.02
Hirda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**	0.00
kalam	0.70	0.90	0.35	0.13	0.10	0.03	0.02	0.01	0.03	**2.27**	0.04
Kasai	0.02	0.02	0.03	0.02	0.02	0.02	0.00	0.00	0.00	**0.14**	0.01
Khair	2.74	1.28	0.71	0.17	0.05	0.01	0.00	0.00	0.01	**4.98**	0.05
Kullu	0.38	0.25	0.29	0.11	0.08	0.02	0.01	0.03	0.03	**1.21**	0.03
Lendia	13.30	4.35	1.28	0.61	0.27	0.08	0.01	0.05	0.01	**19.97**	0.19
Moha	0.90	0.36	0.40	0.10	0.04	0.05	0.10	0.03	0.23	**2.22**	0.08
Mokha	0.45	0.13	0.09	0.02	0.00	0.00	0.00	0.00	0.00	**0.68**	0.01
Mowai	2.98	1.44	1.00	0.80	0.51	0.33	0.15	0.10	0.07	**7.40**	0.17
Palas	17.69	9.30	4.46	2.00	1.02	0.25	0.23	0.12	0.34	**35.42**	0.53
Rohan	0.45	0.37	0.18	0.17	0.08	0.03	0.05	0.02	0.01	**1.35**	0.03
Salai	0.02	0.04	0.03	0.07	0.08	0.10	0.16	0.09	0.08	**0.67**	0.06
Semal	0.04	0.14	0.07	0.02	0.00	0.00	0.01	0.00	0.01	**0.29**	0.01
Shisam	0.00	0.00	0.06	0.03	0.01	0.00	0.00	0.00	0.00	**0.10**	0.00
Shiwan	0.17	0.01	0.04	0.01	0.00	0.02	0.00	0.00	0.02	**0.25**	0.01
Teak	10.84	7.29	5.75	3.23	2.12	1.13	0.44	0.19	0.13	**31.14**	**0.67**
Tendu	11.13	3.97	1.70	0.84	0.52	0.26	0.24	0.10	0.07	**18.84**	0.26
Tiwas	0.18	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.27**	0.00
Bhirra	3.85	1.49	0.93	0.60	0.41	0.22	0.12	0.03	0.02	**7.66**	0.13
Ain	3.37	1.61	0.92	0.60	0.33	0.15	0.06	0.06	0.04	**7.14**	0.12
Bija	0.26	0.60	0.54	0.27	0.06	0.01	0.00	0.00	0.00	**1.74**	0.03
Behada	0.33	0.19	0.18	0.07	0.05	0.05	0.07	0.00	0.07	**0.99**	0.03
Aonla	0.25	0.18	0.06	0.02	0.02	0.01	0.01	0.00	0.00	**0.55**	0.01
Biba	0.22	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	**0.38**	0.00
Other	12.60	4.74	2.38	1.07	0.54	0.27	0.28	0.20	0.32	**22.39**	0.36
Total	**95.10**	**43.89**	**23.80**	**12.00**	**6.80**	**3.25**	**2.11**	**1.15**	**1.52**	**189.62**	**3.10**

13.2.4. The site quality varies between IVb and IVa. The canopy density of the vegetation varies from 0.0 to 0.4. The crop is generally young with occasional middle aged or mature trees.

13.2.5. Natural regeneration of common species is present but its extent is far from being adequate **(Table 13.3).** Heavy grazing pressure has resulted in compaction of the soil with little sub-soil moisture. Young recruits of species like *Ain, Dhaoda, Bhirra and Teak*, etc. are found in many compartments but die-back without getting established. Due to excessive grazing, fires and refractory nature of areas establishment of NR is very poor and issue of concern for the department .

Table 13.3 Average Regeneration recorded in the Afforestation and Rootstock Management Working Circle. (each hector)

Range	Seedlings (R1) 0.3–1.0 meter	Saplings (R2) 1.0–3.0 meter	Saplings (R3) > 3.0 meter	Total
Deolapar	41.92	35.28	35.20	**112.40**
Hingna	85.44	64.33	0	**149.78**
Khapa	0	260.82	15.91	**276.73**
Kondhali	2.22	16.50	11.30	**30.02**
Kuhi	0	0	0	**0**
N/Umred	0	52.16	15.09	**67.25**
Narkher	0.78	159.73	35.32	**195.83**
Parsioni	320.84	309.52	99.84	**730.20**
Ramtek	10.00	64.80	62.91	**137.71**
S/Umred	74.94	68.06	28.71	**171.71**
Average	**39.42**	**89.22**	**30.87**	**59.51**

13.3. BLOCK AND COMPARTMENTS

13.3.1. Details of the compartments in the working circle have been given in **Appendix 13.1.**

13.4. SPECIAL OBJECTS OF MANAGEMENT

13.4.1. The special objectives of management of this working circle has been proposed, as follows:

- To restore the vegetative cover and of degraded and open areas and increase their productivity by site protection and tending of natural regeneration and rootstock, supplementing it with plantations, wherever, necessary.

- To check the loss of top soil by adopting suitable soil and moisture conservation measures and to increase the water absorption capacity of the soil.
- To provide for the local demands of fuel wood, small timber and poles through active involvement Gram Panchayats and other village institutions.
- To improve the quantity and quality of fodder by planting fodder tree species and introducing superior and high yielding fodder grasses and legumes.

13.4.2. The site protection will induce natural regeneration; and tending operations will lead to improvement and establishment of existing saplings, rootstock and poles. The successful results would provide services of the life-support system and improve the site conditions, along with providing small timber, poles and firewood to meet *bona fide* future needs of the local people, including the *nistar*.

13.5. **ANALYSIS AND VALUATION OF THE CROP**

13.5.1. Stock mapping: The conventional stock mapping has been replaced by the extensive enumeration exercise and crown density mapping through image analysis of satellite imageries as described in Chapter 6.

13.5.2. Age and density: The crop of forest areas under this working circle is mostly young to middle aged with occasional mature trees having density below 0.4.

13.5.3. Enumeration: Most of the areas under this Working Circle belong to the PF, which are mainly barren with little growth. Teak constitutes over 15% of the total stock in the forest. The enumeration of the growing stock has been carried out by the SOFR, Unit, Amaravati and intensity of sampling was nearly 1%. The plots of size 60m x 60m were laid at a distance of 600m x 600m. Analysis of the data collected from these sample plots is given in table 12.2.

13.6. **SILVICULTURAL SYSTEM**

13.6.1. The area will be regenerated with both the Teak miscellaneous tree species and Bamboos. No harvesting is required in this working circle. Tending of existing rootstock viz. the saplings, coppice shoots and poles, supplemented by plantations have been proposed as the main activities in this working circle.

Old plantation, which has failed in the past shall not be taken up again under fresh plantation scheme unless reasons of failure are examined and removed.

13.6.2. In view of vicinity of these areas to habitations, fuel wood and fodder availability will be expanded through plantation of fuel wood and fodder species and by involving people in their management.

13.6.3. The areas of this working circle are, primarily, in bad shape. Inadequate sub-soil moisture, highly compact soil structure and heavy biotic pressure are the main limiting factors for the establishment of seedling in this area. Top soil has been washed away

and as a result vast areas do not have even adequate soil-depth to support tree crop. As a consequence, a large chunk of these areas lay bare without any significant vegetation. Hence, intensive soil and moisture conservation measures and tending of existing rootstock have been proposed to be given priority over plantation.

13.6.4. In addition, concept of *'Ecological Index'* has been proposed for deciding the number if seedlings to be planted per hectare, over the traditional method of planting based only on *soil-depth zonation approach*. Ecological Index of a site gives us an idea as to number of plants which could be sustained per hectare on a particular site depending upon the various locality factors of the area. It is based upon the climatic and edaphic conditions prevailing in the area and is determined by the formula, as follows:

$$\text{Ecological Index} = \frac{P \times D}{Tr \times EPT}$$

Where
P = *Annual precipitation in mm.*
D = *Number of rainy days in a year.*
Tr = *Range of maximum temperature averages.*
EPT = *Potential evapo-transpiration in mm.*

13.6.5. There is no need for planting more seedlings per ha than those could be sustained on a particular site. The emphasis is to grow the optimum number of seedlings per ha, which should grow into a healthy future stock with little mortality. Ecological Index for these areas is proposed to calculate on the basis of data at *Nagpur station* to determine the number seedlings to be planted per hectare in these areas. A sample calculation of the Ecological index has been shown in **Appendix 13.2.**

13.7. **CHOICE OF SPECIES**

13.7.1. Order of priority among desirable species for retention is prescribed as: *Teak, Tiwas, Saja, Bija, Karam, Haldu, Bhirra, Dhaora, Shisham, Khair, Siwan, Rohan, Salai, Mowai, Dhaman, Lendia, Semal, Kulu, etc.*

13.7.2. Valuable local species suitable for the site and favoured by the local village communities will be preferred in plantations. *Teak, Shisham, Khair, Siwan, Sisoo, Siris, Chichwa, Karanj, Ain, Bija, Dhaora, Aonla, Chinch, Neem, Maharukh, karak, semal Sitaphal, etc.* and bamboos should be considered among the recommended species. In poorly drained areas Arjun, Babul, Jamun and Ain shall be preferred. Seedlings of edible fruit-yielding forest species may constitute up to 20 percent and seedlings of medicinal plants up to 5 percent of the stock. Two stakes per hectare of suitable species such as *Ficus* spp. should also be used in plantations. An officer not below the rank of Assistant Conservator of Forests should approve the final choice of species. The broad information of the different species growing in different types of soil conditions is given in **Appendix 13.3** as different species show their preference for the particular soil.

13.7.3. Mixed species plantations will include fairly good proportion of fodder and firewood yielding species, like, *Anjan, Neem, Sissoo, Ficus, babul, Gular, Pakar, Maharukh, Kinhi, Siwan, Karanj, Siris, Sitaphal, etc*.

13.7.4. Contour trenches are proposed to be sown with seeds of *Sheda, Paonia, Marvel and Stylo hemata.*

13.8. TREATMENT CYCLE, SERIES AND ANNUAL COUPES

13.8.1. Treatment period: The entire area of this working circle will be covered in a period of 20 (twenty) years.

13.8.2. Treatment series and annual coupes: The entire area of this working circle has been divided into 9 treatment series. Each treatment series has been further divided into 20 (twenty) annual coupes. Details are provided in the **Appendix 13.4**.

13.8.3. Regulation of yield: No yield is prescribed for this working circle. The treatment will be regulated by area.

13.9. DEMARCATION AND TREATMENT PRESCRIPTIONS

13.9.1. The coupe demarcation, preparation of treatment maps and marking will abide by the prescriptions mentioned in the chapter of Miscellaneous Regulations.

13.9.2. The main annual coupes shall be demarcated one year in advance along with coupes due for Cleaning and Thinning. The coupe shall be divided into four sections, if necessary, to effectively control the various operations.

13.9.3. Treatment Map: It has been provided by GIS cell, Nagpur. This shows non-workable areas like those having slope more than 45°, 30m belt on both sides of perennial nallah (the one flowing up to January); crops having density < 0.4 as well as > 0.4 and forest blanks. Such maps are required to be updated by showing regeneration status manually and such a treatment map shall be cartographically accurate.

13.9.4. Treatment Prescribed: Action Plan shall be prepared for each working coupe on the basis of treatment prescribed for various *Treatment-types areas* marked on the treatment map and got it approved by the competent authority, well before the start of main coupe operations. The treatment proposed for various treatment-type areas marked on treatment map are proposed, as follows:

A Type Areas (Protection Areas)

They will include-

- ☑ A1 type areas, which have slope more than 25°,
- ☑ A2 type areas, i.e. 30 m wide strip on both sides of streams,
- ☑ A3 type areas, which are susceptible to excessive erosion.

B Type Areas (Under-stocked Areas)

- ☑ The open forests with root stock as well as without root stock shall be shown in the treatment map.
- ☑ The areas which were earlier planted but the plantations have failed.

C Type Areas (pole crop)

Areas with sufficient pole crop of valuable species which can be retained as future crop shall be marked separately.

D - Type Areas: Well-stocked Areas

Well stocked areas shall be separately shown in the treatment map.

E - Type Areas: Blank Areas

Blanks will be separately shown in the treatment map.

Extent of plantation: Generally it will be around 400 ha. for the working circle but more areas may be undertaken if more funds are available.

13.10. MARKING RULES AND PRESCRIPTIONS

13.10.1. Marking technique and prescriptions described in the Chapter of the Miscellaneous Regulations shall be followed, with modifications, proposed in the following paragraphs.

13.10.2. Marking shall be carried out under the close supervision of the RFO and under guidance of ACF concerned. DCF shall himself inspect majority of coupes to ensure proper marking and to guard against excessive marking, if any.

13.10.3. The following rules shall be observed strictly for marking the trees for felling in various treatment type areas, prescribed in Chapter 9;

A- Type Areas: Protection Areas:

1. No tree shall be marked for felling.
2. Stump planting of Neem and Shishoo as well as seed sowing of Neem and Maharukh is prescribed.

B - Type Areas: Under stocked Areas:

1 No standing tree shall be marked for felling except dead and wind fallen trees retaining at least 2 trees/ha.

2. All live high stumps shall be marked.
3. All but one, the most promising, multiple coppice poles per stool shall be marked for felling.
4. Plantations in the areas which do not contain sufficient natural regeneration will be done as per the suitability of species described under para 13.7 and as given in the appendix 13.3.

In case of old plantations which have failed, they will be covered under fresh plantation scheme only after the factors responsible for the past failures have been examined and it is found that those factors has now been eliminated.

C -Type Areas: groups of young poles:

1. The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3rd of the crop height. Poles of seedling origin shall be preferred for retention over the poles of coppice origin.
2. The dead, dying and malformed poles shall be marked for thinning.
3. Multiple poles shall be thinned to one, the most promising one, per stool.

D - Type Areas: Well-stocked Areas:

1. All dead, hallow and malformed trees, with visual signs of decay, shall be marked for felling but 2 such trees per hectare shall be retained.
2. All live high stumps shall be cut back to the ground level.
3. All but one (the most promising one) coppice pole per stool in multiple coppice teak crops shall be marked for felling.

13.11. METHODS OF REGENERATION

13.11.1. Tending of Natural Regeneration and existing rootstock is prescribed to be given preference over plantations. The areas having promising NR and rootstock patches shall be identified and marked on the treatment map. The treatment, as prescribed under para 9.10 in *Chapter 9,* shall be given to such areas. Tending operations as prescribed for natural regeneration in the D-type areas and rootstock management in the B1-type areas will be taken up with the coupe operations.

13.11.2. Soil and moisture conservation works in the areas put under this working circle will be done as prescribed in the relevant paras under Miscellaneous Regulations and in accordance with specific guidelines issued from time to time in this regard. Hence, no specific quantum of such works has been prescribed. Such quantum of work may also be dependent on the fund availability.

13.11.3. Plantations shall be taken in the B2-type and the E-type areas (but not in natural blanks wherein geology, soil and water regime does not support tree growth) and only in those sites, which have good soil depth and are well drained. The plantations raised in the under stocked areas of Narkehd, Kondhali, Hingna, South and North Umred and Kuhi range in the past are failure. Hence, new sites in these ranges must be selected very carefully. Extensive grazing pressure coupled with little soil depth in these areas may result in failures in future as well. Most of the understocked areas of these ranges have therefore been included under pastures and prescriptions in that regard have been separately given under Chapter 15. Only root stock management and complete protection from grazing in the remaining areas of these ranges under this working circle is therefore prescribed.

13.12 CLOSURE TO GRAZING AND FIRE PROTECTION

13.12.1 Protection from fire and grazing is essential for success of natural and artificial regeneration.

13.12.2 All annual coupes will be provided strict fire protection and will remain closed to grazing till the seedlings reach a minimum height of 10 feet.

13.13 AGENCY OF IMPLEMENTATION: The works under this working circle are to be entrusted to JFMCs

It is therefore suggested that the areas falling under the various felling series of this working circle may be assigned to various villages which willingly form the JFMCs. Hence, the annual coupes may be treated as the area available for assignment to nearest village. The field staff will endeavour to facilitate formation of JFMCs prior to taking up of work in that coupe. The removal of material from C and D type areas of that coupe as well as employment generated through labour requirement on those activities and those in A and B areas should form the direct benefit to members of JFMCs. Besides, the JFMCs should also take full responsibility of protection of plantations to be raised in B type areas and will be entitled proportionate remuneration available for this item in the estimate. The choice of species for plantation will be need based locally and will be decided through PRA.

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Chapter 14. Protection and Catchment Area Management (P&CAM) Working Circle

14.1 GENERAL CONSTITUTION OF THE WORKING CIRCLE

This working circle is generally for insuring ecological and environmental security hence it is proposed to include the forest areas an steep slopes, falling in the catchments of various irrigation projects and those in area of Nagpur City, having forest catchments area more than 500 ha. It extends over to 17540.18 ha of forest areas, comprising of 14442.51 ha as the Reserved Forests and 3097.67 ha as the Protected Forests, forming 10.19 percent of total forest area of the division.

Protection and soil conservation treatment in these forests is necessary for site protection, preserving the steep and precipitous slopes and reducing silt load to the major dams or water bodies in the division.

Following criteria have been proposed for the allocation of forest areas or compartments to this working circle:

- ☑ Forest areas/compartments having more than half of its areas on the steep slope or in the stream buffer.
- ☑ Forest areas/compartments close to and in the catchments the major dams and water bodies in the Nagpur district.
- ☑ Forest areas/compartments critically close to the major dams and water bodies, thereby, necessitating their protection.

Table 14.1 Compartments allocation to P & CAM Working Circle

Range	Compt.	Dense Forests	Open Forests	Blanks	Grass Lands	Sub--merge	Plantations	Total Area
Deolapar	10	2266.05	147.74	0	0	0	95.73	**2509.52**
Hingna	12	1541.53	168.1	36.41	51.47	0	36.26	**1833.77**
Khapa	2	32.37	191.55	0	0	2.02	135	**360.94**
Kondhali	3	507.6	291.81	7.31	0	0	10	**816.72**
S'Hills	11	67.41	0	0	0	0	2640.45	**2707.86**
Narkher	6	559.26	240.17	0	0	0	50	**849.43**
Parseoni	22	3599.22	375.05	93.4	0	247.15	461	**4775.82**
Ramtek	8	1655.95	0	0	0	0	0	**1655.95**
N/Umred	5	34.34	613.43	128.28	0	0	0	**776.05**
S/Umred	4	1024.68	142.18	0	0	0	87.26	**1254.12**
Total	**83**	**11288.41**	**2170.03**	**265.4**	**51.47**	**249.17**	**3515.7**	**17540.18**
Percent		**64.36**	**12.37**	**1.51**	**0.29**	**1.42**	**20.04**	**100.00**

14.2 GENERAL CHARACTER OF THE VEGETATION

The forests composition varies from pure teak to the mixed crop having high proportion of Teak. The common associates of teak are Saja, Dhaora, Tiwas, Lendia, Tendu, Moha, Bhirra, Mowai, Salai, Rohan, Shisham, Aonla, Achar, Kulu, Semal and Khair. Majority of the area supports stunted tree crop as per the details mentioned in the local subtype Poor quality teak forest and Degraded scrub forest in chapter II. The PF included in this circle is mainly open with little or no vegetation. The basal area stocking exhibits that it has a good forest at many places.

On the basis of enumeration results the species composition and their girth distribution in forest areas under this working circle is given in Table 14.2.

Table 14.2 Species and girth distribution in the PRO (areas per ha)

Species	Stems Per Hectare in girth - classes (GBH range in centimeter)										
	16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-above	Total	B.A. (Sq.m)
Char	9.55	7.74	4.63	2.80	1.67	0.65	0.31	0.18	0.04	**27.56**	0.54
Chichwa	2.24	2.33	1.37	0.91	0.43	0.21	0.13	0.02	0.09	**7.74**	0.17
Dhaman	0.46	0.73	0.41	0.18	0.17	0.13	0.06	0.04	0.04	**2.21**	0.06
Dhawada	6.92	3.98	1.39	0.73	0.23	0.12	0.12	0.02	0.01	**13.51**	0.17
Garadi	4.45	2.53	0.54	0.41	0.32	0.18	0.10	0.03	0.02	**8.58**	0.12
Haldu	7.13	4.62	1.87	1.20	0.56	0.29	0.12	0.03	0.02	**15.82**	0.24
Hirda	0.07	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.02	**0.18**	0.01
kalam	7.76	4.76	2.14	1.73	0.94	0.55	0.22	0.04	0.03	**18.17**	0.33
Kasai	0.12	0.11	0.06	0.02	0.00	0.02	0.01	0.00	0.01	**0.35**	0.01
Khair	1.89	1.94	1.25	0.80	0.49	0.21	0.18	0.00	0.06	**6.82**	0.16
Kullu	7.28	7.35	4.23	2.25	0.83	0.27	0.13	0.03	0.02	**22.38**	0.38
Lendia	6.86	5.64	2.18	0.97	0.65	0.22	0.11	0.01	0.09	**16.72**	0.26
Moha	17.39	7.88	2.02	0.74	0.20	0.11	0.05	0.01	0.00	**28.41**	0.26
Mokha	1.35	1.12	0.78	0.47	0.24	0.16	0.21	0.07	0.07	**4.48**	0.12
Mowai	4.22	1.33	0.81	0.46	0.44	0.29	0.19	0.09	0.17	**7.99**	0.17
Palas	60.71	40.84	15.01	5.68	2.89	1.58	0.83	0.38	0.69	**128.59**	1.79
Rohan	9.07	6.37	3.84	1.81	1.07	0.55	0.23	0.07	0.11	**23.11**	0.41
Salai	2.98	3.25	3.26	2.55	1.50	1.28	0.61	0.29	0.18	**15.89**	0.53
Semal	0.17	0.31	0.63	0.70	0.79	0.68	0.73	0.32	0.20	**4.53**	0.29
Shisam	0.25	0.56	0.27	0.28	0.18	0.17	0.12	0.07	0.07	**1.97**	0.08
Shiwan	0.22	0.11	0.16	0.06	0.04	0.07	0.00	0.01	0.01	**0.68**	0.02
Teak	3.03	3.43	2.50	1.72	1.16	0.57	0.46	0.17	0.36	**13.38**	0.40
Tendu	40.88	26.96	14.94	9.32	5.79	3.46	1.92	0.94	0.57	**104.79**	2.15
Tiwas	10.40	3.09	1.31	1.09	0.68	0.36	0.17	0.13	0.14	**17.36**	0.27
Bhirra	2.77	2.41	1.43	0.77	0.49	0.26	0.16	0.06	0.03	**8.39**	0.18
Ain	13.43	7.09	2.62	2.36	1.12	0.52	0.16	0.08	0.06	**27.44**	0.42
Bija	4.86	3.76	1.76	1.28	0.76	0.46	0.16	0.04	0.01	**13.10**	0.25
Behada	1.36	0.56	0.35	0.21	0.11	0.08	0.07	0.03	0.00	**2.77**	0.05
Aonla	7.61	7.53	3.72	2.65	1.79	0.90	0.57	0.29	0.34	**25.39**	0.62
Biba	8.91	5.39	3.28	2.26	1.48	0.84	0.40	0.22	0.10	**22.89**	0.49
Other	4.66	6.72	5.85	4.47	3.14	2.00	0.78	0.46	0.21	**28.29**	0.89
Total	**249.00**	**170.46**	**84.62**	**50.88**	**30.17**	**17.20**	**9.28**	**4.14**	**3.77**	**619.51**	**11.84**

The site quality of the crop varies from IV to III. The quality is generally IVb in the upper slopes and IVa in the lower slopes grading to III on plains, along streams and valleys. The density of crop generally varies from 0.2 to 0.8, having well stocked patches as well as under stocked and open areas.

