GOVERNMENT OF MAHARASHTRA

WORKING PLAN
For
PUSAD FOREST DIVISION
Yavatmal Circle

PERIOD
2019-2020 to 2028-29

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(PART – I and II)

Office of The
Deputy Conservator of Forests,
Working Plan, Yavatmal

PREFACE

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This working plan of Pusad Forest Division replaces the working plan of Dr.Dinesh Kumar Tyagi, IFS and Shri G.Rama Krishna Rao IFS for the period 2008-2009 to 2017-2018. The PWPR was prepared by Shri P.G.Rahurkar IFS, Chief Conservator of Forests (T), Yavatmal Circle and was approved by the State Level Committee on 20.3.2018. On the basis of the recommendations made by the SLC, the Draft Working Plan has been prepared and the chapters of the DWPR have been prepared according to the "National Working Plan Code 2014".

The State Level Consultative Committee has given its approval subject to many improvements in its meeting held on 26.4.2019. As the working plan is to be approved as per the new Working Plan Code 2014, many chapters like Maintenance of Forest Health and Vitality, Maintenance of Soil and Water Resources, Trees outside Forests and other chapters were added to the Part-II of the plan as per the requirement of the code. This was made known at the time of presentation before the SCC by the undersigned. No new working circles were added except those already approved at the State Consultative Committee except recasting of the write up as per the paragraphs numbers specified in the code.

Enumeration of forest crop was done by the SOFR Unit, Amravati. The analysis of the tree enumeration data was done with the help of staff of working plan division. Stock mapping was done by the staff of Pusad division. Data on remote sensing was obtained from Forest Survey of India.

During the preparation of this plan, inputs from the field staff of Pusad Forest Division (Forest Guard to DCF) have been duly considered. The stock maps and enumeration results were sample verified on ground by field visits in all the ranges of the division.

I express my deep sense of gratitude for the valuable inputs given by Dr.S.H.Patil IFS, Principal Chief Conservator of Forests (P & M), Sh. Praveen Shrivastava IFS, PCCF (IT & P) while preparing this plan. I am also thankful to Shri P.Kalyan Kumar, IFS, Chief Conservator of Forests (Working Plan-East), Nagpur for their valuable guidance from time to time. My thanks are also due to Shri P.G.Rahurkar, IFS, Chief Conservator of Forests (T), Yavatmal for the cooperation extended to working plan staff from time to time. My thanks are due to Shri Arvind Mundhe IFS, Dy.Conservator of Forests (T), Pusad Forest Division for his help and co-operation in preparing this draft plan. His help in preparing and analysis of tree enumeration, stem analysis, stock map and all other necessary data in preparation of this plan.

My words of appreciation to my team of officers, Surveyor and support staff, who relentlessly worked and extended their whole hearted support for timely completion of this plan. I am thankful to Shri S.G.Narod, Range Forest Officer, Shri S.D.Jawade, Range Forest Officer, Shri V.G.Sonawane, Surveyor, Shri S.S.Nimbalkar, Ranger Surveyor, all belongings to the Working Plan Division, Yavatmal for their untiring work in compilation and analysis of data, allotment of coupes, felling series, tabulation and Digitization of maps with the help of GIS software.I am also thankful to the field units of Pusad Forest Division for the co-operation extended to working plan staff from time to time.

The team led by Shri V.S.Thorat, DFO, SOFR Unit completed the task of enumeration of forest resources as per procedure laid down in the National Working Plan Code 2014. Hence, my compliments to the SOFR Unit for their timely efforts.

My words of appreciation are due to the forest guards in working plan office, Ku.S.R.Bharsakale, Ku.S.R.Banarase, Ku.V.P.Pendor, Shri S.B.Dhanorkar for their efforts in assisting the officers and Surveyors in preparation of this plan.

The following support staff of my office extended their full co-operation during preparation of this plan and deserves appreciation; these are Shri G.G.Dakhole, Stenographer, Mrs.Anita Gawande, Accountatnt, Shri P.C.Wakulkar, Clerk, Shri.V.P.Nagargoje, Clerk, Shri.K.B.Sanap, Driver, Shri V.T.Gawai, Peon and Smt.S.R.Pardhi, Peon.

Place :- Yavatmal
Date :- / /2020

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WORKING PLAN OF PUSAD FOREST DIVISION

EXECUTIVE SUMMARY

1. THE TRACT DEALT WITH

Pusad Forest division is one of the four forest divisions in Yavatmal circle, in Yavatmal District of Maharashtra. Pusad Forest division is located in the South West of Yavatmal district. Pusad forest division comprises of Pusad, Digras, Shembalpimpri, Mahagaon, Kali, Umarkhed and Mahagaon ranges. Area of the division lies in Pusad, Digras, Mahagaon and Umarkhed talukas of Yavatmal district. The district headquarters is at Yavatmal while the division headquarters is at Pusad. The area consists of masses of hilly country broken by broad valleys and partially surrounded by plains. Painganga river gives a strip of plain in many p arts of its course along the border of the division. Most of the tract lies on a high level plateau at an average elevation of 350m to 450m above mean sea level and edge of plateau facing Painganga is more rugged as it has high elevation, ranges from 600 to 700 m above mean sea level. The forest type belongs to the Sub group Southern Tropical Dry Deciduous Forest. The forests of this division lies between longitude 77°18'' to 78°12'' East and latitude 19°26'' to 20°15'' North. The boundaries of the division are as follows.