Natural regeneration of common species is present, but their establishment vary with damage from grazing and fire. The coppice reproduction of teak is found in the catchments of water bodies and dams, however, its growth is malformed and stunted due to excessive grazing pressure and repeated hacking by the local people.(Table 13.3)

Table 14.3. Average Regeneration recorded in the Protection and Catchment Area Management Working Circle (each hector)

Range	Seedlings (R1) 0.3–1.0 meter	Saplings (R2) 1.0–3.0 meter	Saplings (R3) > 3.0 meter	Total
Deolapar	712.80	218.70	154.10	**1085.60**
Hingna	168.80	133.60	24.40	**294.30**
Khapa	150.00	297.00	12.50	**459.50**
Narkher	79.67	466.00	238.00	**783.67**
Parsioni	0	100.05	16.00	**116.05**
Ramtek	191.38	498.63	444.88	**1134.88**
S/Umred	200.00	234.67	203.67	**638.33**
Average	**214.66**	**278.38**	**156.22**	**644.62**

14.3. BLOCKS AND COMPARTMENTS

14.3.1 The total area allotted to this working circle has been constituted into Felling series with 16 annual coupes each. For effective management, the forest catchment of each irrigation project has been taken as a complete unit. The area is divided into 9 Felling series.

The details of the compartments included in this working circle has been provided in the **(Appendix 14.1).**

14.4. SPECIAL OBJECTS OF MANAGEMENT

1. The dams and water bodies are the life line of Nagpur district. They play a crucial role in the development and well being of the people of this tract. To check the soil erosion and to arrest the run off water by implementing soil and water conservation measures in the forest catchments would help increase longevity of these water bodies

2. The special object of management of P&CAM areas is the protection of fragile forest sites and to prevent the siltation of the dams and water bodies by checking the soil erosion in the forest catchments through soil and water conservation measures.

3. To preserve and increase the vegetal cover and to help enhance water regime of the forest tracts.

4. To develop and optimise the natural biodiversity, wildlife and scenic potential of these areas to cater to the nature and wildlife conservation and education as well as eco-tourism needs of the people of this region.

14.5. ANALYSIS AND VALUATION OF THE CROP

Stock mapping: The conventional stock mapping has been replaced by the extensive enumeration exercise and crown density mapping through image analysis of satellite imageries as described in Chapter 6.

Age and density: The crop is mostly middle aged with scattered patches of mature and young crop. The density of the crop varies from 0.2 to 0.6 having fair share of open and dense patches. The dense areas make a significant part of the crop.

Enumeration: Enumeration has been carried out by SOFR, Amravati, in accordance with the systematic line-plot sampling on 600M x 600M grid, as in practice in the Forest Department. Analysis has been done by Inventory Data Management System, in vogue, in the circle. The sampling intensity is about 1%.

14.6. METHOD OF TREATMENT

The forest areas allotted to this working circle are those which fall in the catchments areas of various irrigation projects irrespective of its crop consideration so the allotted areas are well-stocked in patches as well as under stocked and open in others. On the pattern of watershed management approach viz. ridge to base in systematic steps; soil and moisture conservation works along with the afforestation have been proposed to prevent further soil erosion, siltation of reservoirs and to enhance the vegetation cover and ground water table. The forest areas falling in the catchments of each irrigation project or water body are included in this working circle has been proposed to be treated as a complete unit on the basis of watershed management approach. For convenience of management catchments of each water body is further proposed to be divided into Management series of 16 annual management units on the watershed basis viz. starting from ridge ending up to touching the water bodies.

Table 14.2 tabulating the girth wise and species wise compartment of this working circle shows that the area allotted to the working circle has a good forest, with a basal area/hector equal to 11.84, which match favourably with the area allotted to selection cum Improvement working circle. Hence a preservation approach to these areas has not been prescribed. Conservation aspect of management for these forests has been envisaged. The area will therefore be exploited as a regular working circle. This will promote openings in the canopy to facilitate regeneration of light demander species. The removal will be according to the formula worked out below.

Yield calculation: A simplified method of yield calculation given here is the one adopted from Indian Forest Record for the selection forests of India (appendix 14.2). The following is the mathematical calculation:

1. Let X be the number of trees in the oldest girth class that will survive to reach exploitable size.

n= number of years a tree will take to pass though penultimate girth class i.e. (below exploitable girth class)

Then the number of trees annually become exploitable over the whole area will be x / n trees

2. If the felling cycle is of r years, then the number of trees which annually become exploitable in each coupe will be x /n/ r

And if r=n then

x /n/ r

3. Consequently if x/n trees are felled from the stock of exploitable trees, the trees, which must always be standing on the area will be-

$N \times \frac{x}{n} = x/n$ in the first coupe,

$\frac{(n-1) \times x/n}{n}$ in the second coupe

and so on, i. e.,

o in n^{th} coupe

= (x/r x n/2) – (x/2) for the whole forests.

4. The exploitable girth is 120 cm. and above and it takes 16 years for the penultimate class to reach to exploitable class. Hence, 16 coupes have been iaid by taking the rotation as 16 years. x is equal to 4.14 trees/ hector. Annually 2.07 /ha. i.e. two trees/ hector above exploitable girth will therefore be removed. Appendix 14.2. shows the coupes of this working circle.

14.7 TREATMENT CYCLE, TREATMENT SERIES AND ANNUAL COUPES

14.7.1 Treatment cycle: The entire area is proposed to be treated in 16 year period. **(Appendix 14.2).**

14.7.2 Treatment series and annual coupes: The area of this working circle is comprises of catchments of various water bodies. The catchments of the various water bodies are proposed to be considered as independent unit for management. Each unit is divided into 16 annual units of manageable size preferably matching the size of the compartment.

Annual coupes for felling are laid in areas, which form indirect catchment only. No coupe and hence no felling in the direct catchment areas will be done.

14.8 DEMARCATION, TREATMENT MAP AND MARKING

14.8.1 The coupe demarcation, preparation of treatment maps and marking will abide by the prescriptions mentioned in the chapter of Miscellaneous Regulations.

14.8.2 The main annual coupes shall be demarcated one year in advance along with coupes due for *Cleaning and Thinning*. The coupe shall be divided into four sections, if necessary, to effectively control the various operations.

14.8.3 Treatment Map It has been provided by GIS cell as.. This shows non-workable areas like those having slope more than 45 ^{o}, 30 m. belt on both sides of perennial nallah (the one flowing upto January); crops having density < 0.4 as well as > 0.4 and forest blanks. Such maps are required to be updated by showing regeneration status manually and such a treatment map shall be cartographically accurate.

14.8.4 Treatment Prescribed : The treatment proposed for various treatment-type areas marked on treatment map shall be, as follows:

1. A Type Areas (Protection Areas)

They will include-

A1 type areas, which have slope more than 25°,

A2 type areas, i.e. 30 m wide strip on both sides of streams,

A3 type areas, which are susceptible to excessive erosion.

Areas forming catchments of reservoirs.

A Type areas

B Type Areas (Under-stocked Areas)

The open forests with root stock as well as without root stock shall be shown in the treatment map.

C Type Areas (pole crop)

Areas with sufficient pole crop of valuable species which can be retained as future crop shall be marked separately.

D - Type Areas: Well-stocked Areas

Well stocked areas shall be separately shown in the treatment map.

E - Type Areas: Blank Areas

Blanks will be separately shown in the treatment map.

14.9 MARKING RULES AND PRESCRIPTIONS

14.9.1 Marking technique and prescriptions described in the Chapter of the Miscellaneous Regulations shall be followed, with modifications, described in the following paragraphs.

Marking shall be carried out under the close supervision of the RFO and under guidance of ACF concerned. DCF shall himself inspect majority of coupes to ensure proper marking and to guard against excessive marking, if any.

The following rules shall be observed strictly for marking in various treatment type areas prescribed in the Chapter 8;

A Type Areas: Protection Areas: No tree shall be marked for felling.

Soil and moisture conservation works shall be taken up extensively.

B Type Areas:

1 Only dead and malformed over mature teak trees, retaining 2 trees / ha as snags and dens for nesting and resting of wildlife.

2. (i) Live high stumps will be marked for felling and for facilitating good coppice growth.

(ii) Multiple coppice poles except the most promising one will be marked for felling.

(iii) Growth of seedlings/ saplings of seed origin will be encouraged by soil working, weeding etc. as usual.

3. The areas devoid of NR and rootstock will be covered under plantation of species suitable for soil and water conservation. Such plantations will be carried out only in understocked areas of direct catchment. General plantation guidelines (guidelines for regeneration given under miscellaneous regulations and relevant prescriptions under RSM & A working circle will be followed.

C Type Areas: groups of young poles:

The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3rd of the crop height. Care should be taken to remove the poles of coppice origin first while retaining the poles of seedling origin.

D Type Areas: Well-stocked Areas: Enumeration of trees above exploitable girth will be done as in case of SCI but only two trees per ha as prescribed under para 14.4 will be marked for felling.

Coupes for felling have been laid only in areas of indirect catchment. No felling in direct catchment is prescribed.

E Type Areas: Blank Areas- Marking is not prescribed.

14.10 METHODS OF REGENERATION

14.10.1 Tending of NR and rootstock management as prescribed in Chapter 9 will be given preference over plantations.

14.10.2 The plantation will be restricted to the suitable sites under B2 and E type (not natural blanks) areas and were deep well drained soil if found. Seed sowing of Neem and Chandan in bushes will be done. In addition seedlings of Wad, Pimpal, Umber and Pimperan will be planted.

14.10.3 Since these areas fall in the water shed of medium of major arrigation project it will required a catchment area treatment, where the plantation is the most important

activity. Usually funds are provided by the user agency at the time of forest and environment clearance. In absence of any provision, a scheme under interpreted water shed development will be preferred for treating these areas.

14.10.4 Each water body / reservoir is a unique ecological site having endowed with varied and rich biodiversity as well as natural and scenic beauty. Due to proximity of water there is a great diversity of flora and fauna around these water bodies as well as along the water courses. These forest areas also support a substantial number of NWFP species, which are of great significance for the livelihood needs of the local people. Therefore, these sites are ideally suitable for developing Ecological Centres (Eco-centres) for purpose of disseminating information, generating sensitivity and developing understanding of the complex issues and concerns associated with sustainable forestry, wildlife conservation and environment conservation. These Eco-centres will cater to the eco-tourism needs of the people of this region and will, in addition, open up employment opportunities and new means of livelihood for local people. Involvement of local people and NGOs in development and management of these areas as focal points of nature interpretation and eco-tourism is crucial and will pave the way to generate good will about forests and wildlife in the local communities.

14.11 GRAZING CLOSURE, FIRE PROTECTION AND OTHER REGULATIONS

Protection from fire and grazing is essential for success of natural and artificial regeneration. Grazing closure will be enforced in the entire A -type areas. The entire PRT areas will be provided the Class-I fire protection.

All annual coupes will remain closed to grazing till completion of the sixth-year cleaning operations and provided strict fire protection.

These areas are proposed to receive strict protection from grazing and fire and unwanted human interference.

Five-year protection from the plantation year will be provided to all plantations.

No new roads will be constructed in the P&CAM areas. Cross-drains at appropriate interval should be maintained.

14.12 Agency for executing works

The areas allotted to this working circle may be generally away from villages. Besides only conservative felling and some planting is prescribed. Hence, these areas may more suitably be attended to through departmental agency. However, JFMCs coming forward voluntarily may be associated in executing various works.

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CHAPTER 15. GRASS AND FODDER RESOURCES MANAGEMENT WORKING CIRCLE

15.1 General Constitution

15.1.1 The forests included under this working circle are-

i. Areas under Pasture Working Circle in the previous plan. (Total area 2079.75 ha)

ii. Protected forests of Narkhed, Kondhali, Hingna, North Umred, South Umred and Kuhi ranges (with a few adjoining RF patches), which were previously under Reafforestation and soil conservation working circle. (Total area 28051.75 ha)

iii. Areas of the grass birs. (Total area 10748.92ha)

Hence, the total areas under this working circle are 40880.47 ha.

The protected forests mentioned above have been transferred to this working circle because they are highly degraded and are burdened with heavy grazing pressure. Plantations in the past have failed in these ranges. Rotational grazing along with the protection to the site and soil and moisture works are expected to improve the site. Besides these efforts may ease pressure on the better quality forests in these ranges.

There are 37 identified grass birs with an area of 6900.23 ha which are put to auction every year. However, when this area is compared with the grass bir area as given in appendix 15.1, the discrepancy in the area is apparent and also there is not much of difference on the ground between pasture and grass bir areas. Year wise production of grasses is as follows:

Year	MT	Rs	Year	MT	Rs
1990-91	90.80	97006/-	1997-98	45.00	64500/-
1991-92	104.00	115050/-	1998-99	109.00	160455/-
1992-93	36.80	44226/-	1999-2000	103.00	154975/-
1993-94	165.50	205343/-	2000-01	45.00	71366/-
1994-95	117.00	137744/-	2001-02	--	--
1995-96	--	--	2002-03	16.00	24300/-
1996-97	17.00	22200/-			

The above grass birs are put to auction every year but the above figures show that the results are very discouraging. Enquiries with the staff during the field visits reveal that a few grass birs are purchased during the auction only for getting unhindered access for grazing.

Besides the soil and rainfall factors (which promote growth of species), such areas are put under this working circle because of their closeness and convenient location adjoining to villages. By this yardstick, all the Zudapi jungle areas are to be generally considered for their management according to prescriptions given under this chapter. Such areas presently stand to be 14516.74 ha but no other details including composition and character of the crop in these areas are as yet collected. Also many of such areas have been covered under compensatory afforestation scheme to raise miscellaneous plantations. However, the various ecological and local factors obtained in the Zudapi jungles make a case for fodder resource management and regulation therein.

15.1.2 The extent of area allotted to this working circle is tabulated below:

Table 15.1 Compartments and Area allocation to G & FRM Working Circle (in ha)

Range	Compt.	Dense Forests	Open Forests	Blanks	Grass Lands	Sub--merge	Plantations	Total Area
Hingna	33	2005.67	106.26	896.25	164.62	0	220.61	**3393.39**
Kondhali	76	1373.59	5299.51	603.75	136.61	0	119.0	**7532.46**
Kuhi	33	1267.60	1506.10	466.26	686.27	1.17	1003.38	**4930.78**
Narkher	64	1458.72	5630.30	2.81	0	0	479.21	**7571.04**
Parseoni	1	50.03	0	0	0	0	0	**50.03**
Ramtek	1	0	0	0	196.34	0	80	**196.34**
N/Umred	59	1513.57	6347.34	735.63	1257.67	77.7	624.32	**10556.23**
S/Umred	47	1808.57	2731.99	1638.75	275.43	78.46	117.0	**6650.20**
Total	**314**	**9477.75**	**21621.48**	**4343.45**	**2536.94**	**157.33**	**2643.52**	**40880.47**
Percent		**23.18**	**52.89**	**10.62**	**6.45**	**0.38**	**6.47**	**100.00**

Zudapi jungle areas are not shown in this table as their extent transferred to forest department is not yet known finally, their legal status is unsettled as yet and also technical information as mentioned above is not yet collected.

15.1.3 Areas allotted to this working circle are generally with basal area less than 4 but occasional and scattered dense forest patches may be found throughout the division. Such patches are proposed to be managed under silvi-pasture system (Coppice Selection System) to meet local needs of the people.

15.2 General Character of the Vegetation

The forests put under this working circle contain degraded soils and are with heavy biotic pressure. They are therefore open (density ranges from 0.2-0.4) containing brushwood and bushes along with the grasses. Trees are stunted, malformed and hacked and are found

scattered throughout. Stocking of tree species is thus poor but a few small patches of good tree growth may be found occasionally.

Main grass species found are Kusal, Bhurbhushi, Ghonad, Sheda, Marvel.

Tree species found are Teak, Palas, Lendia, Bhirra, Ain, Bor, Dhawda, Movai, Salai, Char, Moha, Sitaphal, Rohan, Khair. Thorny and bushy species like Bor, Khair, Bharrati, Eruni, Ghot, Chilati, Phetra are also common.

Rantulasi and Tarota as weeds have extensively invaded these forests. There are other herbs and shrubs also which are spreading fast as weeds in the areas which were used as pasture lands and grass birs in the past. Lantana has also invaded in large areas and in some places it has virtually replaced all other bushes, grass and fodder plants. Besides there are regular and repeated fires every year. The palatability of the vegetation and availability of the grasses from such areas is therefore drastically reduced.

15.3 Analysis and Valuation of the Tree Crop

15.3.1 i) Area allocation along with the extent of dense and open forests, grass lands and blanks has been given in the table 15.1 above. The enumeration results, which relate to the valuation of the tree crop, are given in the table (table 12.2) below:

Table 15.2: Species and girth distribution from enumeration data of the compartments allotted to GFRM working circle.

Species and girth distribution in the G&FRM areas per ha.											
Species	**16-30**	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**136-above**	**Total**	**B.A . (Sq.m)**
Char	0.64	0.33	0.30	0.15	0.09	0.06	0.03	0.02	0.00	**1.62**	**0.03**
Chichwa	0.00	0.03	0.01	0.01	0.01	0.00	0.03	0.00	0.00	**0.09**	**0.00**
Dhaman	0.02	0.06	0.06	0.04	0.03	0.00	0.00	0.00	0.00	**0.22**	**0.01**
Dhawada	2.26	1.53	0.92	0.24	0.12	0.17	0.05	0.01	0.05	**5.35**	**0.09**
Garadi	0.13	0.45	0.44	0.31	0.13	0.13	0.09	0.00	0.00	**1.66**	**0.05**
Haldu	0.04	0.04	0.01	0.00	0.01	0.01	0.00	0.00	0.00	**0.12**	**0.00**
kalam	0.96	0.69	0.49	0.30	0.12	0.18	0.02	0.00	0.26	**3.03**	**0.10**
Kasai	0.39	0.49	0.30	0.15	0.04	0.03	0.00	0.00	0.00	**1.40**	**0.02**
Khair	2.12	1.13	0.50	0.26	0.19	0.17	0.17	0.09	0.11	**4.75**	**0.11**
Lendia	11.23	6.03	1.37	0.43	0.09	0.06	0.06	0.03	0.02	**19.32**	**0.19**
Moha	1.79	1.39	0.96	0.44	0.20	0.19	0.05	0.08	0.29	**5.39**	**0.15**
Mokha	0.01	0.05	0.01	0.01	0.00	0.03	0.00	0.01	0.04	**0.17**	**0.01**
Mowai	0.84	0.20	0.27	0.40	0.31	0.10	0.13	0.07	0.05	**2.39**	**0.08**
Palas	12.16	5.24	2.17	0.91	0.43	0.29	0.13	0.08	0.18	**21.59**	**0.29**
Rohan	1.52	1.22	0.93	0.29	0.19	0.10	0.01	0.01	0.01	**4.27**	**0.07**
Salai	4.04	1.72	1.02	0.25	0.15	0.03	0.02	0.00	0.01	**7.25**	**0.08**
Shisam	0.06	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.00	**0.22**	**0.00**
Shiwan	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	**0.03**	**0.00**
Teak	17.21	18.61	8.30	2.92	1.10	0.68	0.38	0.23	0.13	**49.57**	**0.78**
Tendu	9.41	4.56	2.91	2.54	2.04	1.50	0.90	0.45	0.34	**24.65**	**0.68**
Tiwas	0.30	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.35**	**0.00**
Bhirra	1.07	0.75	0.94	0.89	0.63	0.55	0.10	0.03	0.05	**5.01**	**0.17**
Ain	3.43	1.14	0.74	0.26	0.38	0.13	0.10	0.01	0.02	**6.21**	**0.10**

Species	16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-above	Total	B.A . (Sq.m)
Bija	0.03	0.06	0.08	0.06	0.09	0.00	0.01	0.00	0.00	**0.33**	**0.01**
Behada	1.64	1.16	0.78	0.62	0.44	0.22	0.16	0.06	0.12	**5.19**	**0.14**
Aonla	0.18	0.37	0.22	0.15	0.06	0.11	0.06	0.02	0.00	**1.17**	**0.04**
Biba	0.01	0.03	0.05	0.06	0.01	0.08	0.01	0.03	0.03	**0.32**	**0.02**
Other	6.99	3.12	1.40	1.31	1.10	0.87	0.56	0.22	0.31	**15.88**	**0.41**
Total	**77.87**	**50.22**	**24.90**	**12.86**	**7.87**	**5.64**	**3.02**	**1.40**	**2.01**	**185.80**	**3.60**

ii) Stock maps indicating density of tree crop have been generated using LISS II data and through NDVI technique. These maps were generated in the GIS cell.

iii) Regeneration status of the tree crop in the forests allocated to this working circle is given in table 15.3 below:

Table 15.3: Average seedlings and saplings per ha in GFRM areas

Range	Seedlings (R1) 0.3–1.0 meter	Saplings (R2) 1.0–3.0 meter	Saplings (R3) > 3.0 meter	Total
Hingna	61.04	44.13	2.33	**107.50**
Kondhali	3.26	105.96	155.61	**264.83**
N/Umred	0.06	28.09	1.31	**29.47**
Narkher	40.00	208.92	43.04	**291.96**
Parsioni	0	121.00	8.00	**129.00**
S/Umred	6.23	38.62	7.23	**52.08**
Average	**22.04**	**86.06**	**40.80**	**148.90**

15.3.2 Analysis and Valuation of Grass and Fodder Resources

Present enumeration primarily valuates tree crop and this has been given under para 15.3.1 above. However, for the proper management of grass and fodder resources and for their further development, different valuation method is required to be used. It should include valuation of soil type suitable for grassland management and its moisture content. This will help in deciding the grass species most suitable for a site to give optimum production. Extent of grazing and other biotic pressures as well as their effect on grass composition and yield should also be the part of such valuation.

The valuation of the present status of the pasture lands/ grass birs and then formulation of area specific prescriptions is a must and the prerequisite for their scientific management. However, such a valuation is beyond the scope of present enumeration methodology.

15.4 Special Object of Management

1) The forests put under this working circle are primarily intended to augment fodder requirements of the villages. Mostly it is grass resources, which are to be supplemented, wherever required, with palatable legumes and tree fodder.

2) As mentioned under para 15.1.1(ii) above, availability of fodder resources is drastically reduced. Introduction of suitable improved varieties of grasses as well as legumes and fodder tree species in selected areas is therefore proposed.

3) These areas being close to villages and local people being still dependant to a large extent for their fuelwood and small timber requirements on the forests, may also manage such areas to supply these forest produce, though these tracts are primarily meant to act as grazing grounds and grasslands.

4) As the above objects link forest management to people, active involvement of Gram Panchayat and other village institutions is a must. Hence eliciting peoples participation in such management and evolution of site specific and need based JFM mechanisms shall be attempted. This aspect has been separately discussed under Chapter 18 for JFM (overlapping) Working for various dependencies of the villagers on forests.

15.5 Silvicultural System

Despite large area under grass birs (cut and carry-away grasslands permanently closed to grazing), grass production as the above account shows is very low. Also these forestlands are burdened with huge grazing pressure and secondly, the demand for grass resources on cut and carry- away basis is very low. Official grass production figures show declining trend. It is due to various reasons. One of these reasons may be that grass availability has gone down so much that it is not economically beneficial to harvest grass resources. Another reason is that fodder resources from agricultural sector are available at cheaper rates and readily. Therefore, a long term strategy and sustained efforts are required to bring back grasslands of the Nagpur forest division to the level of their optimum production.

Based on the grass and forest resources of the site as well as the objectives of the management, the silvicultural systems to be followed may be classified in the following categories:

1. Regulated and rotational grazing in pasture areas including the protected forests freshly brought under this working circle.
2. Grassland management and development by regulating seeding and grass cutting and through complete closure to grazing in identified grass birs.
3. Silvi-pasture practices (Coppice Selection System) for tending and removal of tree growth from the dense patches of forests in the compartments allotted to this working circle.

15.6 Blocks and Compartments

The blocks and compartments allotted to this working circle are shown in **Appendix 15.1.**

15.7 Method of Treatment

15.7.1 The method of treatment to improve grasses shall be two pronged i.e. rotational grazing in pasture areas and augmenting natural grasses in areas close to grazing.

ROTATIONAL GRAZING IN PASTURE LANDS

i) Major area under this working circle shall be regulated for controlled grazing as per prevailing grazing rules.

ii) Pasture lands have been divided in to 37 pasture series and each series will have 4 coupes, namely A, B, C and D. Each coupe shall remain closed to grazing for two years and therefore half of the area (approximately 15,000 ha) shall always be available. The details are given in appendix 15.2.

iii) The coupe will be demarcated one year before the due date of closure and the period of the closure will be prominently displayed at the convenient places.

iv) In the closed coupe, works for facilitating improvement in grass and fodder productivity such as removal of weeds and woody growth will be taken up. Soil and moisture conservation works may be taken up extensively for improving the site.

AUGMENTING NATURAL GRASSES IN GRASS BIRS

i Areas containing palatable natural grasses shall be closed to grazing and work of removal of weeds to facilitate these grasses to come up naturally will be taken up. It has been seen that as a result of protection to grasslands, a lot of shrubs invade the area as weeds resulting in reduction in grass production. Hence, only the removal of such weeds manually/ mechanically is therefore suggested from the sites, which already contain palatable grasses and where artificial seed sowing is not necessary.

ii It will require complete and permanent closure from grazing but with a provision of drawing fodder resources from it on 'cut and carry-away' basis. It is therefore prescribed for grass birs.

iii. It is well established that grasses when young, that is, prior to their flowering are most nutritious (highest protein content) but management requirements are that they should be removed (grazed or cut) only after grass seeding. Grasslands developed as grass birs (permanent grasslands) are therefore to be allowed for grass cutting either after October or on rotational basis and 4 years after their establishment.

iV The quantity of fodder resources and their palatability in the pasture areas under this working circle) may also be improved on the similar lines but areas selected for that purpose shall also be required to be closed for grazing for 4 years after their establishment and rotational closure thereafter.

SILVI-PASTURE SYSTEM FOR DENSE FOREST PATCHES WITHIN GRASSLANDS

(Coppice Selection System in the Areas Classified under Category B & C)

The areas included in this working circle occasionally contain dense tree growth in small patches. Such areas if existing interspersed with pasture lands and grass birs, may be worked according to Coppice Selection System. The removal of material by this method will enable us to meet the needs of fuel wood and small timber of the villages. Coppice selection system envisages removal of available trees as per the principles of selection working (i.e. fixation of exploitable girth according to the material required and of felling cycle) and regeneration through coppice. Removal of material above the size of 45 cm GBH to meet the demands of small timber and firewood is suggested. However, GBH of Garari trees to be removed is fixed at 30 cm. One out of the 3 stems available silviculturally shall be removed but the patches containing largely the pole crop shall be worked, as far as practicable, according to the rules prescribed under other working circles in regard to tending of the pole crop. The dead and dying as well as malformed, over maturing and/ or mature trees occurring singly and scattered in the coupe shall also be felled, if silviculturally required and available.

The above working is prescribed in the first year of closure in pasture areas and in the current coupes of grass birs. Then afterwards same coupe shall be worked in the alternate rotation i.e. after 8 years.

While the tree growth is worked in the above manner, trees of fodder value will be given preference in retention as well as in facilitating their natural regeneration through nursing of seedlings of seed origin and coppice management.

15.8 Formation of Fodder series and coupes; Demarcation of coupes and Preparation of Treatment map

The working circle has been divided into various fodder series (the term 'felling series' has been replaced with 'fodder series'). There are 28 fodder series. As all the pastures and grass birs are proposed to be managed on a three years rotation, each such series will have 4 coupes **Appendix 15.2**.

The general treatment types, A to E are proposed to be slightly changed, which is as follows:

A) Protection areas- steep slopes and those forming catchment of some reservoir. They shall be shown as unworkable but soil and moisture conservation may be taken up.

B) Understocked and blank areas (with reference to tree crop) – The grazing and grass production areas.

C) Pole crop- suitable for meeting local needs of small timber and firewood.

D) Well stock patches – suitable for meeting local needs of small timber and firewood.

15.9 **Other regulations**: The areas will be protected from grazing and fire with the involvement of the local people. Some areas may be developed with better varieties of grasses through ploughing and broadcast sowing where the local people agree not graze their cattle there. The extent of such areas per JFMC may be around 20 ha and such grass development activity should be if demanded by the village community and may be internalised through schemes like FDA.

15.10 **Agency for executing the works**

The forest areas allotted to this working circle are, in general, those which are in the vicinity of villages. Hence, they are major thrust areas for formation of JFMCs and evolving JFM mechanisms. Regulation of grazing and improvement of grass and fodder availability is to be achieved by involving the JFMCs. Whatever tree growth occurring in these forests is to be managed scientifically to yield firewood and small timber requirements sustainably. The JFMCs will also be persuaded to endeavor in finding out ways and means to reduce traditional dependencies on forests. For this, they will be encouraged to create awareness and for adopting fuel efficient as well as alternate sources of energy. The village wise micro-plan will list and elaborate such activities.

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Chapter 16. Bamboo (Overlapping) Working Circle

16.1. GENERAL CONSTITUTION OF THE WORKING CIRCLE

16.1.1. Natural bamboo is found in hilly areas along Pench and other rivers in Khapa, Parseoni, Ramtek and Deolapar ranges. Compartments 690, 691 and 692 (Parseoni range) contain dense bamboo growth. In other parts of division, bamboo occurs occasionally along nalas or on small hillocks in the form of thinly scattered chumps. However, such bamboo growth is often damaged due to biotic pressure- gazing and fire. There are also old surviving bamboo plantations. Many such plantations were raised as under-planting in old teak plantations. Many important bamboo areas however are transferred to wildlife (as part of Pench National Park) and FDCM and, as a result, 12472.63 ha in 41 compartments is now not available under this working circle. Thus, out of the original bamboo area of 80 compartments (22999.88 ha), 12472.63 ha in 41 compartments is either included in Pench National Park or transferred to FDCM. Hence, an area of 10527.25 ha in 39 compartments is allotted to this working circle

16.1.2. In this plan the areas, where bamboo was noticed during the enumeration, have been included in the Bamboo (overlapping) Working Circle (BMB). Total BMB area extends over to 22999.88 hectares in 80 compartments forming 10.36% of division area. The areas under successful old bamboo plantations suitable for harvesting have also been included in this working circle. It comprises of 20500 hectares is the Reserved Forests and 1216.17 hectares Protected Forests **{Table 16.1}.**

16.1.3. The criteria used for the allotment of compartments are as follows:

☑ The compartments having more than 5 exploitable clumps per hectare of area.

☑ The compartments should not be a part of the Protection Working Circles.

Table 16.1. Area allotment to the Bamboo (Overlapping) Working Circle

Range	Compartments (number)	Notified area in hectare	Number of plots	Clumps/ ha	Available culms/ ha	Dead culms/ha
Deolapar	19	4975.68	54	30.15	97.92	134.85
Ramtek	9	2437.28	39	22.03	22.8	57.25
Parseoni	11	3114.29	-	-	-	-
Total	**39**	**10527.25**	**Average**	**26.09**	**60.36**	**96.05**

Visits in the division show some old bamboo plantations, some of which are not growing due to congestion. Details of these plantations not available. Hence, these areas could not be shown here but they are proposed to be worked as per the prescriptions given in this working circle.

16.2. GENERAL CHARACTER OF THE VEGETATION

16.2.1. *Dendrocalamus strictus* is the main bamboo species in the area, which occurs naturally as an under stories in the areas allotted to this working circle. Bamboo crop is of both natural and planted in origin. Katang bamboo (*Bambusa Arundinacea*) was introduced in small quantities in some stretches along the streams, rivers and water bodies viz. near Chorbaoli tank, along Ambakhori nala near salama and near Mogarkasa tank in compartment 439. Pure patches of bamboos have not been noticed. It is usually associated with ain, lendia, dhaora and teak. The quality of bamboos found in Khapa and Parseoni ranges is better than those found in Deolapar and Ramtek ranges.

16.2.2. The growing stock has been considerably damaged due to over harvesting, frequent fires, illicit cutting and over grazing. The irregular working has resulted in extensive damage to the bamboo clumps at places, and shrinkage of the bamboo area over the years. Approachable areas have been heavily exploited and the interior clumps suffer from congestion. Many of the successful plantations have not been worked leading to deformation and congestion of clumps.

16.2.3. The BMB areas have about 17.7 clumps per hectare and per hectare yield is expected at 89.3 culms.

16.3. BLOCK AND COMPARTMENTS

16.3.1. The compartments allotted to this working circle have been listed in the **(Appendix 16.1)**.

16.4. SPECIAL OBJECTS OF MANAGEMENT

16.4.1. Bamboo has a significant place in local economy. Local tribal and non-tribal families use bamboo for construction, fencing and for making variety of implements.

16.4.2. Bamboo has a great potential as an alternative to the timber and supports handicraft artisans called *Burads* for their livelihood. It has significant value for interior decoration, furniture making and manufacture of other articles of domestic use. Hence, increasing the bamboo productivity, in the division, is very important for the development of local inhabitants of this region.

16.4.3. This working circle aims at improving the bamboo productivity for meeting local needs and demand in the surrounding areas.

16.5. METHOD OF TREATMENT

16.5.1. Each clump is prescribed to be treated as an independent entity for the treatment. Silvicultural system shall be the culm selection system, each culm to be treated as a stem. Clump cleaning is prescribed as an integral part of bamboo harvesting

operation. Successful old bamboo plantations and patches of gregariously flowered areas are prescribed to be cleaned as **per para 16.10** under bamboo harvesting.

16.6. CUTTING CYCLE AND SEQUENCE OF CUTTING

16.6.1. **Cutting cycle** of 3 year duration is proposed for the bamboo harvesting.

16.6.2. The entire area in the working circle has been divided into 16 cutting series of average size 21.80.36 hectares. Each cutting series is further divided into three cutting sections of average size 726.73 hectares in the cyclic order viz. A, B and C; that will serve as annual coupes in each cutting series. The sequence of cutting is given in the **(Appendix 16.2)**.

16.7. AGENCY OF HARVESTING

16.7.1. The Deputy Conservator of Forests, Nagpur Forest Division will decide the agency of harvesting according to the government policy and regulations.

16.8. TREATMENT MAP AND ENUMERATION

16.8.1. The treatment map for the BMB coupes will show bamboo areas, staking sites (temporary coupe depot) and the extraction roads.

16.8.2. Each bamboo clumps will be numbered and two percent of clumps in each compartment of the coupe will be enumerated for the current year, previous year, mature and dead culms as well as intensity of cleaning operations.

16.8.3. High cleaning intensity will mean presence of badly twisted culms, and moderate cleaning intensity would indicate presence of malformed and dead culms exceeding four in number. Fewer malformed and dead bamboos will suggest low intensity cleaning.

16.9. CLUMP CLEANING AND BAMBOO HARVESTING

16.9.1. Cleaning of bamboo clumps and harvesting of culms shall be carried out in accordance with the prescriptions given in para 16.10.

16.10. PRESCRIPTIONS FOR BAMBOO HARVESTING

16.10.1. Harvesting Season: Bamboo harvesting will not be permitted during 15th June to 30th September, the period new culm formation.

16.10.2. Cutting Implements: Bamboo cutting will be done with sharp axe or other suitably designed instruments. A bamboo culm must be cut in a single stroke with a slant cut so that cutting is above the first inter-node and height of the cut is between 15 cm to 45 cm above the ground, to avoid drying of rhizome due to capillary action.

16.10.3. Clump as units: Each clump is an independent entity for the treatment.

16.10.4. Cleaning operations: All clumps will be cleaned during the coupe working. Cleaning operations in bamboo clumps will include following elements:

(a) Climbers infesting bamboo clumps will be removed.

(b) All dead, decayed and dry culms will be removed.

(c) All culms, cut high above the ground, will be cut above the first inter-node.

(d) Twisted culms will be removed.

(e) Top-broken culms, with more than half of the top damaged, and malformed culms will be removed.

16.10.5. Harvestable clump size: No clump shall be considered fit for harvesting unless it contains more than 12 (twelve) culms of one year or older in age.

16.10.6. Even working: While extraction of bamboo it should be ensured that the reserved culms are evenly spaced and some mature culms are present on the periphery of the clumps.

16.10.7. Immature culms: All current year and previous year culms will be retained. *Current year culms* have the culm sheath on the lower half and abundant bloom (white powdery dust), which comes off easily when touched. *Previous year culms* do not have the culm sheath, and the patchy bloom does not come off easily. *Older or mature culms* have blackish-grey bloom.

16.10.8. Reserved culms: The mature culms, equal in number to the current year culms subject to minimum of 8 culms, must be retained to provide support to the younger culms.

16.10.9. Culm harvesting: The remaining mature culms after reserving as described in the preceding paragraph may be harvested. No culm shall be extracted without cleaning the clump, which should be an integral part of the bamboo harvesting.

16.10.10. Debris clearance: Debris of the cutting should be stacked at least 3 meter away from clumps.

16.10.11. Prohibited activities: Digging of rhizomes, removing tender parts of older culms or cutting current year or previous year culms will be strictly prohibited.

16.10.12. Authority: The bamboo management will follow the orders dated 13th April 1994 of the Chief Conservator of Forests (Production) as modified from time to time. It is as follows:

1. The culms at the periphery of the clump will not be removed except where it is absolutely necessary for facilitating working in the interior portion of the clump.
2. The leading exterior culms may not be cut under any circumstances, even if they are malformed. Their relation is in the interest of the outward growth of rhizome and clump and they also support new culms.
3. In order to make whole of the clump accessible, removal of all the culms in the form of a wedge may be permitted but the width of the wedge shall not be more than one meter.

4. The working of the clump will be such that the culms after working are well spaced.

5. The bamboo extraction should end by March, when the culms are almost devoid of starch and attract less insect borers.

16.10.13. Gregarious flowering: Period, extent and location of the flowering will be recorded in the divisional notebook. Extraction of bamboo will be deferred for one year in case of the gregarious flowering. The clumps will be clear felled after seeds are mature and have been collected. Strict protection from fire and grazing will be provided for 7 years to the area where bamboo seeds would be found viable. Gregarious flowering in areas larger than one 1000 hectares should be reported to the Chief Conservator of Forests, (T) Nagpur Circle, who should issue necessary instructions for management of the flowered area. The incidence of gregarious flowering should also be brought to the notice of the Working Plan Officer, the Conservator of Forests, Research Circle and the Officers-in-charge of specialised seed units in FDCM and the Department. Seed collection, disposal of bamboo from dried clumps after flowering and tending operations for bamboo seedlings requires extensive planning and timely action. Very often seeds after the gregarious flowering are subjected to fungus attack and if such incidence is noticed, following treatment should be effected:

The area should be sprayed with a very light solution of fungicide like Bevestein.

16.11. TREATMENT OF GREGARIOUSLY FLOWERED AREAS

16.11.1. The area of gregarious flowering must be closed to grazing and special fire protection measures must be implemented.

16.11.2. The bamboo seeds falling on the ground should germinate and establish into seedlings. The resultant clump formation generally takes nearly 8 years to reach at the harvestable stage. Hence, the grazing closure should continue for 7 years in areas, where bamboo seedlings would be found adequate.

16.11.3. Once the seeding is over, all the flowered clumps will be clear felled and removed in the year following the gregarious flowering.

16.12. COLLECTION OF BAMBOO SEEDS

16.12.1. Fresh and viable seeds of bamboo are proposed to be collected from the areas near the clumps. The seed collection should preferably be organised under the management of the specialised seed units.

16.13. TENDING OPERATION OF NATURAL CROP

16.13.1. The gregariously flowered areas will be tended in every 3rd year matching with the annual bamboo coupes. The tending operation will cease, if the new clump foci fall

below 100 per hectare, clumps become harvestable, or eight years after the bamboo seeding.

Bamboo seedlings 1-3 years old

16.13.2. To induce formation of healthy clumps, evenly distributed, *250 clump foci of 80-cm diameter* will be formed in the area having good bamboo regeneration. Groups of bamboo seedlings showing good growth will be preferred for the foci formation. Weeds, climbers and other bamboo seedlings up to 1.50 meter around bamboo foci should be cleared in July-August to assist growth of bamboo seedlings in the selected foci. The entire area will strictly be protected from fire.

Beginning of the clump formation: 4–8 years old

16.13.3. Immature crop will receive cleaning operations till the crop becomes harvestable. All badly grown, twisted and damaged culms will be removed from the selected foci. Weeds, climbers and other bamboo seedlings up to 1.50 meter around bamboo foci should be cleared, and soil working should be carried out in August. The entire area will continue to receive protection from fire and grazing.

Mature bamboo crop

16.13.4. Fully mature clumps may be harvested in the eighth year onward depending upon location in the annual coupe.

16.14. CONTROL OF INJURIES DUE TO INSECTS

16.14.1. The bamboo culms damaged by the insects *Estigmina Chinensis, Chrysomelidac colioptera* and *Brytotrachelus longipipes* should be cut and burnt during the winter, when these insects hibernate. The insects hide under the debris, and can be eliminated by causing light ground fire during the winter in the affected areas. Bamboos are highly susceptible to insect attack and moderately susceptible to fungal attack. They are also often attacked by Lyctus (powder pest beetle) and by Dinoderus minutus. Dendrocalamus strictus responds well when it is treated with a mixture of boric acid, Copper sulphate, Zinc chloride and Sodium dichromate in a ratio of 3:1:5:6.

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Chapter 17. Non-Wood Forest Produce (NWFP) {Overlapping} Working Circle

17.1. GENERAL CONSTITUTION OF THE WORKING CIRCLE

17.1.1. The prescriptions of this will be applicable to the entire division.

17.2. AVAILABLITY OF NON-WOOD FOREST PRODUCE

17.2.1. Sizable portion the forests of this division are of mixed type, supporting various species of NWFP value, namely, *tendu, mahua, achar, kulu, dhaora, khair, salai, aonla.* NWFP trees are found scattered and mixed with other species. NWFP collection also generates employment opportunities and supplementary income and, hence, it plays an important role in the rural economy particularly in the tribal villages.

17.2.2. The important NWFPs found and collected in this tract are Moha flowers, Moha seeds, Tendu leaves, Kullu gum, Dhaora gum, Salai gum, Dikemali gum, etc.

17.3. SPECIAL OBJECTS OF MANAGEMENT

17.3.1. Sustainable management of the marketable NWFPs and to ensure reasonable returns to the local villagers especially the tribal communities.

17.3.2. Improve stocking of various NWFP species in the forest areas.

17.3.3. Enhance collection of various NWFPs by improvement in collection techniques.

17.3.4. Enhancement in economic returns through training on value addition techniques and by providing better market facilities.

17.4. MONOPOLY PROCUREMENT AND OWNERSHIP OF THE NWFP

17.4.1. Ownership rights over certain NWFPs in the Scheduled Areas have been vested in the village communities through statutory provisions. Rights over the trees and the land however remain with the government. Tendu, Apta and Bamboo are presently excluded from this list. These provisions also affirm that the working plan prescriptions shall be applicable for the harvesting of such NWFPs. However, there are no scheduled areas presently in the Nagpur district.