North	: Darwha taluka of Yavatmal district
South	: Hadgaon taluka of Nanded district and Painganga river.
East	: Kinwat taluka of Nanded district and Painganga river.
West	: Washim taluka of Washim district.

The total geographical area of the division is 4,45,840 ha and the forest area is 1,12,782.92 ha which is about 25.29% of the total geographical area of the division. The total forest area of Pusad forest division is 69035.94 ha out of which 68549.79 ha is reserved forests, 231.07 ha is protected forests and 255.08 ha is un-classed forests. A total 69035.94 ha area is dealt with in this working plan. This Plan replaces the working plan written by D. K. Tyagi and G. R. K. Rao.

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

The total forest area of Pusad forest division is 69035.94 ha out of which 68,549.79 ha is Reserved Forests, 231.07 ha is Protected Forests and 255.08 ha is Un-classed Forests. The land acquired for compensatory afforestation remained as Un-classed Forest which needs to be proposed for declaration as Reserved Forest. The area details are summarized in the table given below.

Rangewise distribution of the forest area (ha)

Sr. No.	Range	No. of Compts.	Total Area	RF		PF	Un-classed Forest
				A-Class	C-Class		
1	Digras	57	12864.43	7191.25	5673.18	0.00	0.00
2	Pusad	34	7798.06	7274.54	523.52	0.00	0.00
3	Shembalpimpri	42	7533.15	4369.04	3164.11	0.00	0.00
4	Umarkhed	49	10240.54	9818.98	361.67	0.00	59.89
5	Mahagaon	51	14100.49	12359.66	1556.83	0.00	184.00
6	Kali (D)	36	8934.78	6564.24	2139.47	231.07	0.00
7	Marwadi	31	7564.49	7112.68	440.62	0.00	11.19
	Total	300	69035.94	54690.39	13859.40	231.07	255.08

For administration Pusad division was reorganised in 2013 wirh 7 ranges, 25 rounds and 117 beats.

Land use, land use change and forestry (LULUCF):

The total area dealt with in the previous plan was 69,435.26 hectares. Over the period of ten years from 2008-09 to 2017-18, certain area was received from Yavatmal division (873.02 ha), from FDCM (1093.17 ha) and for compensatory afforestation (1459.53 ha). Also during the past ten years, forest land was handed over to Yavatmal division (730.70 ha), to FDCM (610.60 ha). An area of 2483.74 ha was notified as Isapur Wildlife Sanctuary. A total area of 488 ha for 11 projects was diverted for non forestry purpose under the provisions of Forest Conservation Act 1980.

3. MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

Biodiversity conservation: The salient features of Biological Diversity Act, 2002 are

1. To regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources and associated knowledge relating to biological resources.

2. Conservation and sustainable use of biological diversity.

3. To respect and protect knowledge of local communities related to biodiversity;

4. To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources.

5. Conservation and development of areas of importance from the standpoint of biological diversity by declaring them as biological diversity heritage sites.

6. Protection and rehabilitation of threatened species. 252 Biodiversity - The Dynamic Balance of the Planet.

7. Involvement of institutions of State governments in the broad scheme of the implementation of the Biological Diversity Act through constitution of committees (NBA, 2004).

A National Biodiversity Authority has been set up at Chennai vide Gazette Notification dated 1 October 2003 under Biological Diversity Act 2002. The Act also provides for establishment of State level Boards and Local level Biodiversity Management Committees to deal with any matter concerning conservation of Biological Diversity, its sustainable use and fair and equitable sharing of benefits arising out of the use of biological resources and associated knowledge. Maharashtra has already established the Maharashtra State Biodiversity Board at Nagpur. In Pusad forest division, till March 2018, no Biodiversity Management Committees (BMC) have been formed.

Conservation of genetic resources:

Forest Genetic Resources refer to the heritable materials that are of actual or potential economic, scientific or societal value. Genetic resources can appear as whole communities, populations or single individuals as well as seed, pollen or soma-banks and even cloned DNA fragments. Forest genetic diversity represents the sum total of genetic variability occurring within and among tree species whereas forest genetic resource is the genetic material of actual or potential benefit to human. In other words, forest genetic resources form a subset of forest genetic diversity, which in turn appears as a subset of forest biodiversity. Tree genetic studies described so far are limited to less than 1% of

total available tree species leaving vast tree resources unexplored, which may harbour potential useful traits for mankind. This lack of knowledge on variation patterns and potentials along with changes in forest land use, deforestation, warming temperature exert a huge pressure on forest genetic resources. Hence, forest genetic resources should be conserved for a sustained harvest of benefits from forests and trees. The steps and strategies followed in conserving genetic resources are based on the nature of the material, timeframe, end product and scope of the measure. In general, two basic approaches are employed to conserve genetic resources. They are *in situ* (on site) conservation and *ex situ* (off site) conservation. Genetic resources of several important timber, fruit and other non-timber tree species are conserved *ex-situ* in gene banks or maintained in field collections. Nevertheless, *in situ* conservation in forests and on farms is in the case of most tree species the most important measure to protect their genetic resources.

4. MAINTENANCE OF FOREST HEALTH AND VITALITY

Status of regeneration: Data on regeneration status was collected by SOFR unit Amravati during collection of enumeration data. The seedlings were enumerated in the following three categories as R1 upto 1 m height, R2 with 1 to 2 m height and R3 above 3 m height. The data is analysed and used to devise prescriptions for natural and artificial regeneration of forest areas. The status of natural regeneration is extremely poor. The natural regeneration of teak and its associates is very poor and restricted to a few patches of selected sites. Heavy grazing, fire incidences, trampling due to cattle movement, human population pressure to meet their demands like firewood and small timber, poor site quality and erratic rainfall are major factors that influence the establishment of regeneration in this forest area. The regeneration data shows that there are 25 seedlings of upto 1 m height, 24 seedlings between 1 to 2 m height and 17 seedlings above 3 m height in a hectare in these forests. The total number of seedlings is 66/ha. The details of regeneration is given below.

Regeneration status

Sr. No	Range	No. of sample	No of seedlings/ha			Total
			R1	R2	R3	
1	Umarkhed	41	4.02	3.43	1.67	50.11
2	Digras	76	2.46	3.31	1.88	83.65
3	Shembalpimpri	56	3.31	3.71	1.92	64.95
4	Pusad	38	3.99	3.45	2.22	47.66
5	Marwadi	33	4.64	4.4	2.87	44.9
6	Mahagaon	67	3.39	2.78	3.37	76.54
7	Kali (D.)	52	3.34	2.98	3.15	61.47
	Total	**363**	**25.15**	**24.07**	**17.08**	**66.29**

5. CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

Trees and forests perform an incredible role in reducing storm water in several ways and removing or filtering pollutants that would otherwise wind up in our waterways. Forests filter and regulate the flow of water, in large part due to their leafy canopy that intercepts rainfall, slowing its fall to the ground and the forest floor, which acts like an enormous sponge, before gradually releasing it to natural channels and recharging ground water.

River Painganga and its tributaries Pus, Arunavati and Adan drain the entire area. Painganga and Pus are perennial sources of water. There are other small rivers and nalas from forest that have water in their streams till December. There are three major, three medium and fourteen minor irrigation projects which form the major source of irrigation. Many areas feel the shortage of water during summer. Erratic rainfall further worsens the situation. The drainage is poor due to high compact soil.

Soil and moisture conservation works needs to be carried out on watershed basis as forests are customarily at the top of a watershed. Good forest management secures water at its source. Appropriate forest management strategies produce clean and abundant water for our watersheds, as well as healthy forests. In Pusad forest division over the past ten years various soil and moisture conservation measures have been undertaken under various schemes. A total of 203 forest tanks, 10 cement check dams and 138 earthen bandhs have been created.

6. MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

Stock mapping: At the time of preparation of this working plan stock maps were prepared compartment wise during 2018 by staff of territorial division. The stock maps have been digitized in the GIS cell of Yavatmal Working Plan Division. Forest Cover mapping (Density classes) done by Forest Survey of India was also procured and used in GIS platform. The results of stock mapping are given in table below.

Results of stock mapping

Quality	Area (ha)	Area wrt to WP area (%)
Teak IV A	8040.12	11.65
Teak IV B	24636.71	35.69
Miscellaneous IV A	3623.27	5.25
Miscellaneous IV B	9529.02	13.80
Plantation	3218.08	4.66
Understock	12347.83	17.89
Blank	3771.18	5.46
Eroded and Scrub	222.76	0.32
Encroachment/ Cultivation	3308.47	4.79
Water Bodies	338.50	0.49
Total	69035.94	100.00

Incremental volume of identified timber species: The periodic CAI and MAI curves intersect at 55th year. The girth (OB) corresponding to this exploitable age is 79 cms. The exploitable girth is hence fixed at 75 cms for teak coppice. The periodic CAI and MAI curves intersect at 71st year. The girth (OB) corresponding to this exploitable age is 105 cms. The exploitable girth is hence fixed at 120 cms for teak of seed origin.

Carbon sequestration and mitigation: In this plan an area of 13679.82 ha is proposed under Afforestation WC which is to be implemented during the plan period. This will add to the forest cover of the division and contribute to the carbon sequestration of the forest. Natural regeneration prescribed in the plan will also add biomass and carbon in the form of vegetation.

7. OPTIMISATION OF FOREST RESOURCE UTILISATION

Recorded removal of timber: Timber is mainly in demand for the purpose of construction, furniture making and preparation of agriculture implements by the local

people. The main preferred species is Teak, which is followed by Ain, Dhawda, Kalam, Tiwas, Bija, Behada and Khair. Most of these species are also in demand locally for various construction purposes. Local demand of timber is met from the timber removed from the forest division. The timber depot at Singad (Digras range) and Nagapur (Umarkhed range) cater to the needs of the local population.

Timber auctioned and revenue realized

Sr.No.	Year	Timber (m^3)	Revenue (Rs.)
1	2008-2009	418.752	5025818
2	2009-2010	1125.182	14951075
3	2010-2011	844.520	14450100
4	2011-2012	422.390	8079620
5	2012-2013	510.520	9953370
6	2013-2014	261.171	5001700
7	2014-2015	455.674	12571400
8	2015-2016	523.259	13618000
9	2016-2017	694.132	19617100
10	2017-2018	1032.164	22534770

RECORDED REMOVAL OF FUEL WOOD

With the introduction of modern cooking fuels like LPG gas, electric implements dependence on fuelwood has decreased. But still firewood is the main cooking fuel for most of the villagers as well as people of Pusad town. Dhawda as fuel wood is the most sought after species for fuel wood. The other hard wood species like Khair, Ain, Babul etc. are also preferred over some of the soft wood species like Salai, Moyen, Behada. As the demand exceeds supply, illicit lopping of the trees and carrying of head loads of lopped branches mostly by the women is frequently noticed in this area. Majority of the ginning mills and processing factories of the area use alternatives such as coal and oil than firewood.