17.4.2. Tendu leaf collection has been nationalised and units are sold through public auction every year.

17.4.3. The Maharashtra Tribals' Economic Condition (Improvement) Act, 1976 empowers the state government to enforce monopoly procurement of certain goods including the NWFPs in the Tribal Sub-plan Areas. Under these provisions, the Tribal Development Corporation (TDC) serves as the chief procurement agent for the

government. accordingly. Moha flowers, Moha seeds, have been reserved for Tribal Development Corporation.

17.4.4. In case of the remaining NWFPs, the Deputy Conservator of Forests decides the agency for collection in accordance with the existing rules and the policies of the department. Kullu gum collection has been banned in Nagpur Circle because of the drastic reduction in the number of mature Kullu trees. Gum unit, which is the whole division, is thus auctioned for Dhawada Gum collection only. The information regarding Gum collection in the division is given in the table below:

Table 17.1 : Year wise Gum collection and revenue

Year	Quantity (in quintals)	Revenue (in Rs)
1992-93	28	100,651.00
1993-94	39	142,900.00
1994-95	43	162,300.00
1995-96	29	117,500.00
1996-97	33	140,900.00
1997-98	23	110,300.00
1998-99	16.5	75,000.00
1999-00	21	100,900.00
2000-01	8	40,400.00
2001-02	7	39,400.00
2002-03	8	43,200.00

As the figures in the above table indicate, the revenue realised from the gum collection is meagre and further it shows declining trend in gum availability. It will therefore be preferable to stop this auction and earmark gum collection to the FPCs under JFM. For even if no statutory scheduled area in the division exists at present, local people have first charge on NWFP as per the National Forest Policy. The JFM guidelines provide for such arrangement. Therefore the division shall endeavour to move the govt. for framing specific rules in this regard.

17.4.5. There may be many other forest species which yield various products or leaves, flowers, fruits etc. of such trees are of some use or the other including medicinal uses. However systematic information in this respect is not available at present. But such NWFPs should also ideally find their due place in the JFM micro-plan. Proper grading, value addition and exploring new markets for the traditional NWFPs (such as gum) as well as exploring the marketability of new NWFPs hitherto unknown (such as medicinal plants) will form important activity under the JFM programme in the division. The possibility of involvement of NGOs in such an endeavour should be explored.

17.5. METHODS OF TREATMENT

17.5.1. Fire protection measures: Collection of NWFPs is often associated with forest fires, because the villagers set fire around the NWFP yielding trees for clearance of leaf litter and undergrowth. Fires are also caused by agents of tendu contractors under the belief to get better flush of tendu leaves. This takes a heavy toll on NWFP trees.

The Village Panchayats and JFMCs shall be involved in awareness generation programme to help control forest fires.

17.5.2. Training for NWFP collection: Training programmes for proper NWFP collection, value addition and marketing is proposed to be organised to help ensure their sustainable harvest and use. This is specifically required in order to develop non-destructive gum collection techniques. The Education Circle is proposed to prepare and oversee the training modules.

17.5.3. Documentation of NWFP collection: There is presently no systematic and reliable data available in respect of-

- Percentage stocking of NWFP yielding trees and mature trees of such species.
- Unit (Beat, Range, Division) wise potential and production for various NWFPs.
- Various NWFPs other than traditional ones and their uses.

This database shall be created systematically and on priority.

17.5.4. Non-destructive collection: As long as it is not detrimental to the wildlife conservation and site conditions, sustainable harvesting and non-destructive removal of herbs and flowers, fruits and other parts of medicinal importance can be permitted in the division. However what is being presently harvested has to be first documented.

17.5.5. Method of regeneration and improvement in stocking: While carrying out various operations in the annual coupes, promising regeneration of identified NWFP species shall be given priority in tending operations and congestion shall be removed, wherever required, to assist in proper growth. Also depending up on the suitability of site and local needs, NWFP species shall be given due weightage (10 to 15 percent) in various plantations schemes.

NWPF trees shall not be marked for felling unless they are dead. It is for this reason that the trees like Dhaora are not to be marked for felling even if their percentage stocking is high.

It is proposed that only 50% of the mature and available gum yielding trees shall be blazed. This will ensure firstly optimum stocking and secondly seed bearers for natural regeneration of NWFP species.

Management of Tendu

17.5.6. Collection of Tendu leaves:

- Tendu is the prominent revenue generating NWFP of this tract. The collection season is short and it is hardly over a month from the last week of April to the last week of May.
- The division has potential to yield 30,000 standard bags of tendu leaves amounting to annual revenue of about Rs. 2 crores.
- Tendu leaf collection is the monopoly of the state government under the Maharashtra Minor Forest Produce (Regulation of Trade) Act, 1969.
- It is an income generating activity for most of the local communities including tribals. It supports their livelihood to a great extent.
- Pruning of young tendu plants does help in increasing leaf yield. However, unsupervised pruning often leads to serious and permanent damage to the tendu saplings and trees. A few tendu trees shall be identified as future crop and seed source. They shall be marked with red band and given number and shall not be pruned. The felling of tendu trees or unauthorized pruning of branches should be dealt with firmly as per provisions of Indian Forest Act, 1927.

17.5.7. Tendu regeneration: In view of importance of tendu to support the livelihood of forest dwelling communities and its economic value for the region, sustainable management and use of tendu is prescribed. This can be achieved by ensuring regeneration of tendu and its subsequent protection. Wherever good tendu regeneration is found, soil working, singling of shoots and other tending operations are to be carried out as part of the various operations under the rootstock and afforestation working circle areas. Similar operations shall also be carried out in the annual coupes of the other working circles. This will improve the stocking of tendu trees and thereby the tendu leaf as well as fruit availability in the forests.

It is also proposed to ensure to include sufficient proportion of tendu in mixed plantations prescribed under various area-specific working circles.

Soil working to regenerate tendu trees through root suckers: Digging of 30 cm deep circular trenches encircling tendu trees and having the diameter matching the tree crown has been found useful to regenerate the species from root suckers. Root suckers are injured by doing this and shoots come out profusely from such injured portions. Singling and tending of such shoots will follow. This way the population of Tendu in forests can be increased.

Management of Moha

17.5.8. Moha collection: Moha trees are generally in substantial number in the forests. The villagers have a local system of allocating the collection rights of Moha flowers and fruits. This traditional approach is a viable system and hence no intervention in allocation

of collection rights of the local communities is warranted in the process of Moha flower and fruit collection in the division. However, being a very important commercial MFP yielding tree and particularly because of the place of importance Moha has amongst the local people, it is proposed to prepare its inventory. This will enable us in initiating documentation of its production potential and regeneration status.

17.5.9. Moha regeneration: Moha regeneration is proposed to be achieved in the same way as in case of Tendu, that is, through tending of natural regeneration in annual coupes, its inclusion in the plantation programme and through Soil working around Moha trees to cause injuries to the root suckers, which would initiate emergence of new shoots.

Management of gum yielding trees

17.5.10. Salai (*Boswellia serrata*), Dhaora (*Anogeissus latifolia*) and Kullu (*Sterculia urens*) are main sources of gum in the area. These gums are used in medicines, chemicals, cosmetics, food industries and incense.

17.5.11. Salai gum is mostly used in the Indian medicines for the treatment of rheumatism and nervous diseases. It has the potential of becoming mounting media by substituting imported Canada balsam in the preparation of microscopic slides and hence has the possibility of becoming an important substitute for imported Canada balsam.

Dhaora gum is used in food industry for making sweets. It may also be suitable in the manufacture of elastic adhesive, lacquers, oilcloth compositions, ink and perfumery.

Dhaora and Salai trees are quite common in the forest crop of this tract. Hence, collection of Dhaora and Salai gum is to be continued and methods prescribed under para 17.5.5 shall be followed, as far as they are applicable, for regeneration and maintenance of stocking. However it can be seen from the enumeration results given under various working circles that though percentage of Dhawada trees it quite high in the forests of this division, the number of mature trees is quite low. Therefore no felling of Dhawada trees except dead ones is to be allowed.

17.5.12. Method of extraction: No scientific method for tapping has been applied so far in this area. Therefore, FRI Gum Tapping Rules described in the Chapter of Miscellaneous Regulations are proposed to be adopted for the tapping of gum.

In addition, tapping of trees below 90 cm GBH shall be prohibited and only 50% such available trees shall be tapped. The collection period will be confined from November to May. These measures are expected to minimise the damage to the trees as well as to the crop. The areas around the trees should be cleaned to facilitate gum collection and to prevent fire in the forests. A strict watch is necessary to enforce tapping rules and check unauthorized collection of gum. No gum producing trees should be felled. No tapping of gum should be carried out during the period of rest.

The agency- the organisation or the individual, collecting the Dhaora or Salai gum in violation of the prescribed tapping rules should be charged under the Indian Forest Act, 1927 for causing wilful damage to the gum-yielding trees.

17.5.13. Formation of gum units: The present gum unit is the whole division. However, it is proposed to be revised in the light of the prescriptions given under para 17.4.5 above.

17.5.14. Kullu gum: Kullu (*Sterculia urens*) is a fairly large sized tree but it now has very sparse distribution in the forest crop. Due to this, extraction of Kullu gum is presently not allowed in the Nagpur Circle. This ban on Kullu gum collection in Nagpur division is proposed to be very strictly implemented during this plan period and an inventory of Kullu trees is to be prepared during coupe operations. This will enable the review of the status of the occurrence of kullu trees at the end of the plan period.

17.5.15. Regeneration of gum-yielding trees:

Dhaora and Salai: They are not very uncommon. However, mature trees of these species as mentioned above are less in number and present method of gum extraction not being totally non-destructive, no felling of these trees has been prescribed. This is expected to ensure satisfactory stocking of these species. Timber of these species is also not very valuable and not in demand. In addition, the DCF may include, particularly Dhaora, in plantation programme depending on the field conditions and local requirements.

Kullu: Kullu regeneration is proposed to be achieved in the same way as in case of Tendu and Moha, that is, through tending of natural regeneration in annual coupes, its inclusion in the plantation programme and through Soil working around mature Kullu trees to cause injuries to the root suckers, which would initiate emergence of new shoots.

17.5.16. Dikemali collection: Some areas of the division yield *Dikemali*, which is used in medicinal preparations. Local villagers will be allowed to collect *Dikemali* for their own use as well as for sale.

Management of Hirada, Beheda, Aonla, Char and other NWFPs

17.5.17. Collection of Hirada, Beheda, Aonla, Char and other NWFPs: Fruits of Hirada, Beheda, Aonla and Char are marketable items. Similarly, fruits, flowers and leaves of certain shrubs and trees are used for variety of purposes. Current level of collection is quite erratic and not much of the information about these produce is presently available.

17.5.18. The production of non-traditional NWFPs (that is, those which are presently not identified as MFPs yielding revenue in the division.) shall be quantified and their market shall be explored. This shall be integrated into the JFM arrangements.

17.5.19. Removal of NWFPs shall be within the sustainable limits of production. Felling of trees and lopping of branches shall not be permitted for NWFP collection. Destructive removal shall not be permitted. Whenever it requires digging up of plant roots, branch cutting, debarking and other destructive harvesting, specific norms and terms and

conditions shall be formulated for each species to that there is no permanent damage to trees and/ or it does not irreversibly reduce the population of a particular species.

17.5.20. Regeneration of *Hirada, Beheda, Aonla and Char* : Compartments having good regeneration of Hirada, Beheda, Aonla, Char and other NWFPs are proposed to be listed species-wise. Saplings of Hirada, Beheda, Aonla and Char shall be tended to remove congestion on priority. Soil working and mulching of natural seedlings and saplings shall also be carried out. Sufficient proportion of these species is proposed to be included in the plantation programme under area-specific working circles.

17.6 Agency of harvesting for NWFP

1. Procurement of tendu leaves has been nationalised and units are sold every year through public auction. It is one of the major sources of revenue in the division.
2. Moha flowers, Aonla fruits (dried), Behada fruits, Neem seeds, Karanj seeds, Bahava seeds, Tamarind, Palas lac in the tribal area of Ramtek taluka are reserved for Tribal Development Corporation and it pays royalty to the department. However, the production and the revenue realised, as the official figure of 1.2 quintal production of moha flowers in Nagpur district made available from the office of the Chief Conservator of Forests (Territorial) Nagpur for the year 2002-2003 indicates, is insignificant.
3. NWFPs other than the above may be identified and assigned to JFMCs, which will be the sole agency to harvest them. This aspect may be covered under the micro-plan proposed to be prepared to implement JFM programme as mentioned under miscellaneous regulations.

17.7 Future management proposed

A. For building the data of NWFPs, it is proposed that weekly markets will be surveyed extensively to find out the types of NWFP coming from forest area, their extent, purpose of utilisation, rate, chain and the agency of marketing and final destination. The local schools, village level functionaries and NGOs are proposed to be associated in building up this database.

The detail checklist of the information to be collected from the point of view of NWFP management is given under miscellaneous regulations.

It is proposed that the above information should be used to formulate correct prescriptions at the time of next revision. Depending upon the speed with which the information is made available, working plan division may be asked to revise this chapter even during the currency of this plan - at the time of mid term review.

B. To make a beginning towards NWFP cultivation, each forest (Beat) guard and his vanmajoor will be given target of collecting seed material of most traded NWFP and to propagate it as part of his beat patrolling duties.

C. The division will endeavour the following:

(1) Explore possibility of fixing fees/ royalty for the removal of each and every NWFP from the forests.

(2) Each NWFP purchaser to maintain a register, in which the information like the type of NWFP; person/s who collected it; quantity, rate and place of collection (comptt.); rate at which and to whom it has been sold, will be maintained.

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Chapter 18 The Wildlife (Overlapping) Working Circle

18.1 GENERAL CONSTITUTION OF THE WORKING CIRCLE

This is basically an overlapping working circle but a few exclusive areas are proposed for identification. The prescriptions given in this chapter therefore will apply to the entire forest area of the division as well as to the issues relating to control of illegal trade in wild animal articles in and around Nagpur city.

18.2 GENERAL CONDITION OF FLORA AND FAUNA

The composition and the general condition of vegetation had been prescribed in 'Chapter 2 – The Forests' and in various area-specific working circles. Information about the wild animals has been given in Chapter 7. The background including legal framework necessary for the wildlife management in general has also been described under Chapter 7.

18.3 SPECIAL OBJECTS OF MANAGEMENT

1) As mentioned in the chapter 7, maintenance of Biological diversity is the new mandate of National Forest Policy, 1988. Restoration of degraded habitats outside protected areas is one of the strategies for action listed in the National Wildlife Action Plan (2002-2016). Therefore, entire plan is proposed to be based on the primacy of environmental concerns and biodiversity conservation but the issues not specifically addressed in other working circles have been dealt with in this chapter. Even after the establishment of a network of protected areas, wild animals continue to be much more in number outside the protected areas, that is, in managed forests. It is true for Nagpur division also. Tiger and panther population in the division and its adjoining protected areas as per 2001 census have shown the following trend:

	Tiger	Panther
1. Pench Tiger Reserve	15	9
2. Bor Sanctuary	5	8
3. Nagpur Division	13	10

Forests of Nagpur division provide effective corridor to the Pench National Park and Bor Sanctuary. Thus, the specific objective of this working circle is to ensure wildlife protection and biodiversity conservation in the managed forests of the division. For this purpose, it is proposed to undertake measures like habitat management, water hole monitoring and development and monitoring of populations of the wild animals on a limited scale, as an integral part of works prescribed under various chapters of this plan and from the available resources of manpower and funds of the division. For this purpose, ecologically sensitive areas and special habitat sites such as, *riparian zones, mesic sites (natural water seepage sites*), perennial water holes and wallows, salt licks, natural breeding and nesting sites like caves, snags, overhangs, groves of old Ficus trees, thick

bamboo groves and small evergreen patches found occasionally may be given special attention and protected from any kind of interference.

2) Nagpur is a big city and being located in the middle of the country and central India having dense and extensive forest areas, it becomes a sensitive place to check illegal wildlife trade, which is supposed to be next only to narcotics and illegal arms trade in the country. Hence, special and effective anti-poaching measures are an important mandate of the division.

3) Vidarbha area boasts of an attractive place for forest and wildlife tourism (Eco-tourism). Forests of Nagpur division being close to this big city, and some of these forests, being epitomes of unique serenity, tranquillity and naturalness, offer a unique opportunity to develop eco-tourism. This is particularly important because a lot of restrictions on tourism are put inside the PAs and therefore certain activities, which are not allowed in PAs, may be offered in the forests of the division. Entry restrictions as regards the timings, which often become major irritant in offering eco-tourism package, may be relaxed or even done away with in the areas outside PAs.

18.4 TREATMENTS PRESCRIBED

1) WILDLIFE PROTECTION AND CONSERVATION IN GENERAL

The PCCF (WL) MS, Nagpur has issued a standing order (Wildlife) No.001 **(Appendix 18.1)**. This order prescribes duties and lists measures for the protection and conservation of the wildlife outside PAs. Following are the general prescriptions, majority of which are based on the guidelines under this standing order, for the protection of wildlife in the areas out side the protected areas. The territorial staff of the Nagpur Division shall scrupulously implement these prescriptions.

1) Duties of Forest Guard, Forester, RFO and ACF include-

- Keeping information of waterholes, particularly in summer and watch on the same, that is, special vigilance at all the water holes in the division is proposed.
- Keeping a watch on the electric lines passing through forests.
- Ensuring registration of arms licenses as required under Wildlife (Protection) Act 1972.
- Cognizance of cases of injury due to wild animals as per govt. orders from time to time.
- Keeping a track of animals like tiger particularly tigress with cubs and a watch on such vulnerable animals.
- Proper disposal of carcass of wild animals found dead or killed.

2) Local staff should maintain record of sensitive wildlife areas such as areas with heavy wild animal concentration. These areas will be given special attention for anti poaching efforts.

3) Establishing network of information system. (Provisions of 60A and 60B may be invoked in this regard.)

Establishment of cells under RFO (MS) and also under DFO (Vigilance) for handling wildlife offence cases. There shall be regular short-term training/ workshops in anti-poaching activities and legal requirements in dealing with wildlife offence cases. Case studies from the point of view of important intelligence gathering cases of the wildlife wing should be used in such training programmes. Such information from the wildlife wing should be used to supplement and coordinate anti-poaching activities out side PAs.

Forest check posts shall be sensitized for keeping a watch on wildlife offences. Any transit of wildlife articles etc. from these check posts should be scrupulously stopped.

4) Taking up nature education programme in the villages adjoining forests and in schools and colleges.

5) Identification of sensitive habitats and their protection as described under para 18.4(2) below.

6) Antler trade is now banned. Hence, no collection of shed antlers is to be allowed. Similarly collection of shed peacock feathers is to be allowed only for domestic purposes i.e. within country.

7) Measures against crop damage by wild animals are to be taken as per govt. orders from time to time.

8) Soliciting help and involvement of honorary wildlife warden in activities like nature education programme, in establishing network of informers and in eliciting people's participation.

9) It will be insured that cattle grazing in forests near the important wildlife habitats are inoculated against contagious diseases.

10) In the sensitive sites identified as wildlife habitat by the division, removal of NWFP-flowers, fruits and medicinal parts and harvesting of herbs shall not be allowed.

The NWFP harvesting in general should also be watched and monitored to prevent any permanent loss of genetic material from the forest area.

11) Any person possessing fire arms will register his name with the wildlife officer concerned/ with the Deputy Conservator of Forests, Nagpur, as the case may be, in accordance with the provisions of the Wildlife Protection Act. 1972.

12) In addition to all India Tiger and Panther census every four years, the division will under take regular estimation of wild animal populations at a frequency decided by the CCF, Nagpur.

13) While marking of dead and fallen trees in the various annual coupes, two trees per ha. shall be reserved against their removal. These trees will act as snags and hence shall provide shelter and nesting site to many small animals and birds.

Similarly at least two hollow trees per ha. shall also be reserved against felling for the same purposes.

14) Tendu collection centers and labour camps shall not be established near the water holes. Also such labour camps shall be established away from the areas of high wildlife density.

15) Maintenance and development of Water holes: Water availability, or the lack of it, is one of the major factors that decides the health of the habitat. Its non-availability at sufficient places in the forests also increases probability of animals being found on the limited water holes and thereby increases their susceptibility to poaching.

Maintenance of existing water holes and development of new ones even in managed forests therefore becomes essential. It would be desirable to map all the perennial as well as ephemeral water holes. The activity of developing the water holes should consist of augmenting sub surface water level through nala bunds, underground bunds and similar other methods as part of general soil and moisture conservation measures. This should also consist of creating water storage facilities like forest tanks with small submergence, say, half a hectare and such measures as are in practice in the wildlife areas. These facilities shall be created on priority in the identified sites and in their vicinity.

16) Augmenting fodder resources for wild animals: An attempt shall be made to determine the carrying capacity for the purposes of livestock grazing in the division after excluding fodder requirements of wild animals.

Special schemes of fodder development in the vicinity of irrigation projects (draw-down zones) benefiting herbivores may be considered and attempts shall be made to persuade the project authorities through nodal cell in the PCCF office to finance such schemes. Regular plantation schemes under various working circles shall include sufficient percentage of fodder and fruit trees preferred by wild animals and birds. A few such species are Gular, Umber, Bor, Anjan and their extent to begin with should be minimum 5%.

2) WILDLIFE IN MANAGED FORESTS

As explained under para 19.3(1), there is a case for attempts to be made for conservation of wildlife in the managed forests also. However, because of the human dimensions obtained in these forests, it is not possible, though desirable, to have a full range of habitat management practices some inputs of wildlife management as practiced in PAs may be incorporated in the forestry practices. Wildlife management in PAs is being done on a bigger scale but in the adjoining forests of the Pench National Park and Bor Sanctuary and also in other key areas in the division (the division should endeavor to identify such areas while implementing this plan), activities on a lesser scale and as described below are prescribed. ***No stoppage or alteration of any forestry practice in such areas is intended.***

Ecologically sensitive areas and key habitats shall be identified as follows:

A) Management Indicator species (MIS) such as the flying squirrel in old and moist riparian zones, keystone species such as year round fruiting ficus groves and flagship species such as Tiger will be indicated for the whole division or for smaller management units as the case may be.

B) Identification of unique habitats (Caves, dens, overhangs in rocks usually along nalas and rivers, cliffs); riparian zones; mesic sites (Swamps); biological hotspots

(natural blanks); plantation sites offering edges and ecotones; old growth stands; forests adjoining irrigation projects (those between HFL and FTL).

2) The area frequently occupied by the species identified under A above and critical habitats identified under B shall be first listed and mapped during the course of implementation of this plan as no such systematic information exists today. Because of this reason no specific prescriptions are given in this chapter for the time being. However, first requirement of the conservation is to protect these sites and to remove all outside interference from such identified sites. Depending upon the requirement and the funds available, development activities may be planned on year to year basis during this plan period and in consultation with, and as per guidelines from, the Chief Wildlife Warden.

3) Sites identified as above may be designated as unworkable areas from the point of view of forestry operations and shown in the treatment map of the coupe in which they are located.

4) A comprehensive database of the above sites along with the relevant maps shall the created.

5) No felling of trees or harvesting of other forest produce shall be allowed in the identified sites and also within 50 mtr radius buffer around these sites.

6) There is a general restriction on felling of fruit trees like Aonla, Beheda, Hirda, Char, Tendu. Other trees bearing fruits and forming food to the wild animals and birds shall be identified and shall be reserved against felling particularly in the identified sites.

(3) ECO-TOURISM IN FOREST AREAS

1. A proposal submitted to govt. in regard to development of eco-tourism by the PCCF (WL), MS, Nagpur has incorporated 45 sites and 24 circuits in Nagpur division. This programme shall be developed fully during the plan period. The details of these eco-sites and eco-circuits along with their map are given in (**Appendix 18.2**).

a) A model eco-centre may include -

- Nature interpretation center;
- Providing audio-visual aids and other equipments like binoculars;
- Camping facilities;
- Nature trails near the center;
- Watch towers;
- Water sport facilities wherever such centre is located closed to the water body.

It is proposed that such eco-centres shall be developed at one or more places (depending upon the demand and the resource availability) included in the appendix 18.2 and shall be run by the village community, preferably through an FPC, that is, an eco- development approach (the integration between eco-tourism and JFM programmes) will be aimed.

b) Cultural sites including places of worship as well as archeological sites of tourism importance within the forest area, if any, shall be marked on the map and shall be integrated within the various tourist circles proposed. According to a study commissioned

by the Chief Wildlife Warden of Maharashtra, no sacred groves, as they are understood in the context of Western Ghats in general and western Maharashtra in particular, exist in Nagpur district. However, there are many sacred places within the forests and floristic there resembles in many ways with that found in sacred groves. Such places may have be the places of warship since long time and hence unattended and uncontrolled human activities there may very adversely affect these sensitive locations. It will therefore be preferable to regulate these activities and integrate such areas into a sustainable eco-tourism programme. A register of cultural/archeological sites at the division level is proposed to be maintained in order to create a permanent database for these sites in future.

2. Seminary hills, comptt. No. 715 (area 67.41 ha) containing Anjan and Teak forests is located within the Nagpur city. This forest area gives it a unique distinction of being one of the few cities in the country that can boast of beautiful and dense forests within its surrounds.

3. Besides, forests in Ambazari and Gorewada catchments, new compartment numbers 790 to 799 with a total area of 2618.6 ha. are situated near Nagpur. In fact major portion of these forests is also within the corporation limits. These areas are a green belt for the city and are therefore intended to be included in the list of 204 heritage buildings /precipitin in Nagpur Municipal Corporation limits vide gazette notification dated 10.2.2000 under section 37(1) of the Maharashtra Regional and Town Planning Act, 1966. The two areas have been kept in grade-I in these list, meaning thereby that they are of national importance from aesthetic point of view and are the prime landmarks of the Nagpur city. These areas richly deserve careful preservation. A committee called as Heritage Conservation Committee has been constituted under these provisions for regulating inter alia matters relating to granting permissions for development of these precincts in the overall interest of the environmental conservation.

Therefore, Ambazari and Gorewada forest areas along with reserve forests of Seminary Hills (area 67.41-compartment no. 715) are the appropriate places where city based eco-tourism activities can be developed. Hence, this area is specifically allotted under this working circle for eco-tourism purposes. Maharashtra has a unique concept of forest parks and there are 43 such parks in the state, which include Seminary Hills Forest Park also. These forest parks are a major attraction particularly in a large city like Nagpur. However, Seminary Hills has many limitations including area constraints. There is a proposal to establish a zoo of national standards at Gorewada. Gorewada forests are spread in extensive area and, hence, they are an ideal location for establishment of nature interpretation center on the lines of the one developed in Borivali or in some other PAs. Hence following activities in Gorewada are envisaged:

- Establishment of modern Zoo of national standards.
- Establishment of Nature interpretation center.
- Establishment of Forest park.

(4) CONSERVATION OF GREAT INDIAN BUSTARD (ARDEOTIS NIGRICAPS)

Great Indian Bustard (GIB) is one of the rarest birds and is kept in Schedule I of Wildlife (Protection) Act 1972 (P) Act, 1980. Maharashtra is however one of the few States, which has taken significant steps in its protection. Conservation of habitats of GIB was on the agenda of 10th five year plan and identification of suitable alternative homes of isolated populations of species like GIB is identified as an action under National wildlife action plan 2002-2016. Gazetteer of Nagpur district has mentioned abundance of this bird in this district. The bird had been seen in this area till 1980. However, thickly forested areas in charge of the deptt. under this division do not have suitable GIB habitats of much significance. However, certain grasslands in Umred ranges, community lands and uncultivated private lands in and around Umred even now offer conditions conducive to existence of GIB. A solitary bird was spotted in one such area on 4.11.1991 in presence of the then CWLW. One of the authors of this plan who was working as Deputy Conservator of Forests (W L) Nagpur at that time had accompanied him and thus was part of the team, consisting of a few members of an NGO-VNHSC, Nagpur, CWLW and ex CWLW of MP, which had spotted the bird on that day.

Under the Maharashtra Forestry Project, a study to find out the existence and suitable habitats of GIB in this region was conducted. The scope of this study was later on widened to study suitable and potential habitats of GIB in whole of Vidarbha and also that of lesser florican (LF) and Jerdon's courser (JC). The Pilot Project Area (PPA), which fell within the geographical limits of Nagpur Forests Division encompassed areas around the place where the bird was seen on 4.11.1991 and included grasslands of the forest area in this region as well as community and private lands. It is designated as Nagpur-Mauda- Umred- Butibori- Nagpur PPA comprising 900 sq. km area of 6 talukas of Nagpur district. This PPA includes some forest area, many patches of community land including zudapi jungle and private lands containing sizable uncultivated lands.

By identifying GIB as flagship species for conservation intervention in this area, we may further investigate existence or otherwise this bird in the region. Besides such an effort may help in investigating existence/ occurrence of other upland birds, that is, JC & LF in the region. These management inputs shall also go a long way in the conservation of other grassland avifauna along with lesser carnivores, reptiles etc. of the region. However, the area, as mentioned above, predominantly contains private lands and no systematic basic data in respect of bio-diversity of the area and threats to it is available. Hence, no possible legal framework and direct intervention is proposed. There are however NGOs in Nagpur, which continue to explore this area. Therefore, the division shall endeavor to facilitate and encourage those non-governmental efforts and be an active partner in this exploration. It may take up sustained Nature Education Programs with on emphasis on discovering and conserving GIB in the region.

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Chapter 19. Miscellaneous Regulations

19.1 BOUNDARY DEMARCATION

In order to keep the integrity of forests areas intact, strict vigilance over the forest boundary and periodic verification of the demarcation on the ground for the entire forest area has been prescribed. However, in view of the position of demarcation and boundary pillars on the ground, priority areas for the demarcation work have been identified. For the purpose of boundary demarcation, the following areas have been identified in the order of priority;

- ☑ Reserved Forests notified during 1977–78.
- ☑ All the Protected Forests.
- ☑ Outer boundary of remaining forest of compartment in which erstwhile forest villages are located **(Appendix 19.1)**
- ☑ All unclassified forests with the division.
- ☑ Zudupi Jungles transferred to the division.
- ☑ Disforestation areas of the various reservoirs and other non-forestry projects of which disforestation maps are not available.
- ☑ Forest areas where exact boundaries are not shown on the forest maps.

The priority will be the areas while at the interface with the private land.

19.1.2 THE SPECIAL OBJECTIVE OF MANAGEMENT

1. To maintain territorial integrity of forestlands in the division by delineating their boundaries by permanent pillar marks to act as psychological barriers.
2. To ensure effective protection of the forest resources of the entire division against adverse influences.

19.1.3 APPROACH TO THE FOREST DEMARCATION

1. Well-defined forest boundary is a prerequisite for effective forest protection and its sustainable management. However, in most of PF the forest boundary marks are either missing or in a very poor state. Forest areas vulnerable to boundary obliteration need to be identified for survey and demarcation so that forest encroachment on the forest fringes could be detected, promptly. Presence of boundary marks also serves as psychological barrier against the forest encroachment. Artificial boundaries adjoining private land are proposed to receive the highest priority to ensure protection of these areas.
2. The gaps in the land records, such as, incomplete disforestation maps or unavailability of the authentic forest maps should be closed as soon as possible.

3. The forest maps by using GIS software has been developed and the total external boundaries is being calculated, by digitising external boundaries in Geometic software.
4. The Zudupi jungle areas were taken over by the division, without due verification of records and demarcation on the site. Most of these areas were not demarcated before taking over the area. Hence, examination of record, collection of authentic maps and demarcation of the area is essential for the entire Zudupi Jungle. Majority of these areas have by now been proposed for notification under section 4 of IFA, 1927. This process shall be completed expeditionary and enquiry will have to be conducted in a time bound manner.
5. **Fixing Boundary of the Erstwhile Forest villages**

   There were 15 forest villages, which were located within the reserve forest compartments. They have been formed into the revenue villages in the year 1970 by disforesting the requisite area of the reserve forest of the respective compartments. These details are given in the **Appendix 11.1c**. The boundaries between the forest land and the village within these compartments however are not clear on the ground. A sample checking in case of Van Paoni ¼ou iouh½ village of Ramtek range (RF comptt. 421) was done physically when it was revealed that old pillars of the erstwhile outer RF boundary near this village are being maintained as 1/5th boundary demarcation programme. The numbers on these pillars lead to an impression that village Van Paoni is still within the forest area. Therefore, it is necessary that outer boundary of this village is surveyed, new pillars bearing revised series of numbers of RF boundary are fixed and these details are shown on the map. Similar work may be required in other erstwhile forest villages.

19.1.4 FORMATION OF DEMARCATION WORKING SERIES

It is proposed to cover the entire boundary in *5 years* period i.e. the period of this plan. The entire boundary is proposed to be worked under 5 years working series. Details of the compartment boundaries, for survey and demarcation purposes will be included in the final draft. **(Appendix 19.2).**

19.1.5 SURVEY AND DEMARCATION OF BOUNDARIES

1. **Demarcation of the external forest boundaries**: The entire area shall be tackled during the ten-year plan period**.** The length of the external boundary of the Reserved Forests is 786.91 km of which about 41.27 km, is formed by permanent natural features. Whereas, the boundary line of Protected Forests is 2132.10 km, out of this 15.80 km from permanent natural features. The boundary common with Reserved Forest is 283.80 km. In addition, boundary length of Unclassified Forests is 117.05 km, out of which, 41.55 km is common with Reserved Forests and 67.90 km is common with Protected Forests. **(Appendix 19.3).**

2. The Principal Chief Conservator of Forests has approved in May 2001 a demarcation model using a series of concrete pillars**.** This model as modified, till date, shall be followed for the external boundary.

3. Cement-concrete pillars at bends and corners of the artificial boundaries should be raised immediately after the boundary survey. This work will require substantial fund allocation, as it will need sizeable manpower and resources.
4. Some of the forest staff can be trained at the training institutes of the Land Records Departments, and engaged for boundary survey and demarcation work in undisputed sections. There is a need to delegate the power under section 136 of Maharashtra Land Revenue Low, 1966 to the forest surveys.
5. The protection staff shall continue with traditional demarcation using stone Cairns or earthen Cairns of standard size till such permanent boundary marks are created or re-established in the field. The specifications of a boundary cairn are given in the paragraph 19.1.5 (13). The traditional demarcation work will be checked at least once a year. Hence, this plan considers the 1/5 boundary demarcation schedule as irrelevant, and this schedule is thus dispensed with.
6. **Demarcation of the internal forest boundaries:** Internal boundaries between compartments or those between the Reserved Forests and the Protected Forests may be demarcated using traditional stone cairn, earthen cairn or standard wooden pillar (paragraph 19.1.5 (13)). Fund allocation for this work is generally discouraged because it is a part of the responsibilities entrusted to the protection staff. This work should not be unmanageable in light of the manpower available in the Forest Labourers.
7. **Routine boundary maintenance**: The Beat Guard after his personal inspection of the entire compartment must submit the '*Compartment Inspection Certificates'* every month before disbursement of the monthly salary. The certificate must record forest encroachments, illicit cutting and condition of forest boundaries including pillar numbers and inter-pillar visibility conditions. Separate certificate should be submitted for each compartment.
8. The Round Officer should submit similar certificates for his inspections. Half of his certification should involve checking of the work done during the previous month by the Beat Guards in his jurisdictions, and the other half should involve checking of the compartments not reported by the Beat Guards during the months. He should also submit monthly report regarding the action taken on the forest offences recorded and the progress of forest enquiries entrusted to him.
9. The Range Forest Officer can allow the delay not exceeding 15 days for reasons recorded in writing. Default on this account for consecutive 2 months should be viewed as dereliction of duty and should attract disciplinary action.
10. The Range Forest Officer should check accuracy of the 'Compartment Inspection Certificates' according to the prescribed norms covering each round. He should

personally check at least 2 (two) vulnerable compartments other than those covered by the Beat Guards and the Foresters during the previous month.

11. The Range Forest Officer, Mobile Squad will co-ordinate cross-checking of 'Compartment Inspection Certificates'.
12. These guidelines shall be applied along with other directives issued for the forest protection from time to time. Other field officers will carry out their field inspections according to these guidelines as modified from time to time.
13. **Specification of boundary pillars:** The prescribed design must be followed to carry out the task of fixing the boundary pillars as prescribed. According to provisions contained in the BFM Vol. III, Conservator of Forests is empowered to give sanction to the design of the pillars. However, May 2001 instructions referred to as above have given uniform specification for this purpose. Accordingly 1.40-meter long cement concrete pillars at roughly 50 meters interval on the external forest boundaries will be erected. Wherever the external boundary is shared with other government land, the interval should be increased to 100-150 meters and intermediate pillars may be 0.90 meter long. Both types of pillars should be embedded to 0.40-meter depth in the cement-concrete base. The prescribed tapering cross-section of the 1.40-meter pillar is 0.10 x 0.15 meter at the top and 0.15 x 0.23 meter at the base. The 0.90 - meter pillars are parallel pipe with 0.15-meter width and thickness.
14. **Specification of a boundary cairn:** Artificial boundaries should be marked with a series of boundary Cairns. A Cairn should be made of loose stones upon excavated foundation to a depth of 30 (thirty) centimetres and shaped like a truncated cone. Interspaces between the large stones should be filled in with small stones, and the outer stones will be wedged with stone chips. A cairn will be 1.20 meter high, and have 1.20 meter top diameter and 1.80 meter base diameter, as described in the *Central Province and Berar Forest Manual*. A slab stone (0.20 x 0.20 x 0.90 meter) or a timber stake projecting 1/2 (half) meter in the centre will be fixed firmly on the top of the cairn, and marked with cairn serial number. Each boundary marks (cairns) must be visible from its neighbouring ones on both sides. Distance between two consecutive boundary marks should not exceed 250 meters. The cairn stone or post should be colour washed white for the open forests and red for the closed forests. The cairn tops should have direction of boundary lines shown by the same colour lines radiating from the centre. Such Cairns can be made of earthen mass, where stone boulders are not available.
15. **Recording locations of the boundary pillars or Cairns:** The location of the boundary pillars and Cairns along with their numbers should be shown on the maps. The numbering will follow the convention communicated by the Chief Conservator of Forests in charge of the land matters. The numbers shown on

the topo-sheets will be maintained unless warranted by the compelling reasons. Such reasons must be reduced in writing and entered as a note on the master set of the maps. This master set will be made available to the Working Plan Division for updating the working maps and the digital database.

16. **Clearance for the boundary line:** Boundary line clearance on the artificial boundaries will follow the standard width as described in the directives on the subject. Trees should not be felled for the boundary line, but shrubby undergrowth should be cleared. Norm for the external boundary line is *12 meters*. The internal compartment boundary lines should be *3 meter wide*.
17. **Compartment plates:** Metal plates on the boundary trees at a height of 2.5 to 3.0 meters will be fixed on the corners and roughly at half-kilometre interval on the side away from the compartment. The colour of the plate and lettering should agree with the state-level general guidelines. Till such guidelines are available, red letters on white plates will be used. Size of the plate and letters should not be less than *15 cm and 10 cm*, respectively. Strokes should be at least 2 cm wide.
18. **Colour wash on the boundary marks:** The Beat Guard will be responsible for annual freshening of the pillar numbers, the compartment plates and the colour-wash of the boundary pillars carried out in September-October. He must submit details for work done in each compartment in his *Annual Colour-Wash Report.* The Round officer will carry out sample checking of the report in the manner decided by the Range Forest Officer. Only material cost should be admissible for the purpose.

19.2 MISCELLANEOUS AREA MANAGEMENT

19.2.1 The previous plan constituted miscellaneous working circle comprising various forest areas not specifically allotted to other working circle. Major portion of area under this working circle was that which was either transferred or was earmarked to FDCM. The process of transfer of forest area to FDCM is now complete and hence this area has been under mentioned in **Appendix 1.8** and has been fully explained under paras 1.6.06 of chapter 1. Besides plan has been prepared for the forest area of 1721.267 sq.km. which is administratively with Nagpur division. Hence, it excludes area transferred to FDCM (394.109 sq.km.) and to wildlife wing (273.485 sq.km). Other areas under miscellaneous working circle in the previous plan like RF compartments 421 (Ramtek range) and 715 (Seminary Hills) have been allotted to appropriate working circles. Continuance of this working circle therefore was not required.

However, 14516.74 ha of Zudapi jungle and 2933.93 ha of non-forest land (para 1.6.14 of chapter 1) have been recently transferred to the division and the process of issuing notification under section 4 of IFA, 1927 in regard to these areas

has been initiated **Appendix 1.6**. But due to lack of necessary maps and other relevant information, these areas (Zudapi jungle areas) could not be allotted to any working circle. NF land (2933.93) includes 2640.45 ha of forest land of Ambazari and Gorewada which has been notified under section 4 in the year 1990 and hence has been included in the P&CAM working circle. Thus, no prescriptions could be given in this plan in regard to the Zudapi jungle and the balance NF land (293.48 ha). Aspects of survey, demarcation and map preparation for these areas have already been dealt with under para 19.1 above and as per the latest available information, these areas are categorised as follows

1) Zudapi jungle already proposed under various projects (13040.10 ha).
2) Zudapi jungle where plantations have been already raised (398.58 ha).
3) Zudapi jungle available for projects in future (1476.64 ha).

19.2.2 The details of Zudupi jungle areas under Category I, are given in **Appendix 19.4**. These areas are characterised by blanks and sparse vegetation having few dense patches scattered over entire area. The areas have been proposed for compensatory afforestation under various projects by the division. In the event of approval of projects, these areas will be taken up for plantations under compensatory afforestation scheme, as per prescriptions of the Afforestation Working Circle (AFF). However, till then, it seems logical and hence proposed to carry out works of soil and water conservation and tending operations in these areas.

19.2.3 Areas under Category II include plantation areas **(Appendix 19.5)**. These areas have been proposed for scheduled cleaning and thinning operations along with other plantations as per Appendix 12.2

19.2.4 The areas under Category III form the part of land bank intended to be used as areas for compensatory afforestation against future projects. However, it seems logical and hence proposed to carry out works of soil and water conservation and tending operations in these areas **Appendix 19.6**.

19.2.5 Due to their proximity to the habitations these areas require close watch and proposed to be provided protection against forest fires, over grazing, illicit cutting and encroachment. It is proposed that these areas shall be managed to primarily meet the local needs of fuel wood, fodder and small timber by involving local communities through JFMCs and other authorised village bodies.

19.3 DEMARCATION, PREPARATION OF TREATMENT MAP AND MARKING OF COUPES.

19.3.1 DEMARCATION OF COUPE:

1. The annual coupes for the harvesting and tending operations will be demarcated one year in advance, and each coupe, if so required, is proposed to be subdivided into four sections for effective management and control. The Range

Forest Officer will thoroughly inspect the coupe after demarcation and issue 'Coupe Demarcation Certificate' in the prescribed format, given in the following paragraph, which is to be verified by the concerned Assistant Conservator of Forests.

2. Format for the Coupe Demarcation Certificate is prescribed, as follows, in Form No. 21.1 :

Form No. 19.1

"I ---------- - R.F.O. ---------- certify that I have personally inspected the demarcation of the coupe No. ---------- in Compartment No. ---------- of F.S. ---------- of W.C. ----------on dated---------- and found that the coupe has been demarcated as prescribed in the working plan. The area of the coupe is ---------- hectares.

Date: Signature of the RFO

3. **DEMARCATION OF COUPES:** Annual coupes have been prescribed to be demarcated by cutting and clearing bushy undergrowth on 3 (three) meter wide line and by erecting pillars or posts up to 2 meter height in middle of the cut line at suitable intervals, so as one pillar shall be visible from the other one, except where the coupe boundary runs along streams, fire line or road. The pillars shall bear the coupe number, name of the felling series and the working circle on the side away from the coupe.

4. Selected trees, above 45 cm gbh, at suitable intervals standing on the periphery of the coupe will be given two coal tar bands and a geru band in between after scrapping the loose dead bark. The lower coal tar band will be at B.H. and the other coal tar band will be 15 cm above it. Just below the lower coal tar band *Tree serial number* in Arabic will be given on the side away from the area of the coupe. The bands and serial numbers of such trees will be maintained in the marking register in, the following, Form No. 19.2.