Firewood auctioned and revenue realized

Sr.No.	Year	Quantity (m^3)	Revenue (Rs.)
1	2008-2009	0.000	0
2	2009-2010	307.614	262930
3	2010-2011	478.876	172881
4	2011-2012	95.000	172800
5	2012-2013	159.500	201910

Sr.No.	Year	Quantity (m^3)	Revenue (Rs.)
6	2013-2014	123.483	200660
7	2014-2015	112.320	24670
8	2015-2016	63.600	42600
9	2016-2017	71.280	149000
10	2017-2018	46.000	56850

8. MAINTENANCE AND ENHANCEMENT OF SOCIAL, ECONOMIC, CULTURAL AND SPIRITUAL BENEFITS

Status of empowerment of JFMCs: In Maharashtra JFM committees in the forest division are guided by Government of Maharashtra Resolution dated 16th March 1992, 5th October 2011 and 10th July 2012. In Pusad forest division there are 471 villages, out of which 225 villages are within forests, 124 villages adjoining the forest areas and 122 villages which have no forest area. In this division 240 JFM committees have been formed till March, 2018. As per the Government Resolution the total number of members in a committee is a minimum of 12 and maximum of 24 with one third members from gram panchayat, 50% of the members should be women and two members from SC/ST and OBC. In the 240 JFM committees there are a total of 77359 members. A total of 217 Memorandum of Understanding (MoU) has been signed and 23 micro-plans have been prepared.

Maharashtra Forest Department has issued guidelines for grading of JFM committees into A, B and C categories based on various criteria. Based on this, of the 240 JFM committees, 57 committees, 70 committees and 113 committees have been graded into A, B and C category committees respectively. General body meetings and executive committee meetings of JFM committees are conducted periodically. The overall attendance in general body meetings is 60% and executive committee meetings is 80%.

Labour welfare: Members from the JFM villages are given priority in all the activities for semi skilled and unskilled labour. Works of plantations, protection, boundary pillar repairs, fire line tracing and all other works are done primarily through JFM Committee members. In Pusad forest division there are Forest Labour Cooperative Societies which perform tree felling activity in their allotted coupes after due approval.

Use of indigenous knowledge: The availability of medicinal plants within the forests are collected and used for various ailments. Though the exact quantum, methodology and usage is not recorded but local medical practitioners or vaidhyas have many indigenous and traditional knowledge. They use forest based resources to create various formulations which are still used by local villagers. Apart from this, presence of other indigenous knowledge cannot be ruled out. Indigenous and traditional knowledge related to forest and environment needs to be documented.

Extent of cultural/sacred groves: There are no sacred groves in this division. There are sites of cultural significance in the division. Ansuleshwar temple in compartment number 414 of Shembalpimpri range draws huge crowds during Shivratri. Lots of devotees throng to the temple. Bhavani tekadi in compartment number 803 of Digras range is also visited by large number of devotees during dussehra to visit the goddess temple. Harshi temple in Shembalpimpri range is also significant culturally for the local population.

Ecotourism areas and activities: Various important ecotourism sites have been identified in the division. Some of the sites have been developed while there is a need to develop other sites.

Status of implementation of FRA 2006: The status of implementation of this Act (up to March 2018) is summarized in the table below.

Status of implementation of FRA 2006 till March 2018

Sr. No.	Type of FRA	No. of FRA Proposal	No. of FRA Proposal accepted	Total Area (ha)
1	2	3	4	5
1	Individual Forest Right	18	18	24.06
2	Community Forest Right	81	81	19961.5
3	FRA u/s 3(2)	20	20	8.157
	Total	119	119	19993.72

9. ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The management of forest is done according to the existing policies, acts and regulations of Government of India and Government of Maharashtra. The manpower required for the execution of the plan is adequate.

10. FIVE YEAR PLANS

Various working plan were in operations during the five year plans. 12th five year plan concluded in the year 2016-17. The budget allocations in the five years plans have increased considerably. Fund sources have increased with the introduction of various new schemes.

11. PAST SYSTEMS OF MANAGEMENT

The regular Working Plan to manage forests was started in 1915 based on the requirement of treatment to the forest, needs of the local population and policies, rules laid down by the Government from time to time. The working plans that followed are listed below.

Malcolm's Working Plan (1915-16 to 1937-38)

Robinson's Working Plan (1938-39 to 1955-56)

Thosre's Working Plan (1955-56 to 1970-71)

Pal's Working Plan (1976-77 to 1991-92)

Gupta's working Plan (1996-97 to 2005-06)

D. K. Tyagi and G. R. K. Rao's Working Plan (1996-97 to 2005-06)

In D. K. Tyagi and G. R. K. Rao's working plan, the following working circles were constituted.

1. Selection-cum-Improvement Working Circle.
2. Afforestation Working Circle.
3. Catchment Area Treatment Working Circle.
4. Fodder Management Working Circle.
5. Miscellaneous Working Circle.
6. Non Wood Forest Produce (Overlapping) Working Circle.
7. Joint Forest Protection (Overlapping) Working Circle.
8. Wildlife Conservation (Overlapping) Working Circle.
9. Forest Protection (Overlapping) Working Circle.

12. STATISTICS OF GROWTH AND YIELD

Stock mapping: Forest stock maps are defined as the maps which naturally contain detailed spatial information on forest type, density, encroachments, cultivation, human habitats, and regeneration status which typically provide a fundamental idea about available resources. The status of forest vegetation includes categorization of the forest into density classes, species distribution, assessment of growing stock, growth data for various species and age distribution.

During the present revision stock maps have been updated in 2018 by the territorial staff of Pusad forest division. With help of GIS software entire data pertaining to beat, round, range, division, village, taluka, stock maps, forest cover, drainage and contour have been digitized in the GIS cell of Working Plan office Yavatmal and maintained in the form of various layers. The results of stock mapping are given in table below.

Tree enumeration: SOFR unit, Amravati, has completed the enumeration of forest resources in Pusad forest division during September 2015 to September 2016. The entire area of forest division was considered for sampling enumeration plan. The trees are enumerated in girth classes from 30 cm and above. The girth was scientifically measured at breast height (gbh). This data was correlated with stock maps prepared by field units and also compared with satellite imagery before the compartments were allotted to various working circles.

The total growing stock as per analysis of enumeration data is 434.45 out of which 317.70 is teak and 116.75 is of miscellaneous species. The results of enumeration data is given in the table below.

Stem analysis: During the revision of this working plan stem analysis was done by Working plan office Yavatmal during 2018. The stem analysis of teak coppice and seed origin was carried out by selecting representative teak trees of site quality IV from Pusad, Mahagaon and Marwadi range. The results obtained have been computed and age/diameter, height/age, age/volume curves were drawn. Yield calculation was done.

FUTURE MANAGEMENT

1. BASIS OF PROPOSALS

This working plan is prepared for the scientific management of of Pusad forest division. The primary obkective is to treat the forests as per the site requirements so as to optimize the growing stock. Various aspects of wildlife management, protection, NTFP, JFM have been taken into consideration for the preparation of this plan. The existing policy framework of Central and State Government, various legislations governing Forests and Wildlife, orders of Hon'ble Supreme Court and High Courts, Government resolutions, Circulars, Notifications have formed the basis of the prescriptions of this working plan.

Distribution of area to various working circles. The area under the different working circles in the division is given below.

Area allocation to different working circles

Sr. No.	Working Circle	Area in (ha)	Percentage
1	Selection-Cum-Improvement WC	35984.18	52.12%
2	Catchment Area Treatment WC	16414.79	23.78%
3	Afforestation WC	13679.82	19.82%
4	Fodder Improvement WC	1307.27	1.89%
5	Miscellaneous WC	1649.88	2.39%
Total		69035.94	100%

2. SELECTION CUM IMPROVEMENT WORKING CIRCLE

General constitution of the working circle: This working circle consists of areas which were earlier assigned to coppice with reserve, SCI, Miscellaneous, Plantation and Pasture improvement working circles. The crop is uneven aged. In Dinesh Kumar Tyagi and G. R. K. Rao's plan majority of these areas were treated under Selection cum improvement working circle. The forests are predominantly teak forests. The total forest area included in this working circle is 35984.18 ha. It constitutes 52% of the total forest area of the division.

Area allocation: Forest areas with density of 0.4 and above, which can produce medium to large size timber and poles are included in this working circle. Most of the crop is of site quality IV with a few patches of site quality III.

Special objectives of management: The special objects of management are:

1. To gradually replace coppice teak crop with high forest of seed origin by encouraging establishment of natural regeneration.
2. To increase the stocking of the miscellaneous species.
3. Encouraging natural regeneration assisted by artificial regeneration by introducing selected germ plasm.
4. To maintain and improve adequate soil cover by in the forest areas taking up intensive soil and moisture conservation measures on watershed basis.

Silvicultural system: The Selection cum Improvement system is aimed at harvesting matured trees and carrying out improvement felling for removal of malformed trees. The percentage of teak improved over the years which constitute approximately 70% of the growing stock. However, miscellaneous species have not shown substantial increase in composition of the crop. Teak trees of coppice origin would be felled on priority to replace age old coppice trees with teak trees of seed origin. There would be no felling of non teak species. Silvicultural operations like CBO, thinning, cleaning are included in this system. Thinning would also be carried out to decongest natural regeneration pole crop. Natural regeneration will be given suitable treatments to regenerate the area. Areas poor in natural regeneration will be supplemented by artificial regeneration to increase productivity and density of the crop. Soil and moisture conservation works would also be taken up on watershed basis to protect and improve soil and water regime.

Harvestable diameters: As felling is restricted to only teak trees, harvestable girth is prescribed for teak alone. Harvestable girth has been determined at maximum volume production as per the CAI and MAI curves in stem analysis exercises for site quality IV forests. Harvestable girth for teak trees of coppice origin is fixed at 75 cm (GBH over bark) and for teak trees of seed origin at 120 cm (GBH over bark). As the site quality III is very

limited separate harvestable girth for site quality III is not prescribed. The harvestable girth prescribed above would be applicable to site quality III also.

Calculation of the yield: Annual yield shall be regulated by area, and the efforts are made, for making annual coupes as equi-productive as possible. For yield calculation in Selection Cum Improvement Working Circle was Sagreiya's modification of Brandis' formula is used.