Form No. 19.2 List of trees on the coupe boundary

S.N	Name of species	GBH (OB)	Remarks
1			
2			
3			

5. No tree, bearing the coupe demarcation bands, is proposed to be marked for felling.
6. **DEMARCATION OF SECTIONS:** For effective monitoring and control of the harvesting operations, each coupe marked for felling in SCI and Improvement Working Circles will normally be divided into four approximately equal sections. Sections will be demarcated by 1.5 m. wide cut lines by clearing brushwood, unless the section line runs along a permanent feature.
7. Trees above 45 cm girth, selected at suitable intervals on the inner edge of the 1.5 m wide cleared section line will be given two coal tar bands 15 cm apart, the lower coal tar band being at breast height. Just below the lower coal tar band section number will be given on the side away from the area they would denote.
8. **DEMARCATION OF PROTECTION AREAS**: Selected trees, on the periphery of the *Protection areas* will be given two geru bands 15 cm apart, lower band being at B.H. In addition, a cross in geru colour between the bands will also be given on the side away from the protection areas. All those trees will be serially numbered. The serial number will be given on the side away from the protection area just below the lower geru band, on the side bearing the cross. All the protection areas will be numbered in Roman numerals and the trees standing on the periphery of each protection area will be numbered in Arabic, adopting separate series for each areas, so that the trees on periphery of Protection Area No.I will bear the Sr. no. I/1, I/2, I/3, etc. and the similar trees on the periphery of Protection Area No. II will bear the Sr. no. II/1, II/2, II/3, etc. The protection area will also include sample plot and presentation plot, shown in Red. These are to be excluded from the marking.
9. **DEMARCATION OF OTHER AREAS GIVEN IN THE TREATMENT MAP:** The other categories of areas shown in the treatment map will be marked by giving one geru band at B.H and one coal tar band 5 cm above it.

19.3.2 TREATMENT MAP:

1. Immediately, after completion of demarcation of the coupe, RFO will prepare the *Treatment map* of the coupe by clearly showing the various *Treatment-type areas* as prescribed in the chapter 9. The concerned ACF will verify the treatment map and make corrections, if necessary, before submission to the DCF Nagpur for approval.

   The treatment map will bear the date of preparation by the Range Forest Officer and the of verification by the Assistant Conservator of Forests.
2. The compartment maps prepared in the Forest Geomatics Centre, Nagpur should serve as the base maps, which would be used for marking areas suitable for different treatment types. Corrections in the base maps, if any, and observations on crop conditions in the coupe should be recorded and send to the Working Plan Officer for verification and updating the digital database.

3. Preparation of treatment map will preferably be done one year, in advance, of the coupe working. Timely preparation would facilitate necessary checking and corrections, if any in time.
4. Immediately after seeking approval of the treatment map, site-specific Work Plan for the entire coupe shall be prepared by RFO, incorporating all the prescribed activities under various treatment-type areas marked on the map, entailing quantum of work involved, estimated amount required and period of operation for each activity. The Work Plan is proposed to be verified by the ACF concerned and submitted for approval by the DCF Nagpur or CCF (Territorial) Nagpur, as the case may be, depending upon the extent of amount involved. The work plan is prescribed be got approved sufficiently, in advance, the commencement of coupe working in the respective coupes.

19.3.3 MARKING OF TREES FOR HARVESTING.

1. After approval of treatment map, marking of trees for harvesting shall be carried out as per prescriptions given in respective working circles. Marking of trees for harvesting shall be done one year in advance of the coupe working and it shall be done departmentally. Timely marking would facilitate necessary checking and corrections, if any, in time.
2. Marking is prescribed to be done by the forester concerned under the close supervision of RFO and constant guidance of ACF concerned. The DCF shall himself inspect majority of coupes to ascertain proper marking as per prescriptions of working plan as well as to guard against the excessive marking. To ensure this close supervision, a marking certificate in following format is prescribed.

Form 19.3

I, …… RFO, …… personally inspected the marking of the coupe No. …….. in compartment No …… of felling series …… in ……. Working circle …….. on dt…….. and found that marking of trees for felling has been done as prescribed in the working plan.

Date : Signature of the RFO

These certificates shall be regularly and frequently checked and verified by ACF as well as Deputy Conservator of Forests.

3. Trees marked for felling will be given *geru bands* at breast height and will bear marking hammer impression at the B H (breast height) as well as at the base on the blazes of sizes 10 cm x 10 cm.

4. Following trees in addition will bear digit serial numbers both at BH (Breast Height) and at the base.
   a) All trees of Teak, Bija, Shisham, Ain, Tiwas, Haldu, Kalam, Dhaora and Siwan of 45 cm and above, girth at b.h (o.b).
   b) Trees of all other species, of and above, 60 cm girth at b.h.
5. The remaining trees marked will bear serial numbers, which will be given by coal tar. The digit and coal tar serial numbers will form separate series.
6. The number of the tree marked shall be written vertically on the blaze, shown as under:

For Tree no. 210

XX (Hammer mark)
2
1
0

7. All trees bearing serial numbers will be individually recorded in marking (recording) book in, the following, *Form No 19.3***.** Serial number given in coal tar must be recorded in the marking book.

Form No. 19.3 Format for marking of trees for harvesting

Tree Digit No.	Serial No. Coal tar	Name of species	GBH (OB)	Remarks

8. Abstract of trees marked for felling will be made in 15 cm girth classes. Timber, poles and firewood trees will be shown, separately.
9. Malformed trees alone will be recorded as fuel trees, except that of teak. A tree will be classified as fuel tree only when it is incapable of yielding any useful sawn timber or pole.

19.4 FOREST PROTECTION

19.4.1 Status of forest offence cases: The Range Forest Officer, the Assistant Conservator of Forests and the Deputy Conservator of Forests will take review of forest offence cases at least once, every month. Shifting of boundary marks along the forest boundary shall be viewed seriously, and the adjoining landholders or encroachers would be charged in the court for omission or commission causing

obliteration of the forest boundary. Charges regarding all cases of forest encroachments must be submitted before the Judicial Magistrates within 3 months. Similar time-bound action is recommended in all cases of timber theft. All cases of violation of the Forest (Conservation) Act, 1980 shall be referred to the Nodal Officer for suitable directives.

19.4.2 Routine monitoring: The Deputy Conservator of Forests shall personally carry out routine checking of the Range Offence Register and the Round Enquiry Reports in at least 4 Ranges every year. Similarly, the Conservator of Forests shall check these records in at least one Range every year, and circulate the inspection report to all the Ranges.

19.4.3 Regular training: The Deputy Conservator of Forests and the Assistant Conservator of Forests will periodically convene staff meeting to review and impart training for the boundary management and for effective disposal of offence cases. Training should be organised locally with the help of the Education Circle.

19.4.4 JFM activities: JFM activities open up communication channel, discourage forest offences and provide village bodies an opportunity for direct involvement in forest protection. Therefore, JFM activities should be encouraged, and taken advantage of as a workable strategy for effective forest protection.

19.5 FIRE PROTECTION

19.5.1 Fire adversely affects natural regeneration, forest growth, ground flora, soil organisms and site productivity. Effective fire control as prescribed in the plan is essential for the forest development. The division officials and local people should be sensitised about the need of effective fire control. All fire incidences must be meticulously recorded and investigated to assess the damage caused. Records of fire exceeding 100 ha proposed to be sent to the Forest Geomatics Centre, Nagpur for random cross-verification using the satellite imageries.

19.5.2 Classification of fire control

Class-I (Complete Fire Protection): The Class-I fire control areas include all felling coupes (six years), thinning coupes (six years), plantations (five years), the A-type areas (permanent), forest depots (permanent), forest nurseries (permanent), Special habitat areas (permanent) and any other areas of special importance decided as such by the Chief Conservator of Forests (Territorial) Nagpur.

Class-II (General Fire Protection): The Class-II fire control areas include the remaining areas of the Selection-Cum-Improvement and the Improvement Working Circle as well as any other areas, which deserve this protection in the opinion of the Chief Conservator of Forests (Territorial) Nagpur.

Class-III (General vigilance): The remaining forest areas (that is, areas not included in the above two classes) and pasture areas are identified as the Class-III

fire control areas. Any special measure for the fire protection is not undertaken, but deliberate setting of fire and burning the forest is prohibited.

19.5.3 Fire control measures

1. A fire protection scheme for the entire division shall be prepared before February each year, identifying the watch points (including watch towers), strategic locations, strength of fire watchers at each location, deployment of vehicles, use of wireless sets, supervising of the forest staff and the co-ordination protocol.

2. Each location is proposed to have 5 to 10 persons including regular staff and fire watchers. The staff should be trained in the application of modern fire-fighting tools. The fire prevention should be treated as a high priority item. The scheme should be implemented sincerely during the fire season.

3. Areas deliberately burnt for silvicultural reasons under the sanction of the Chief Conservator of Forests (Territorial) Nagpur will be excluded from the fire protection scheme. Fire in such areas need not be reported unless spreads beyond such area.

4. All the Class-I and Class-II areas will have external fire lines and internal fire lines dividing the forest area into convenient blocks. The Class-I areas will also have cut and cleared guidelines.

5. Fire Watchers and local forest staff will constantly patrolled the Class-I and Class-II fire control areas. The directives require that fire in the Class-I areas be reported to the Deputy Conservator of Forests, immediately, along with details of the area burnt and the damage inflicted on the forest crop.

6. The group of fire watchers shall immediately rush to the site and extinguish fire as soon the fire spot is located by upcoming smoke in their area of operation. Modern fire fighting tools should be used for extinguishing the fire. The supervising officials should mobilise reinforcement in case of large fire. Utmost care will be taken to quench the smouldering material. Providing a thick layer of soil over such material is generally effective.

7. The fire lines will be kept clear of all growth and combustible material during the fire season. Leaf litter and other dry material on the fire lines will be collected periodically along the edge and burnt before the fire season starts.

8. The cutting of fire lines should be completed in December. Fire tracing (burning) should be completed in February, and thereafter should require permission of the Deputy Conservator of Forests and physical presence of a gazetted officer.

9. The division office shall maintain a *"Register of fire lines,"* and enter the period of cutting and burning of fire lines. The register will be kept up to date and checked every year, in March. **(Appendix 2.2).**

10. Standard widths of fire lines are prescribed in the Table 19.2. The supervising officer will decide the width unit for carrying out the fire line work on the shared boundary.

Table 19. 2. Standard width of various types of fire lines

S N	Characteristics of the area	Width of fire line
1	External Reserved & Protected Forests boundary	12 meter
2	Naturally or artificially regenerated areas (For 5 years)	6 meter
3	Remaining coupe boundary	3 meter
4	Both sides of roads and cart tracks passing through the forests	6 meter
5	Timber, bamboo and firewood depots	40 meter

11. Negligence in the fire protection by the staff should be taken as dereliction of duties. The supervisory officers have been proposed to, extensively, verify the fire control measures.

19.6 GRAZING REGULATIONS

19.6.1 Due to absence of revised grazing settlement for the tract under consideration, the grazing in the division is prescribed to be regulated as per the guidelines of Grazing Policy 1968; and Grazing Rules 1973 of Maharashtra state.

19.6.2 Heavy cattle pressure adversely affects the forest regeneration and soil condition. The statutory provisions regulating grazing are difficult to apply in the entirety. The present political economy of domestic animals in the area throws up strong challenge and implementation of the grazing regulations in its current form.

19.6.3 The situation may be substantially improved by establishing effective communication with the local people, awareness generation and efficient animal husbandry programme. The forest officers should take up these preventive measures in co-ordination with the Animal Husbandry Officers.

19.6.4 Maximum admissible grazing incidence according to the current policy has been shown for various working circles in Table 19.3. A systematic survey of fodder availability is recommended during the plan period in each protection round. **(Appendix 19.7).**

Table 19.3. Admissible grazing incidence in various working circles

Working Circle	Functional classification	Maximum grazing incidence (hectare per cattle unit)	
Special areas (overlapping)			
1. Protection areas (A1 & A2) & 2. Special habitat areas	Protection forest	Nil	Permanent
3. Flowered bamboo area	Protection forest	Nil	Till seventh year
4. Annual coupes	Protection forest	Nil	Till six year
5. Plantations	Protection forest	Nil	Till fifth year

Other areas (under Working Circles)			
6. Selection-cum-Improvement	Tree forest	1.2	
7. Improvement	Tree forest	1.2	
8. Afforestation	Open forest	0.4	0.8 after plantation
9. Miscellaneous	Minor forest	0.8	Except plantations
10. Protection	Protection forest	Nil	Permanent

Note: Area required for wildlife population should be calculated accordingly, and deducted from the available for the domestic cattle. If relevant data is not available 20% area should be marked for the wildlife.

19.6.5 The carrying capacity and period of closure should be calculated for the forest areas falling in each village. The grazing passes, free or otherwise, to individual families proposed to be distributed on this basis. These village bodies should also be engaged in the implementation of grazing regulations.

19.6.6 The surplus cattle should be kept under regular watch, and villagers should be encouraged to adopt stall-feeding or other means to address mismatch between cattle-heads and fodder availability.

19.6.7 Fodder development on the community lands and translocation of surplus cattle may be encouraged.

19.6.8 The Animal Husbandry and the Dairy Development agencies should be motivated and influenced to take up breed improvement programme. Fodder in the plantation areas should be made available free of cost on cut-and-carry basis.

19.7 ILLICIT CUTTING

19.7.1 Illicit felling in the forest area is growing at alarming rate. Since the subject is dealt separately according to a series of directives for the purpose, recommendations of this plan are of a little consequence. However, faster communication including vehicle facilities, adequate defence capabilities, frequent training and establishment of forest stations at strategic places are recommended to control illicit felling and wildlife offences. Establishing intelligence network for the purpose is strongly recommended.

19.7.2 In addition to addressing supply-side management by augmenting wood production on forest and other community land, the demand-side management should take up efficient wood utilisation and energy efficient alternatives like *smokeless chulhas, biogas, solar cookers*, etc.

19.8 FOREST ENCROACHMENT

19.8.1 The causes of forest encroachment should be examined thoroughly and addressed in a comprehensive manner. All the necessary support should be provided, and encroachment should be evicted as early as feasible. The boundary management and standard administrative guidelines will help contain encroachment.

19.8.2 The state government should be urged to finalise and complete the land grant in all identified cases of encroachments to be regularised in accordance with the government resolutions issued before 1980. **(Appendix 19.8)**

19.8.3 The forest areas under encroachment from 1978 onwards are *2000 ha. The efforts undertaken by the division lead to eviction of encroachment in 1500 ha.* The Balance area under encroachment after 1978 onwards is 1000 ha **(Appendix 19.9).** Renewed and concerted efforts on the part of division staff for eviction of encroachment are proposed on priority basis.

19.8.4 Small isolated patches of the forestland are often neglected and become vulnerable to encroachment. Special care shall be taken to ensure protection of such patches from encroachment.

19.9 SOIL AND MOISTURE CONSERVATION:

19.9.1 The areas adjoining the human habitations, especially, the Protected Forests have become devoid of vegetation by way of illicit cutting, heavy grazing and repeated fires. The compaction of soil reduces percolation of water and the water holding capacity of the soil. Due to these factors, NR of teak and its associates die back before being established as part of future crop.

19.9.2 The soil and moisture conservation is crucial to maintain and improve the site conditions as well as water regime of a given tract. Moreover, extensive silvicultural works have been prescribed in this working plan to regenerate the forests primarily assisting and tending the existing NR and the available rootstock. To ensure the success of these operations in improving the forests, soil and moisture conservation works are of utmost importance.

19.9.3 The soil and moisture conservation works would start along with the marking of coupe and be completed before the onset of monsoon. Wherever feasible, the local material obtained from climber cutting, bamboo cleaning and shrub clearance should be used for brushwood check dams to arrest the soil loss.

19.9.4 It is prescribed to follow watershed management approach viz. the *ridge-to-valley approach* for carrying out soil and moisture conservation works. The contour trenching and gully plugging/check dams, as given under, have been prescribed to constitute the major component of these works.

19.9.5 CCTs as soil conservation measure are not prescribed because past experience in this regard in the division has not been encouraging.

19.9.6 Nala Bunding and Check Dams: The primary objective of nala bunding and check dams is to reduce the run off water and to arrest the silt. They are prescribed to be made from the loose boulders found in and around the nala bed or from the dug up soil. No blasting shall be done for this purpose. Where sufficient boulders are not available brushwood may be used. In this plan check dams of both the loose rubble

for arresting silt and soil loss and earthen gully plugging (nala bunds) for moisture conservation and water harvesting are prescribed.

19.9.7 The structure and quantum of work will depend upon various factors such as the erosion status, ground conditions, local availability of suitable materials. However, to narrow the wide variations in implementation, the norm for gully plugging or nala bunding is proposed as 5 meter^3/hectare of loose rubble filling or earthwork unless otherwise prescribed in the specific scheme.

19.9.8 The streambeds more than 8 meters in width shall not be covered under the nala bunding. Nalas more than 8 meter wide at the top should normally require elaborate engineering structures for bunding, and therefore, such bunds should not be considered as part of the quantity prescribed here. Each of such nala bunds, if required, should be treated as an independent project.

19.9.9 The forest tanks are proposed to be taken up in exceptional circumstances without causing damage to the tree crop either during construction or due to submergence.

19.10 GUIDELINES FOR REGENERATION

It has been observed that the soil depth in areas covered under plantation programme in the division generally is very shallow and therefore the efforts made in the past in raising plantations (particularly the miscellaneous plantations) have resulted in failures. Hence, the plantations should be taken up on selective basis and only in the areas having good soil depth and which are well drained. Also the areas selected should have no or negligible grazing pressure. If the area was already planted and resulted in failure, such sites should be avoided. B2 type areas in the various working circles i.e. the under-stocked areas with scanty natural regeneration are prescribed to be considered but such areas should specifically be put to above tests before taking up plantation there. In the rest of the under-stocked areas, attempts will be made to encourage natural regeneration.

Broad criteria for regeneration in general have been developed in the foregoing paragraphs.

Local people should be involved in all types of afforestation activities.

19.10.1 Tending of natural regeneration: Preference will be to encourage natural regeneration and considering existence of sufficient rootstock in majority of areas and successful experience in its management, it will be given preference. Natural regeneration is proposed to be achieved in two ways:

i) Identifying seedlings and saplings (those having attained a height of 60 cm and occurring roughly at a spacement of 5 m, that is, about 400 seedlings per ha) of valuable species. Growth of these seedlings/ saplings shall be encouraged by way of weeding, singling, soil working and mulching in the same way as in case of plantations.

ii) The areas devoid of seedlings/saplings of seed origin but containing sufficient rootstock shall be tended (stool dressing, singling, removal of congestion etc.) in favour of valuable species. While doing so, the species, which are less in number in stocking (as indicated by enumeration results) shall however be given preference.

19.10.2 Artificial Plantations: Only the areas neither having sufficient seedlings/ saplings of seed origin nor sufficient root stock but are found to be suitable for plantation of miscellaneous species shall be covered under the plantation programme. Two-stage plantation approach is proposed. The idea is to give the nature a fare chance to regenerate itself and to intervene by way of artificial plantation only as a last resort. Thus, the plantations are prescribed to fill the deficit of natural regeneration in under stocked and blank areas.

19.10.3 Two-Stage Plantation in Afforestation areas: Under the Afforestation, Protection and also B type areas of other working circles in the trap zone (Narkhed, Kondhali, Hingna), that is, the areas, which are refractory in nature and have relatively poor soil and site quality, the plantations are proposed to be carried out in two stages, that is, the restorative phase followed by planting phase.

19.10.4 Restorative Phase: Restorative phase is proposed to include the soil and moisture conservation works and fencing in the year of coupe operations. Seed sowing of neem, chandan, maharukh and babul will be done in bushes and planting of Agave on TCM *and of Khus* on earthen soil conservation structures will be carried out in the following year. The restorative phase will be judged in the fourth year of the coupe working. Effectiveness of fencing and success of the soil and moisture conservation measures will mark the completion of the restorative phase.

19.10.5 Switch over from restorative phase to planting phase is not to be automatic: All the areas covered under restorative phase shall not be allowed to be switched over in the fourth year to the planting phase. It shall be only after evaluation of the restorative phase and the tests for the success of the restorative phase shall be those made applicable by evaluation wing. The areas failing these tests shall not be covered under plantation programme.

19.10.6 Planting Phase: The effective completion of restorative phase will mark the beginning of planting phase. Presence of 600 seedlings per hectare obtained from the seed sowing should be considered adequate for the purpose. Areas having adequate regeneration from rootstock and seed sowing will be tended as described for the rootstock management. The plantation will be taken up in the area, which could not have adequate regeneration from the rootstock or seed sowing. PPO/PYO (pre-planting operations) shall be taken up in the fourth year of coupe working, while the seedling planting and other FYO (first year operations) activities shall be carried out in the following year, that is, the fifth year of coupe working. Other plantation

works will follow in the sequence. The cleaning and thinning operations in plantations will be done in the fifth and eleventh year of plantations.

19.10.7 One stage plantation in other areas: Plantations in the remaining areas – Ramtek, Parsheoni, Deolapar, Khapa and parts of North Umred, South Umred and Kuhi ranges, that is, generally those in the metamorphic zone containing good soil and better site quality will be taken up in the single stage. The PPO/PYO (pre-planting operations) will be taken up in the year of coupe working, while FYO (first year operations) will be carried out in the following year. Other plantation works will follow in the sequence. The cleaning and thinning operations in plantations will be done in the sixth and 10th year of plantations. The extent of plantation should not exceed the prescribed norms.

19.10.8 Choice of species in artificial regeneration: Naturally occurring local species will be preferred for the plantations. In addition, plantation of Neem, Maharukh, Aonla, Karanj and Babool is suggested in two stage plantation areas and of Neem, Bamboo, Aonla, Khair, Chandan, Siris, Siwan, Shisham, Teak (in open patches only), Chichwa, Moha in one stage plantation areas.

19.11 Thinning Guidelines

19.11.1 1. Objective: Thinning may be defined as felling made without permanently breaking the canopy in an immature stand and for the purpose of improving the growth and form as well as maximum volume production of the remaining trees in the stand. Thus, the production of timber, which may though be substantial considering 2500 plants being planted initially, is not the prime objective of thinning.

2. General considerations: Thinning is proposed to be carried out in plantations and patches of dense pole crop and, by doing it, average spacing is to be maintained at one-third of the crop height. The post-thinning crop should have basal area and number as close to the relevant stand or yield table for that site quality as possible.

- It is prescribed to be carried out in the plantations having at least 50% survival in the 6th year, that is, after the sixth-year cleaning. Such areas shall be recorded in the divisional notebook.
- The first thinning shall be carried out in the 10th -year of the coupe working and it shall be of mechanical in nature. Subsequent thinnings will be silvicultural in nature and will be done in 15th, 25th, 35th year and so on till the 65th. By this time such areas are expected to merge with the adjacent natural growth.
- All thinnings will be done either at the beginning or at the end of the growing season.
- The expected results of the thinnings is available in FRI publication No Volume 9,Yr.1957.

19.11.2 Observable Factors as the basis for Thinning Procedure

(a) **Tree classification***:* To describe the nature and intensity of a thinning, there is a choice between qualitative and quantitative methods; the former being almost mainly subjective. The older procedures were all of former category, as would be expected from the fact that the latter calls for standards of reference which are still only available for a few species. The individual trees in a crop were classified by height and size of crown, whilst the thinning prescriptions laid down which classes were to be removed. The standard adopted is, as follows:

I. DOMINANT TREES (D): All trees which form the uppermost leaf canopy and have their shoots free. These are usually subdivided as follows:
   (1) Pre-dominant trees comprising all the tallest trees which determine the general top level of the canopy, and
   (2) Co-dominant trees which fall short of this, averaging about 5/6 of the height of predominant.
      (a) Trees with normal crown development and good stem form.
      (b) Trees with defective stems or crowns, e.g. :
         1) Trees with crown space cramped by neighbouring trees,
         2) Badly shaped old advance growth,
         3) Trees with forked leader and similar defects
      (c) Trees with very defective stems or crowns, i.e. with same defects as (b) to such an extent that they are of little or no present value or promise.
      (d) Whips -Trees with very thin bole and very constricted crown incapable of existence without the support of the neighbouring tree

II. DOMINATED TREES (d): These trees do not form part of the upper most leaf canopy, but the leading shoots of which are not definitely overtopped by the neighbouring trees. Their height is about ¾ that of the tallest trees.
   (a) Trees with normal crown development and good stem form.
   (b) Trees with defective crowns or stems.

III. SUPPRESSED TREES (s), which reach only about ½ to 5/8 of the height trees, with their leading shoots definitely over-topped by their neighbours or at least shaded on all sides by them.

IV. DEAD AND MORIBUND TREES (m). This class also includes bent over and badly leaning trees usually of the whip type.

V. DESEASED TREES (k): This class includes those trees which are infected with parasites to such an extent that their growth is seriously affected or that they are a danger to their neighbours.
   (a) Dominant.
   (b) Dominated and suppressed.

19.11.3 THINNING METHODS

General considerations: When a plantation is made, silvicultural requirements, particularly, the restoration or creation of a tree cover to the soil dictate spacing than would be adopted if economy is not the immediate cause and number of plants required had alone to be considered. Many of the original number planted have to be cut out when they are of little or no sale value to permit satisfactory development of those retained. Even so, the number of stems still standing after the first thinning or two, will be far greater than the final number at maturity, and somewhat irregular spacing is, relatively, un-important as it can be adjusted in later thinning.

(1) Mechanical Thinning: There may accordingly be little objection to provide extra growing space by the mechanical removal of complete lines of plants, or every alternate plant subject to provision to cover cases of local gaps. Where spacing is irregular, the "stick" method used in natural regeneration is a possibility whereby one tree of every pair of adjoining trees is removed if the distance between them is less than a prescribed length.

(i) Only one mechanical thinning has been prescribed and it will be removal of one pole in a diagonal cluster of three poles.

(ii) It is usually provided that where there is a gap in the retained line, an adjoining plant in the cleared line should be retained.

(iii) This method is only practicable where casualties are very few and growth is both good and even under such conditions but it is out of question in poor or uneven plantations.

(iv) It is not suitable for mixed plantations. However, in rare cases, similar operation may be done in mixed plantations where one species has been introduced essentially to help cover the ground quickly and its removal or cutting back is necessary in the interest of the major species.

(2) **Silvicultural Thinning:** Alternatively, thinning may be selective, the case for removal or retention being considered for each tree in turn according to a set of rules drawn up for the purpose. This is the most usual procedure even where additional checks are applied, being often described as a "*silvicultural*" thinning.

(3) **Thinning Schedule:** The other possibility is to be guided by thinning schedule which lay down the number of stems that should remain standing after thinning according to various criteria of dimensions, site quality and/or age. Such criteria should ideally be based on a wide range of growth studies to reveal the development to be expected to take place under the conditions concerned.

19.11.4 TYPES OF THINNING

(a) ORDINARY THINNING (i) The mechanical thinning meet the initial requirements of plantations. It soon ceases to be a practical proposition owing to the unequal

development of the trees and their smaller numbers, and hence calls for other methods for thinning operations.

(ii) The most usual method has been to view each tree in relation to its neighbours, and to remove those which appears already to have shown their inferiority by dropping behind, taking first the suppressed trees, then the dominated ones, and finally some of the dominants with restricted or, otherwise, inferior crowns. As this method begins with the removal of the lowest canopy class and then works upwards, it has been called *Low thinning*, but it is now known, on account of its widespread application, as *Ordinary Thinning*.

(iii) The smaller dominated and suppressed trees are usually removed, they may be retained as soil cover and as insurance against casualties among the larger trees standing over them.

(iv) Most foresters tend, at first, to thin very lightly corresponding to something between B and C grades, after experience however they mark heavily up to a full C-grade and D-grade. The term 'heavy thinning' implies the C-grade thinning.

(b) The standard grade of ordinary thinning*:*

(1) **Light thinning (A-grade):** This is limited to the removal of dead, dying, diseased and suppressed trees, i.e. classes V, IV and III. Grade A is of no practical use, it serves as the initial stage, especially, in comparative research on the effect of thinning on increment.

(2) **Moderate thinning (B-grade):** This consists in the further removal of defective dominated stems and whips. Branchy advance growth which it is impracticable or not desirable to prune may also be taken, i.e. classes V, IV, III, II(b) and I(d) and an occasional I(c). B-grade is also of little use in practice, due to its having little influence on the increment of the remaining stems.

(3) **Heavy thinning (C-grade):** This consists in the further removal of the remaining dominated stems and some defective dominants without making lasting gaps in the canopy, i.e. classes V, IV, III, II and I(b), (c) and (d).

(4) **Very heavy thinning (D-grade):** It consists further removal of some of the good dominants, subject to the condition of not making any lasting gap in the canopy. The trees for removal are selected in such a way that the remaining crop consists of trees, with good boles and crowns, well and evenly distributed over the area, and with space for further development, i.e. classes V, IV, III, II and I(b), (c), (d) and some I(a). If their removal is of no economic or hygienic value, class V, IV and III trees are not removed, in heavier grades.

(5) **Very very heavy thinning (E-grade):** For research purposes it has been found desirable to make ordinary thinning even heavier than the standard D-grade. It prescribes removal of more of the dominant stems even in class I(a), so that all retained have ample room for further development. It goes as far as possible within the rule for avoiding permanent gaps in the canopy.

(6) It is often inadvisable to make a full C-grade or D-grade thinning in a dense crop in which thinning has been unduly delayed. The first thinning in such cases should be lighter than is ultimately intended.

19.11.5 CROWN THINNING: This method of thinning looks first of all to the dominants, and removes such of them, beginning with the least promising individuals, as are hindering the development of the best individuals. Due regards are paid to obtaining as even a distribution of good dominants over the area as possible. It requires special skill and acumen in carrying it out.

(a) Grades of Crown Thinning: Only two grades of crown thinning have been standardized; they are defined as follows:

(1) **Light Crown Thinning (LC - grade):** This consists in the removal of dead, dying and diseased trees, with such of the defective, after them the better dominants, as are necessary to leave room for the further development of the best available trees evenly distributed over the area, i.e. classes V, IV, I(d), (c), many of I(b) and few of I(a) but not III and II. This is similar to D-grade ordinary thinning, but retains all III and II, and is not quite so heavy on I.

(2) **Heavy Crown Thinning (HC- grade):** This grade pays even more attention to favouring the selected best stems by removing all the remaining I(b) which can be taken without creating permanent gaps, and more of I(a), i.e. classes V, IV, I(d), (c), most of I(b), some of I(a); but not III and II.

(3) Crown thinning is well adapted to moderately shade-tolerant species in which the retention of the lower canopy presents no difficulty.

19.12 THE RULES FOR GUM TAPPING (FRI, DEHRADUN)

19.12.1 The tapping season will commence from November to end of May each year. No tree below 90 cm in girth will be tapped.

19.12.2 Tapping will be confined to the main bole of trees between 15 cm from ground level to the point from which first branch is given off.

19.12.3 Each tree shall be tapped continuously for 3 years; and, thereafter, will be given rest for 3 years.

19.12.4 The initial blazed 20 cm wide and 30 cm in length or height may be made in the month of November on trees at 15 cm above ground level with a sharp axe having 7.5-cm wide blade. The blaze is made 0.6 cm deep in the bark.

19.12.5 Blaze may be made horizontally leaving approximately equal space between the blazes. The blazes should not have any loose fiber. The lower surface of the blaze should be slightly slopping outwards to avoid lodging of guggul in the blazed pocket, in case, initial blazing is done by axe.

19.12.6 The guggul starts oozing out soon after blazes are made and may be collected initially after a month, that is, by about December when the blazes may also

be freshened. Subsequent collections and freshening may be done fortnightly up to May. Overall, 12 freshening are required to be made, during the year.

19.12.7 In each freshening, the lower surface is not to be freshened. The edges may be scraped so that only 3.8 cm is increased on either side in width, at the end of 12th freshening. This means that about 0.3 cm should be scraped off from either side in width in each freshening.

19.12.8 The lowest row of blazes will be at one meter above the ground level. The next row of blazes will be made at the height of 60 cm from the lower that is, at a total height of 1.6 meter from the ground level. The vertical portion of the blaze of upper row will alternate with similar portion of the row and no two blazes of the two rows will be directly one above the other.

19.12.9 The number of blazes to be made on each tree will depend on its girth at breast height, as given below:

Category	Girth at BH	Maximum blazes allowed on each tree
I	0.9 m to 1.3 m	2
II	1.3 m to 2.0 m	3
III	2.0 m to 3.0 m	4
IV	Over 3 m	One blaze for each 45 cm girth in addition to the category III, above.

19.12.10No fresh blaze will be made on the partially healed up surface or old wounds.

19.12.11Each blaze will be in a shape of parabola with a 2.5 cm wide base. The curved side of the parabola will be upwards and of height not more than 7.50 cm and the depth of the blaze will not exceed 0.6 cm in the wood.

19.12.12At the end of the season, the height of the blaze shall not be greater than 12.50 cm. Maximum permissible dimension of each blaze shall be 10cm x 12.5cm x 0.6 cm in width, height and depth, respectively.

19.12.13Since the tapping is to be done continuously for three years the total height of the blaze at the end of three years of tapping will be 37.50 cm, the width and depth remaining the same.

19.12.14In the second cycle that is, in the 7th year (after three-year rest) new blazes will be made in the same way in the un-blazed portion, in between the blazed portions of the first cycle. This blazing will continue for another three years in the manner described above and the operations will be repeated till un-blazed portion is fully covered.

19.13 ROADS, CART TRACKS AND CULVERTS

19.13.1 The forest areas of the division have a good network of roads and cart tracks. The Public Works Department of the state government or the Zilla Parishad maintains large number of roads passing through the forest area. Some stretches have been permanently transferred to the Department. The division is proposed to compile a comprehensive records for all roads passing through the forest area and the roads transferred to the division for maintenance, on priority basis.

19.13.2 The extent of forestry operations and gravity of forest protection concerns should determine the priority for maintenance of the forest roads.

19.13.3 Unwarranted up-gradation of the forest roads should be discouraged, but required culverts may be constructed in stretches useful for the forest protection.

19.14 HARVESTING AND DISPOSAL

19.14.1 **Agency for harvesting:** The Deputy Conservator of Forests, Nagpur shall decide the agency for harvesting in accordance with the applicable policies and regulations. Present policy prohibits the sale of standing trees. Estimation of bamboo yield should be based on actual enumeration carried out a year prior to the beginning of bamboo harvesting.

19.14.2 **Disposal at timber depots:** Harvested timber and firewood are proposed to be transported to the established forest depots for sale by auction or allocation according to the prevailing policies and guidelines. Bamboos are also sold at these depots. The National Forest Policy, 1988 acknowledges the first charge on the forest produce in the local tribal and village community living in and around the forest areas. Hence, decision for the disposal of the forest produce should be guided by the philosophy of the first right of the local village communities, which is also recognised in the nistar patraks. For facilitating *nistar distribution,* temporary depots can be created at the Range Headquarters.

19.14.3 **Stacking for the nistar supply**: Each established or temporary depots is prescribed to have designated areas for stacking small timber, poles, firewood and bamboo for the nistar supply at the special low sanctioned rates to local people including agriculturists and artisans. The Deputy Conservator of Forests can approve additional nistar depots at suitable places in the division, preferably the round or beat headquarters, so that villagers may not be required to traverse large distance to procure the nistar materials. The Deputy Conservator of Forests in consultation with the District Collector fixes the nistar rate. Supplies of small timber, firewood etc. as well as the forest produce required for occupational nistar will be governed by nistar partak of each village (also refer to para 1.9 of chapter I in this regard). Availability of the nistar material will to be informed to the Taluka Panchayats and the material left unused for three months will be sold through open auction.

19.15 IRREGULAR HARVESTING

19.15.1 **Restriction on irregular harvesting:** Irregular harvesting of timber, firewood and other NWFPs is prohibited, except in the following cases:

19.15.2 **Harvesting for the fire lines and the transmission line:** The Deputy Conservator of Forests may permit felling of trees within the prescribed width of the established fire lines and the approved power transmission line. The prescribed width in the guidelines for the Forest (Conservation) Act, 1980 and rules, there under, will be applicable to the transmission lines. Creation of new fire lines shall require prior permission of the Conservator of Forests.

19.15.3 **Felling for the haulage roads:** The Deputy Conservator of Forests may permit felling of trees for the purpose of haulage roads, which should be aligned properly to ensure minimum possible felling of trees.

19.15.4 **Harvesting in forest areas diverted for non-forestry purposes:** Felling of trees on forest land required by the other departments such as Irrigation, PWD, etc., will only be undertaken after the proposals for the use of forest land for non-forest purposes are approved by the Government of India under the provisions of the Forest Conservation Act,1980. The Deputy Conservator of Forests may permit felling of trees on forestland diverted for the non-forestry purposes as approved under the provisions of the Forest (Conservation) Act, 1980. The material obtained from such harvesting will be brought to the depots and will be disposed off as regular coupe material.

19.15.5 Any plantations done because of separate scheme in that regard which are located outside the annual coupes will not be considered as irregular working.

19.15.6 Harvesting **for wood supply after the natural calamities**: At the instruction of the State government, the Principal Chief Conservator of Forests may sanction advance working of coupes, up to two years, for supply of timber, poles and bamboos to the areas affected by the natural calamities.

19.15.7 Bamboo clumps outside the area of Bamboo overlapping working circle can also be harvested and the material so obtained may be utilised for meeting the local demands.

19.15.8 Harvesting of dead fallen and uprooted trees in the storm: Removal of dead fallen firewood and trees uprooted by wind or storm from all parts of the forests, except the coupes due for working, will be done in the following manner. Every year in the month of October each beat guard will report the availability of dead fallen firewood and trees uprooted by wind or storm to the concerned Range office. The Range Forest Officer will estimate availability for such material in each compartment and ACF concerned will verify the same. If more than 2 (two) such trees per hectare is estimated, proper marking will be carried out. Two dead and fallen trees are required for retention from wildlife conservation. Wood removal will be carried out from the compartment after approval of the Deputy Conservator of Forests. The

details of material obtained from each compartment and revenue realised from it will be entered in the respective Compartment History Form. Harvesting of dead and fallen firewood is governed by the nistar rights and privileges as admitted in the *nistar patrak* or directed by the government from time to time. The nistar holders are proposed to be allowed to collect such material directly from the forests on rated passes or in the manner determined by the DCF Nagpur through the written directives.

19.15.9 No irregular harvesting for the purpose of undertaking plantations/afforestation works under schemes outside the scope of this working plan will be taken up in any of the areas under the working plan.

19.16 MAINTENANCE OF THE FOREST LAND RECORDS

19.16.1 Maintenance of the land records and forest maps: The forestland records and the forest maps will be brought up to date, and maintained as such. A certificate to this affect will be recorded annually in the Form No 1- Register during the month of June.

19.16.2 Forest notification: Unclassified forests and non-forest areas transferred for the compensatory afforestation shall be, immediately, proposed for notification as the Protected Forests, and the reservation process shall be initiated with the section 4 notification under the provisions of Indian Forest (Protection) Act 1927.

19.16.3 Reconciliation of the revenue records: The revenue records will be reconciled on the basis of the forest notifications. The Collector and the Deputy Conservator of Forests will jointly ensure that the Revenue Records are brought up to date according to the forest notifications. Since the Divisional Commissioner issues the forest notifications, there is no apparent need to issue separate orders for the mutation entries. The Revenue Department will provide a certified copy of the Records of Rights to the Nagpur Division to mark completion of the process.

19.16.4 Along with the reconciliation, the details of land grants (*patta*) issued on the forestland will also be made available to the Nagpur Division. The Collector and the Deputy Conservator of Forests shall send the details of all grants or occupancies rights issued since 1980 to the Nodal Officer at Nagpur.

19.16.5 DIGITAL DATABASE: Geomatics Centre, Nagpur shall convert all the forest maps into the digital format for analysis and quick retrieval. Map procurement shall be the responsibility of the territorial division. Similarly, all primary land-related records will be scanned at suitable resolution not less than 150 dpi, and stored in digital form on CDs (Compact Discs). Copies of such CDs will be made available to the Conservator of Forests and the Deputy Conservator of Forests as well as the Deputy Conservator of Forests, Working Plan and the Land Cell, at Nagpur.

19.17 JOINT FOREST MANAGEMENT

19.17.1 BACKGROUND OF THE JOINT FOREST MANAGEMENT

The National Forest Policy 1988 envisages massive people's movement for conservation of forest resources. Thus, the government of India advised state governments in June 1990 to involve local people in protection and development of forests. Participatory management strategy envisaged in forestry sector is known as Joint Forest Management (JFM). Therefore, instructions have been issued for incorporation of prescriptions of joint forest management in the working plan. Hence, separate chapter has been proposed.

Through the government resolution no. SLF–1091/199/F-11 dated 16th March 1992, this approach was adopted for degraded forest areas of the state and now new guidelines have been issued vide GR No.MSC/2000/C.No.143/F-2, dt.25.4.03.

Villagers themselves are required to voluntarily participate in the programme. Forest protection committee (FPC) is to be formed in each village. The members of the committee will help in protection and development of forests and they will receive in turn a share in the usufructs and output from the forest areas assigned to such committee. The JFM areas will be managed according to the micro-plans prepared jointly by the Deputy Conservator of Forests and members of the FPC. These micro-plans shall contain the details of forest and village development. This has to be sustainable, should cater to aspirations of local communities and, at the same time, the silvicultural requirements of the forests are to be met properly.

Later, the government of India also advised the state governments to take up the Joint Forest Management in well stocked forest areas on experimental basis and accordingly guidelines dt.25.4.03 mentioned above have authorised the forest department in the state in this respect. Summary of these guidelines is as follows:

1) Good forests within 2 km from a village are to be covered under the programme on experimental basis and stage by stage other villages containing good forests are to be brought under it.
2) JFM is to be implemented with the help of gram panchayat and forest produce available is to be provided on priority to meet bonafide local needs. (Hence, local rights as enshrined in Nistar Patrak and Wazib-ul-arj are not to be curtailed.)
3) Non-forestland available in the village, which has agreed to participate in the programme, may be brought under the scheme if villagers and the panchayat agree to do so.
4) Help of institutions of local self-govt., NGO, environmental expert, if any available locally, may be solicited.
5) The scheme though does not intend to facilitate agriculture based professions but non-irrigated horticulture schemes in (private) wastelands may be encouraged if approved in the micro-plan.

6) The programme underlines conservation of forests and wildlife and therefore any activity/ agreement etc. that is not consistent with Forest Conservation Act, 1980 should not be incorporated in the micro-plan.

19.17.2 PRESENT EXPERIENCE WITH THE JFM IN THE DIVISION

1. The JFM concept was for the first time made operational in the state through World Bank assisted Maharashtra Forestry Project from the year 1992-1993 to 1999-2000. The list of villages alongwith the forests covered under this programme as well as future proposals are given in **(Appendix 19.10)**.

2. **Forest Development Agency:**

It is an instrument through which JFM can be achieved. Its implementation in the division so far is summarized below:

(i) FDA of 50 villages of the division (list and other details of these villages are given in Appendix 18.1 with works of Rs. 362.33 lakhs planned for 5 years, 2002-03 to 2006-07 has been approved by the govt, of India vide its letter No. CSS-FDA/171/02-03 dated 20.01.2003. First installment of Rs.59.42 lakhs has accordingly been received on 19.3.2003.

(ii) Rs.50.40 lakhs were distributed to FPCs in these villages by the end of June 2003 and this money was transferred to their bank accounts in nationalized banks, which are being operated jointly by the Secretary and the Treasurer of the FPC concerned.

(iii) The activities in brief are given in table below.

Sr No	Particulars	Physical	Financial (in lakhs)
1	Aided Natural Regeneration	900 ha	53.89
2	Pasture Development	100 ha	6.17
3	Bamboo Plantation	700 ha	45.90
4	Misc. Plantation	800 ha	88.36
5	Other works	--	168.01

iv) The activities have been short listed based on PRA and therefore it can be seen that SMC and plantation works are also planned on hitherto community lands, Zudapi jungle.

3. **Other participatory programme**

(i) An area specific and intensive INTEGRATED WATERSHED DEVELOPMENT PROGRAMME (IWDP), which is also financed by the govt. of India, is presently under implementation in the watershed designated as WRJ-4 comprising 24 villages of Katol taluka. The elements of JFM like people's participation and micro planning are an integral part of this programme.