Coupe demarcation and treatment Map:

1. Demarcation and Marking: One year in advance
2. Treatment Map to be prepared as prescribed
3. A type: Protection area
4. B-type: Understocked and Blank areas (density <0.4)
    a. B1-Area with rootstock and natural regeneration
    b. B2-Area without natural regeneration
5. C-type: Pole crop and plantations
6. D-type: Well stocked areas (density >0.4)

Marking:

1. A type area: No marking
2. B type: Dead and diseased trees, live high stumps
3. C type: Marking for thinning
4. D type: Enumeration of trees in approach girth class and above is prescribed. Trees above selection girth as per regulation of Smythies safeguarding principle. Dead and malformed trees, live high stumps are to be marked.

Silvicultural System:

1. Selection-cum-Improvement system
2. Trees above selection girth are prescribed for felling as per principle of safeguarding future yield.
3. Openings created by felled trees would promote natural regeneration of light demander species

4. Hygienic operations (removal of dead, malformed, live high stumps) will improve the existing crop.

Regeneration:

1. Natural Regeneration of seed origin of valuable species to be preferred and managed through cultural operations in D areas and B1 areas.
2. Artificial Regeneration in B2 type area if site is suitable.
3. Strict protection from fire and grazing
4. Tending of natural regeneration of valuable species in B type area.

SMC Works: To be done on watershed basis

1. SMC works as prescribed in the chapter of Miscellaneous regulations shall be taken up.
2. SMC works will be along with marking operation and completed before onset of monsoon.
3. SMC Works are to be based on the requirement of site.

Subsidiary operations:

1. CBO works: Subsequent year of main felling
2. CBO works like cutting left over marked trees, removal of damaged trees, singling of multiple coppices shoots, etc
3. NR or ANR should compulsorily be carried out immediately after CBO in the same year in D areas. This is necessary to regenerate the area felled.
4. Cleaning operations: 6th Year

Associated regulations and measures

Fire Protection: The main felling coupes shall be fire traced and rigidly protected from fire for a period of 5 yrs. The fire tracing activities shall be completed by 15th of February to avoid fire hazards to standing crop as well as to the natural regeneration. Effective protection against fire shall be under taken for a period between February 15 to June 15 to ensure survival and establishment of natural regeneration of all species for developing it into the future growing stock.

Grazing: The coupe of main felling will be closed to grazing till cleaning operations in the 6th year.

3. CATCHMENT AREA TREATMENT WORKING CIRCLE

General constitution of the working circle: This working circle includes the forest areas falling in the catchment areas of different major, medium and minor irrigation projects and also drinking water projects which are directly draining into the reservoirs and water bodies. The 'C' class reserve forest falling in the catchment areas of irrigation and drinking water projects having the area more than 200 Ha. The extent of area included in this working circle is 16414.79 ha, which constitutes around 23% of the division area.

Area allocation: These forests are well stocked in some patches and are under stocked with open patches in other areas. The 'C' class reserve forest assigned to this working circle is mainly of open type with little or no vegetation. The density of the forest varies from 0.1 to 0.7 and the crop mostly young to middle age. The site quality in general confirms to IV B.

Special objectives of management: The special objects of management are:

1. Intensive soil and moisture conservation works to check the soil erosion and to arrest the runoff in the forest catchment areas.
2. Effective drainage treatment to check flow of silt into reservoirs.
3. To preserve and increase vegetal cover through appropriate measures that will enhance ground water table.

Silvicultural system: The areas allotted to this working circle are those which fall in the catchment limitations of different irrigation projects and the areas shall be completely protected irrespective of its crop density, composition, etc. No felling shall be carried out in the area except removal of dead trees only. The natural regeneration shall be boosted with appropriate tending operations and supplemented by artificial regeneration with suitable species, wherever required to increase the vegetation cover in the catchment areas. The healthy coppice regeneration will be retained depending upon the site requirement and quality of coppice. Suitable soil and moisture conservation measures

along with the afforestation must be taken up in order to prevent further soil erosion, siltation of reservoirs and to enhance the ground water level.

METHOD OF TREATMENT:

For the purpose of treatment the forest areas of this working circle shall be divided into following categories.

Category A: Protection Areas: Steep slopes above 25°, erosion prone areas and 20 m on both the side of perennial water course.

Category B: Under Stocked Areas: Areas with density less than 0.4.

Category C: Pole Crop and Old Plantation Areas: The established natural regeneration with pole crop and old plantation areas.

Category D: Well stocked areas: Areas having crop density more than 0.4 are included in the type. In all above categories of area suitable soil and moisture conservation measures as per the site requirements shall be undertaken such as nala bunding, check dams, cement plugs, etc. The treatment will be on watershed basis.

The various treatments proposed for the above mention areas are as follows.

Category A: Harvesting of standing trees (dead or alive) is strictly prohibited in A-type areas. Soil and moisture conservation work shall be taken up in chapter on miscellaneous regulations. Teak and suitable miscellaneous species shall be planted in the gap areas as per site requirement. Bamboo shall be planted in the 4^{th} year of the plantation especially along the streams. The seed for raising such planting stock should be from known source specially from plus trees of high forests.

Category B: Soil and moisture conservation shall be taken as given in miscellaneous regulations. Plantation of teak and suitable miscellaneous species as per the suitability of site followed by bamboo under planting in the 4^{th} year is prescribed. Tending of rootstock will be carried out.

Category C: No plantations will be taken up in these areas. Marking for thinning shall be done in the young pole crop and the old plantation to bring about appropriate spacing as per stand table.

Category D: No felling except dead trees removal and no plantations shall be undertaken. Two dead trees per hectare shall be retained for snags and dens. Singling and spacing out will be carried out among saplings of teak and other valuable species.

Marking Rules: The coupes will be demarcated one year in advance of the working. The marking will be done by an officer not below the rank of Range Forest Officer. In the category A, B, and D all the dead trees will be marked except 2 trees per ha. which will act as snags and dens for wild life. Marking for thinning in category C areas shall be done as per the stand table. No marking shall be done for removal of any tree except mentioned above.

4. AFFORESTATION WORKING CIRCLE

General constitution of the working circle: This working circle comprises of major portion of the 'C' class reserve forest outside the catchments areas of various of irrigation projects, part areas of miscellaneous working circle, coppice with reserve, Pasture improvement, plantation and fodder reserve working circle of past management plans. The areas having density of less than 0.4, open, degraded and understocked areas have been included in this working circle.

Area allocation: Forest areas with density of less than 0.4 are included in this working circle. Areas of protected forests and unclassed forests are also included in this working circle. A total of 13679.82 ha is included in this working circle which constitutes 19% of the division area.

Special objectives of management: The special objects of management are:

1. To increase vegetative cover, improve quality and composition of the area by tending to natural regeneration and supplementing with plantations.
2. To improve soil condition by taking up suitable soil and moisture conservation measures.
3. To meet the local demand for fuel wood, fodder and NTFP requirements along with better employment opportunities.

Silvicultural system: The main limiting factors for the establishment of seedlings in this area are insufficient sub soil moisture, highly compact soil structure and heavy biotic

pressure. Therefore intensive soil and moisture conservation measures shall be undertaken in these areas. Tending of existing rootstock, saplings, coppice shoots, supplemented by plantations are the main activities in this working circle. A two phase approach has been prescribed for these areas.

Phase I: Restorative phase: The duration of this phase will be minimum one year. Survey and demarcation, soil and moisture conservation works along with complete protection by digging TCM or fencing shall be undertaken in this phase. Nala bunding works and other appropriate soil and moisture conservation works shall be taken up on watershed basis. Contour trenches, deep CCT depending upon the site requirement shall be undertaken as prescribed in the miscellaneous regulations. Seeds of suitable species like Glyrisidia, Maharukh, Khair and the other local species shall be sown on the mounds of trenches and TCM. Singling and cut back operations shall be carried out in order to improve rooted sock in the area.

Phase II: Productive phase: The duration of this phase shall be of 5 years immediately after the completion of restorative phase. The RFO shall inspect the area and prepare the treatment map in the 2nd year. The RFO shall prepare the treatment map with the features of crop density, soil type, topography and natural regeneration areas of one hectare at one place and above features shall invariably be shown on the treatment map. The treatment map shall indicate about the treatment proposed to be given grid wise. Minor repairs of soil and moisture conservation works shall also be undertaken if necessary. PPO work shall be undertaken in 2nd year onwards.

Demarcation: The annual felling coupe shall be demarcated one year in advance.

Preparation of the treatment map: After the demarcation of the coupe a treatment map will be prepared. The following categories of area shall be shown distinctively in the treatment map.

1. **Category A:** Protection areas: It shall include the following areas.
    - Area with steeps slope i.e. more than 25°
    - Eroded areas or areas liable to erosion.
    - 20 meters wide strip on either side of the water courses.

2. **Category B:** Under stocked areas: Includes areas with crop density less than 0.4 and exceeding 5 hectares and above at one place.
3. **Category C:** Pole crop and old plantation areas: It includes pole crop of established regeneration of teak and other species suitable for retention as future crop in addition to old plantations. The survival of old plantation will be to the extent of not less than 1 hectare at one place.
4. **Category D:** Well stocked areas: It includes the areas crop density more than 0.4.

Treatments: Various treatments proposed for deferent categories of the areas are as under:

1. Category A: No felling is prescribed. The soil and moisture conservation works shall be carried out on watershed basis as given in the Chapter on miscellaneous regulations. Teak and other species shall be planted in the under stocked areas, where the area exiting 5 ha. and above in extent at one place as per requirements of site. Whereas in the under stocked areas where the extent of areas is less than 5 ha. seed dribbling of suitable species is suggested.

2. Category B: The soil and moisture conservation works shall be carried out in order to increase the productivity of the soil and to check soil erosion. Gap planting with teak and other species and seed dribbling shall be under taken as per the conditions of the site. Felling shall be done as prescribed under the marking rules.

3. Category C: No plantations shall be carried out in this area. Marking for thinning shall be done in the young pole crop as well as in old plantations to create appropriate spacing as per the stand table.

4. Category D: No planting will be done in these areas. Felling will be done as prescribed in marking rules.

Soil and moisture conservation works: Soil and moisture conservation measures shall be undertaken in the restorative phase. These works shall be taken up along with marking and completed before the onset of monsoon of the next year. Detailed descriptions regarding soil and moisture conservation works given in miscellaneous regulations shall be followed.