(ii) The area falls in Kondhali range and the scheme is being implemented in 9 forest villages (area 5102 ha) by the forest department as PIA (Programme Implementing Agency) 2 and in 15 non-forested villages or in villages having negligible forest area (area 5456 ha) by the Social Forestry Department as PIA 1.

(iii) Works under this scheme are planned for 5 years, 2001-02 to 2005-06, with the total outlay for various activities under this plan being Rs.633.48 lakhs. It includes Rs.306.12 lakhs for 9 villages allotted to forest department and Rs 327.36 lakhs for 15 villages being covered by the Social Forestry Department.

This programme thus has already entered third year of its implementation.

(iv) The scheme envisages preparation of micro water shed plans for each village through PRA and containing entry point activities, training and awareness etc. and treatment to non-forest (Private and Community Lands) as well as forestlands. Land treatment includes SMC works, bund line plantations, pasture development and block plantations.

(v) The scheme also envisages self-help groups, formation of watershed committee and its registration, identifying volunteers etc. and development and improvement of civic amenities. Thus it is essentially JFM in approach. Further improvements in that approach can be aimed at by including private and non- forestlands and village development approach in to the scheme.

19.17.3 POTENTIAL AREAS FOR THE JFM PROGRAM

1) Areas under Rootstock Management & Afforestation and Grass & Fodder Resource Management working circles are ideal for this, though under the new guidelines dt. 24.3.2003 all areas are the potentially fit for JFM and hence JFMCs as one of the implementing agencies in all except Old Teak Plantation working circle and as the exclusive implementing agency in GFRM and NWFP have been considered. This has been covered under relevant chapters.

2) Zudupi Jungles, though not much information is available as yet and though exact extent of Zudupi jungles finally to be owned by forest department is yet to be worked out, are generally found close to villages and, hence, are other potential areas which can really meet people's needs. Therefore, villages having sufficient zudapi jungle may desire or expect such arrangements on these forestlands.

3) Local communities and institutions/ bodies of the local self-government as well as NGOs interested and experienced in the field may be associated in the programme.

19.17.4 TREATMENT PRESCRIBED

Based on the nature of work in the various working circles and local requirements, role of a JFMC will have to be identified and defined in the micro-plan. While doing that, following points may be taken into consideration:

1) While formulating micro-plans, silvicultural management, maintenance of forest boundary, removal of forest encroachment and control over illicit cutting should receive high priority.

2) The micro-plans should be prepared in such a manner as to ensure meaningful participation of all the stakeholders including disadvantaged groups like women, scheduled tribes, scheduled castes and locally backward groups.

3) Participatory methods, that is, PRA shall be used to adequately address the concerns and apprehensions of all the groups.

4) The forest department should play only co-ordinating and catalytic role for the village development works recommended in the micro-plans and should also involve other government agencies and non-government organisations for efficient and effective execution of these works. Actual works should be executed by the FPC.

5) The area kept under SCI, IWC, P&CAM are essentially for forest and bio-diversity conservation and for forest productivity. However, material removed from the annual coupes from these working circles may be considered for its diversion to meet the bonafide local needs. However, primary areas from where local needs are to be fulfilled are other working circles namely Fodder Resource, Afforestation and Zudupi jungles. The local needs may be identified and quantified on the basis of what has been allowed in the nistar patrak and Wazib-ul-arz of the JFM villages.

It will therefore be advisable to assign different categories of forests to a JFM village and fix a scale for dependences on each category of forests. Such aspects will have to be elaborated in each micro-plan and mirco-plans so formulated shall be the basis of implementation of JFM programme.

19.18 CHECKLIST OF INFORMATION REQUIRED FOR NWFP MANAGEMENT

A database for the NWFP management is proposed to be created at the division level incorporating the following information:

1) Red data plants of Maharashtra vis-à-vis concerned division (district).
2) Endemic plants.
3) District (division) flora as published by BSI.

   Information in regard to the most traded plants and plants used as traditional medicine, their trade name, local name and Marathi names is to be obtained.
4) Identification of bare foot botanist for the above purposes.
5) Recorded MFP collection.

   Estimation of unrecorded MFP (NWFP) collection

   Quality and collection for 10 years is to be found out.
6) Establishment of 1 ha plot in each division; monthly monitoring of occurrence, flowering and fruiting of NWFP plants.
7) Identification of areas capable of supplying seed material (Seed/ Rhizome/ Tuber) of common NWFP species.
8) Survey of weekly markets regarding
   - Type of NWFP
   - Extent
   - Purpose of utilisation
   - Rate
   - Chain and agency of marketing
   - Final destination and processing

   To maintain information of all vendors, purchasers, manufactures etc. associated with NWFP trade as obtained in the above survey and through other means. Creation of database of the above in the division office.
9) Compilation of traditional knowledge about NWFP plants and their utilisation.
10) NWFP species, which are harvested through unscientific and destructive methods shall be identified at the division level and shall be referred to to the research wing of the department to explore non-destructive methods.
11) Database creation by each JFMC regarding NWFP collection and it will be linked to the database proposed at the division level.

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Chapter 20. The Establishment and Manpower

20.1 THE ESTABLISHMENT

20.1.1 The recent range, round and beat reorganisation during 2000-2001 is based on the policy of separating protection and development functions at the range-level. However, operational details of two functional units are still evolving and the arrangement is under transition phase and hence a new proposal incorporating 16 ranges, 78 rounds and 317 beats has been submitted to the government in the year 2003. It has been presumed that the division has adequate staff strength for implementation of provisions of this plan. **(Appendix 20.1).**

The division is proposed to be split into two namely North Nagpur and South Nagpur with Head Quarters at Nagpur. Formation of these two divisions was also prescribed in the last plan. Hence, the same proposal after incorporating the relevant reorganisation aspects in the field as proposed in the year 2003 is given below:

	North Nagpur	South Nagpur
DCF	1	1
ACF	3	3
Ranges	8	8
Rounds	34	44
Beats	148	169
Mobile Squads	1	1
Depots	2	2

North Nagpur is proposed to be comprised of Narkhed, Katol, Kalmeshwar, Khapa, Parshioni, Ramtek, Paoni and Deolapar ranges while South Nagpur will have Kondhali, Hingna, Butibori, North Umred, South Umred, Kuhi, Bhiwapur and Seminary Hills ranges. The details of this proposal are incorporated in appendix 20.1.

20.1.2 The division has a large cadre of the Forest Labourers, whose nature of duties changes quite frequently. Since their posts are supernumerary in nature, expenditure on their establishment does not reflect in routine budget. Hence, it is recommended that the Deputy Conservator of Forests should identify and assign their services to different schemes for efficient utilisation of their services. It is expected that at least a major proportion of the Forest Labourers are engaged in execution of plantation, fire protection and other such works resulting in substantial saving in the labour component.

20.1.3 Adequate education and health facilities are usually not available at the beat and round headquarters in the interior areas, and majority of the field staff keep their

families at a different stations. These conditions demand special efforts for the staff welfare programme. Sufficient facilities should be provided for quality education to the minor children of the field staff.

20.1.4 Skill up-gradation training or exposures on various aspects of forest management such as nursery management, plantations management and organising and managing coupe operations like marking, felling, logging, etc. are proposed for the staff to improve their efficiency as well as keep them fully toned and abreast.

20.1.5 Trainings of field staff and village communities, in collaboration with NGOs, is essential and will be proposed for NWFPs collection, grading and value addition mechanisms to upgrade their skill in NWFPs management.

20.2 MANPOWER AVAILABILITY

20.2.1 Most of the schemes have some amount on labour welfare. These amounts should be pooled, and utilised for the community welfare programme in concerned villages by involving local communities.

20.2.2 Some schedule adjustment should be sufficient for execution of the forestry operations. Temporary manpower shortage may be experienced during the paddy transplanting and harvesting seasons.

20.2.3 Sometimes persons from adjoining districts come to the area for tendu collection and other works executed through contractors. Care should be taken to ensure adequate employment availability to the local people. The Forest Labourer Co-operative Societies (FLCS) often engage large manpower of non-members in coupe working allotted to the Societies, and the proportion of the work done by the non-members should be recorded.

20.3 BUILDINGS

20.3.1 The problem of accommodation is acute, as the existing buildings are not sufficient to house all the staff, especially the field staff. Many residential quarters for the Forest Guards and the Foresters working in the field are in poor conditions, and many beat and round headquarters do not have residential facilities. The field staffs are forced to occupy private accommodation. Although a number of buildings were constructed under the Maharashtra Forestry Project, more residential buildings are required in the field, especially, in the interior locations. Sufficient funds should be made available for the maintenance and construction of buildings in the field. Funds will also be required for developing eco-centres and camping facilities for eco-tourists as prescribed in the chapter of Wildlife Management (Overlapping) Working Circle.

20.4 WATER SUPPLY

20.4.1 The availability of water for drinking as well as for agriculture depends mainly on the pattern of monsoon. Whenever the rainfall in scanty, water scarcity is experienced throughout the division. Adequate arrangements should be made to supply drinking water to staff , especially, at the interior places. The existing nursery sites are near the perennial water sources. The new nursery sites, if required, shall be selected near the perennial water sources.

20.5 METEOROLOGICAL OBSERVATIONS

20.5.1 Since meteorological observatories are in existence in all the talukas and the district headquarters, there is no need for a separate observatory for the department. However, record of the rainy days will be maintained in each plantation register.

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Chapter 21. The Deviation, Control and Records

21.1 DEVIATION PROPOSALS AND PROCEDURE FOR OBTAINING SANCTION

21.1.1 All the deviation proposals require sanction as per process and guidelines of Government of India. Application for sanction to such deviation shall be submitted sufficiently, in advance, so that it may be obtained as far as possible before the deviation occurs; and/or without fail before the annual list of deviations is submitted along with the Control Forms. **(Appendix 21.1).**

21.1.2 Provisions of the Forest (Conservation) Act, 1980 and directives of the Central and the State governments, in this regard, including those with respect to deviations from prescriptions of approved working plans, must be strictly followed.

21.1.3 The Deputy Conservator of Forests territorial will submit 8 copies of the deviation proposals to Conservator of Forests through Deputy Conservator of Forests, Working Plan, who after scrutinising the proposals will submit them to the Conservator of Forests of the territorial circle with his opinion. The Conservator of Forests will then pass on the proposal to the Chief Conservator of Forests through the Conservator of Forest, Working Plan Circle with his remarks.

21.1.4 The Government of India has created a Working Plan Cell in the Ministry of Environment & Forests under the Inspector General of Forests. This cell has to be associated while considering any deviation from the prescriptions of the approved working plans and the deviation will be allowed only after obtaining the approval of the Inspector General of Forests. All proposals for deviations must be entered in a Register of Deviation maintained by the Division office.

21.2 SURVEY AND MAPS

Survey and Digital database

21.2.1 The digital database, described in the Chapter 6, requires series of corrections and revision to make it accurate and up-to-date. It is proposed that the DCF Nagpur in consultation with the DCF Working Plan, Nagpur and the Deputy Conservator of Forests (Database) will undertake this work and make it accurate and complete in the first 5 years of this Plan.

Preparation of Maps

21.2.2 The maps on the 4" = 1 Mile scale, have been prescribed to be prepared on the 1:15,000 scale for metric setting. In pursuance of the Standing Order No. 55 of the Conservator of Forests, Working Plans, the following, sets of maps have been prepared and proposed for distribution to the concerned offices:

21.2.3 **Divisional maps:** The following six (6) sets of divisional maps, on 1:15,000 scale, have been prepared by Geomatics Centre, Nagpur O/o CF (WP) Nagpur for distribution to the Divisional and the Range offices.

Management maps: 4 sets (2 cut and mounted + 2 uncut and mounted)

Stock maps : 2 sets (1 cut and mounted + 1 uncut and mounted)

These maps are proposed to be distributed, as follows:

21.2.4 **Working Plan Office** will retain 2 set of uncut and mounted maps, as given under, as the Master sets.

Management maps: 1 master set (uncut and mounted)

Stock maps : 1 master set (uncut and mounted)

The *Stock Maps* show the compartment boundaries, density, site quality, age classes and other stocking details, including nature and composition of crop; and the *Management Maps* show the coupes, compartments, felling series, working circle, ranges and other management details.

21.2.5 **Nagpur Division** will be provided, the following, set of maps showing the management details for office use.

Management maps: 3 sets (2 cut and mounted + 1 uncut and mounted)

Stock maps : 1 set (cut and mounted)

The Division office will retain 1 (one) set (cut and mounted) of Management maps for office purposes, and provide 1 (one) set (cut and mounted) of Management maps to the concerned Range Office.

21.2.6 **The Chief Conservator of Forests (Territorial) and the Conservator of Forests, Working Plan** each will be supplied 1 (one) set of the Management Maps on 1:50,000 scale, showing management details viz. compartments, working circles, felling series, range boundaries and other administrative details.

21.2.7 **Reference maps:** The reference map on 1: 250,000 scale, showing range boundaries, compartments, working circles, felling series, roads and other prominent reference features will be enclosed with the working plan.

21.2.8 **Grazing maps:** Grazing maps showing grazing areas / series is proposed to be prepared on 1:250,000 scale. Working Plan Division will retain on set, while other one will be supplied to the Nagpur division.

21.3 CONTROL AND RECORDS

21.3.1 The following records are prescribed to be maintained in the division office:

- **Control Forms**
- **Compartment History Forms**
- **Plantations and Nursery Registers; and**
- **Divisional Note Book**

21.3.2 **Control Forms**: The records of harvesting, subsidiary silvicultural operations, regeneration works and soil and moisture conservation works carried out as per working plan prescriptions, will be maintained in the Control Forms given in **(Appendix 21.2)**

21.3.3 Two sets of Control Forms will be prepared by the division. One set will is prescribed to be kept in division office, while the other set will be the flying set for the use of Working Plan division. The flying set will be sent to Working Plan division not later than 1st September, every year by the Nagpur division. All entries showing deviations from the prescriptions will be underlined in red. The DCF Working Plan will examine it and forward the reports with his remarks to the territorial CF, latest by 1st October. The territorial CF will forward the report with his remarks to CF Working Plan, Nagpur not later than 1st December. The CF Working Plan in turn will forward them to CCF (Production) for perusal and necessary orders, where required.

21.3.4 **Compartment History:** A set of the compartment history forms for the division was prepared with the earlier working plans. The revised history was not made available to the working plan officer at the time of preparing this plan. The Compartment History Forms are the significant documents that keep the records of past management practices and their effect on the growing stock. It is, therefore, prescribed the division office must maintain the updated compartment history in, the following, standard Forms I to V, given in the **(Appendix 21.3)**

Form I	**Descriptions of the Compartment.**
Form II	**Records of Plantations and Changes in Growing Stock.**
Form III	**Records of Operations and Outturns**
Form IV	**Records of Observations.**
Form V	**Records of injuries**

Each compartment must have a separate file for its records. The revised compartment number must be marked on each record. Every year in July , the Range Forest Officer will fill in the necessary information and will send to the Deputy Conservator of Forests for examination and scrutiny, through the concerned Assistant Conservator of Forests, who will get them typed and sign them, in three sets. One set of these Forms will be kept in

Divisional Compartment History File, while one set each will be send to the Working Plan Division and the concerned Range Forest Office, in the month of August.

21.3.5 **Plantation Register and Nursery Register:** The Plantation Registers are prescribed to be maintained for all the areas regenerated artificially in the Form Nos. 1 to 9 as given in **Appendix 21.4.** Plantation Registers must show dates of the rainy days and survival count. The Nursery Registers are prescribed to be maintained in Form No. 1 to 10 as given in **Appendix 21.5**.

21.3.6 **Divisional Note Book:** The matters of the divisional importance will be recorded in the Divisional Note Book under standard heading for records and ready reference. The standard format of the Divisional Note Book is given in **Appendix 21.6.**

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Chapter 22. Financial Forecast

22.1 COST OF THE PLAN

22.1.1 The cost of preparing this plan is worked out by summing the expenditure incurred from 1999-2000 to 2003-04 that amounts to 81.36 Lakhs excluding the cost of enumeration works carried out by SOFR unit, Amravati. The cost of plan per hectare worked out is about 46.80 rupees only.

22.2 COST - BENEFIT ANALYSIS:

22.2.1 **Intangible Benefits**: It is an acknowledged fact that forests ecosystems have both the tangible and the intangible benefits to the mankind. They contribute to a great extent in term of intangible benefits. However, it is not easy to assign economic value to the intangible effects of the forests ecosystems. Professor T M Das (1980) has quantified the environmental services, provided by a medium sized tree of 50 tons over a period of 50 years, by assigning notional values by using surrogate market techniques, as given in the **Table 22.1a** (Proceedings of the Indian Science Congress, 1980).

Table 22.1a: Environmental benefits derived from a medium sized tree of 50 tons during its 50 years life span (excluding the value of Timber, Fruits and Flowers)

Sr. No	Environmental benefits	Single tree (Lakhs)	Forest Type	
			Tropical in Lakhs/ha	Sub-tropical in Lakhs/ha
1	Oxygen Production	2.50	22.50	20.50
2	Conversion to Animal protein	0.20	1.80	1.64
3	Control of Soil Erosion	2.50	22.50	20.50
4	Recycling of Water & control of humidity	3.00	27.00	24.60
5	Shelter for Birds, Squirrels, Insects, Plants	2.50	22.50	20.50
6	Control of Air Pollution	5.00	45.00	41.00
	Total	**15.70**	**141.30**	**128.74**

22.2.2 Thus, according to Das, one hectare of subtropical forests accrues, environmental benefits of worth Rs.128.74 Lakhs over a period of 50 years i.e. benefits of worth 2.60 Lakhs per hectare per year.

22.2.3 Hence, intangible benefits accruing from Nagpur Division, having over 87,000 ha of well-stocked forests @ of 2.60 Lakhs per ha, are worth Rs. 226200 Lakhs per year.

22.2.4 **Tangible Benefits:** The tangible benefits accruing from forests is, however, can be computed in economic terms from various goods and services ensuing from forests. The estimation/forecast of timber, poles, fuel wood, bamboos, tendu, gum and other non-

wood forest produce accruing from forests can be made with reasonable accuracy with the help of yield regulating formulae and the available market trends.

22.2.5 In this Plan, major yield of wood will be obtained from the SCI Working Circle. Improvement Working Circle may contribute in form of small timber, fuel and teak beats, to some extent. In other Working Circles, felling of mature trees has not been prescribed. The yield from thinning of old plantations as well as congested pole crop has not been considered.

22.2.6 The estimated future annual yield and revenue, as part of the tangible benefits derived from the forests, has been given in Table 22.2a. The abstract of tangible benefits and costs as a result of this plan is given as follows:

Annual estimated expenditure for the prescribed operations = 1216 Lakhs

Annual estimated revenue from the forest, including, = 1225 Lakhs statuary taxes

Annual intangible benefits as above = 226200 Lakhs

Total benefits accrue from forests of Nagpur Division = 227425 Lakhs per annum

Cost- Benefit Ratio is 1216 Lakhs : 227425 Lakhs

Or 1 : 188

Thus, the above Cost-Benefit Ratio favors the scientific management of forests, as prescribed, in this Working Plan.

22.3 FINANCIAL FORECAST

22.3.1 The norms used for the financial forecasting are given in **Table 22.1b**. Forecast for the implementation of this plan is given in **Table 22.2 (a) & (b), 22.3 and (Appendix 22.1).**

Table 22.1b. Rates used for estimating expenditure for the working plan prescriptions

Daily wage rate used for calculations = Rupees 60.00

Sr No	Particulars of work	Unit of work	Man days/ unit	Labour component (in % age)	Amount/ unit (Rupees)
1	Demarcation and marking	Hectare	4.5	90%	300
2	Singling of coppice shoots, etc.	Hectare	1	96%	62.5
3	Soil and moisture conservation				
	Gully plugging (nala bunding)	Cubic meter	0.92	96%	57.5
4	Coupe working				
	Timber harvesting	Cubic meter	9.5	75%	760
	Firewood extraction	Stacks(2x 1x1.20)	3.5	80%	262.5

	Long Bamboo	No.	0.06	80%	4.5
	Bamboo bundles	No.	0.12	80%	9
5	Removal of wind fallen				
	Timber	Cubic meter	9.5	75%	760
	Fuel	Stacks(2x 1x1.20)	4.5	80%	337.5
6	Thinning	Cubic meter	9.5	75%	760
7	Cutback Operations	Hectare	6	96%	375
8	Cleaning	Hectare	8	96%	500
9	Natural Regeneration				
	Nursing of seedling and coppice management	Hectare	10	96%	625
10	Afforestation /plantation				
	Fencing including live hedge	Hectare	43	85%	3035.29
	Planting & sowing on fencing	Hectare	2	75%	160
	PPO/PYO (including fencing)	Hectare	60	85%	4235.29
	FYO (First year operations)	Hectare	95.1	77%	7410.39
	SYO (Second year operations)	Hectare	40.9	92%	2667.39
	TYO (Third year operations)	Hectare	20.7	93%	1335.48
	4th YO (Fourth year operations)	Hectare	15.15	93%	977.42
	5th YO (Fifth year operations)	Hectare	15.15	93%	977.42
11	Bamboo under planting				
	PPO/PYO (including fencing)	Hectare	64.5	90%	4300
	FYO (First year operations)	Hectare	34.65	90%	2310
	SYO (Second year operations)	Hectare	20.77	93%	1340
	TYO (Third year operations)	Hectare	16.53	93%	1066.45
12	Maintenance				
13	Road	Kilometre	38	95%	2400
14	1/5th boundary demarcation	Kilometre	7	80%	525
15	Fire protection	Kilometre	6.5	96%	406.25
	Fire protection	Hectare	1	96%	62.5
16	Joint Forest Management				
	Awareness generation	Village	12	20%	3600
	Micro plan preparation	Village	88	50%	10560
	Supplementary development	Village	1400	75%	112000
17	Training for NWFP collection	Round	30	50%	3600
18	Wildlife habitat improvement	Round	20	75%	1600
19	Fixing boundary pillars	Kilometre	70	30%	14000
20	Grass & Fodder				
	Weed extraction and woody growth removal	Hectare	20	93%	1284

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