Associated regulations and measures: All annual coupes and plantation sites shall be provided fire protection. Effective protection against fire must be ensured during the fire seasons so that the survival and establishment of the seedlings for development into future growing stock can be achieved. Fire protection can be achieved through Joint Forest Management Committees. A comprehensive fire management plan shall be prepared out every year. The coupe shall remain closed to grazing for a period of 5 years after main felling.

5. FODDER IMPROVEMENT WORKING CIRCLE

General constitution of the working circle: This forests included in this working circle are the areas managed under Pasture Improvement Working Circle, CWR, Plantation Working Circle and Miscellaneous Working Circle in the past. These areas are in the vicinity of villages and under severe biotic pressure.

Area allocation: Areas are mostly open and blank with sparse tree growth. The density ranges from 0.1 to 0.4. The extent of area allotted to this working circle is 1307.27 ha which constitutes 1.89% of the division area.

Special objectives of management: The special objects of management are:

1. To augment the demand for good palatable fodder requirement of villages
2. To improve fodder quality in the areas by introducing palatable species of grass and legume and fodder tree species.
3. To improve the site and conserve soil and moisture through soil and moisture conservation works.

Silvicultural system: Based on the grass and forest resources of the site, the silvicultural systems to be followed are regulated and rotational grazing in pasture areas.Regulating seeding, grass cutting and complete closure to grazing in identified grasslands is prescribed.

METHOD OF TREATMENT:

1. Soil and moisture conservation measures work like gully plugging, nala bunding at suitable places and contour trenches as per the agro climatic models of the Soil Conservation department is prescribed.

2. All obnoxious weeds and thorny shrubs and bushes shall be uprooted and the unpalatable grasses shall be removed by ploughing in the area in pre flowering stage.
3. Broadcasting of seed of superior grass species shall be taken up after ploughing along with contour trenches at the onset of monsoon. The tussocks of palatable grass species of freshly excavated and heaped soil bund on the lower side of trenches.
4. Seed broadcasting and tussock planting of good palatable grasses like Sheda (*Sehima nervosum*), Paunya (*Schima salcutum*), Marvel (*Dicanthum annulatum*), Ned Gavat (*Panicum antidotale*), etc. The fodder tress species prescribed are Babul (*Acacia nilotica*), Anjan (*Harwickia binata*), Sirus (*Albizzia lebbek*), Apta (*Bauhina species*), Tiwas (*Ougenia daldergioides*), etc. However the selection of fodder species shall be as per the site requirement.
5. The area shall be effectively fire traced and protected from fire every year.
6. Plantation of tree species like Anjan, Babul, Subabhul, Kusum, Sirus, Tiwas etc. of fodder value shall be taken up by poly pot planting during the monsoon.
7. The cutting of grasses for stall feeding of cattle shall be allowed in these areas for 1st three years after planting. The grazing shall be regulated as per Government policy on rotation basis.

Associated regulations and measures:

Seeding of grasses: In order to allow seeding of fodder grasses, the coupe shall be closed to cutting of grass and will be prohibited from first June to 30thNovember, after which the grass will be allowed to be removed by cutting.

Fire Protection: The areas will be protected from fire with the involvement of local people or JFM committees.

6. MISCELLANEOUS WORKING CIRCLE

General constitution: This working circle consists of the following areas. Areas of 'A' and 'C' class Reserve Forest handed over to other departments which are yet to be disforested.

Method of treatment:

1. The areas which were handed over to other departments will have the same legal status until they are denotified. Therefore it is prescribed that a proposal shall be mooted to denotify these areas and necessary entries should be made in form no. 1 after denotification.
2. The 'C' class reserve forest is mostly opened and scrub which are nearer to habitations. These areas shall be properly demarcated and these shall be brought under forestry uses, such as nursery, forest garden, medicinal plants, forest demonstrative plots, eco tourism, residential accommodation of staff and other forestry activities depending upon the suitability of the area and availability of funds.

7. WILDLIFE MANAGEMENT

Special objectives of management: The special objects of management are:

1. To ensure protection and conservation of wildlife in this division.
2. Scientific management of wildlife by undertaking measures like habitat management and regular monitoring population of the wild animals.
3. To conserve areas of wildlife importance like perennial water holes, natural grasslands, natural wallows, salt licks, natural resting, breeding and nesting sites (caves, snags, overhangs).
4. To reduce dependency of fringe villages on forests to reduce human wildlife interactions.

FUTURE MANAGEMENT:

Standing Order (Wildlife) No.001: The PCCF (WL) MS, Nagpur has issued a standing order (Wildlife) No.001. This order prescribes duties and lists measures for the protection and conservation of the wildlife outside PAs.

Creation of Data Base: The Division will carry out survey, annual population estimation of the wildlife, including the migratory and other rare birds, in addition to All India Tiger and Panther population estimation.

Delineation and Mapping of Special Habitat Areas: Delineation of the special wildlife habitat sites including natural water seepage sites (mesic sites), water holes, natural wallows and saltlicks used by the wildlife, breeding sites, dens or nesting sites of animals and birds shall be carried out and marked on the Divisional/range maps.

Habitat Development Works: The most important factors in the habitat are water, food, safe places for resting, breeding, and nesting. Wallows and salt licks are other factors.

Marking Reservations, Other Restrictions: The following, prescriptions have been made for implementation along with coupe operations and other treatment prescriptions, in the wildlife area-specific coupes.

- No felling of trees or harvesting of any sort shall be allowed in riparian zone.
- While marking of dead, wind fallen and malformed trees in annual coupes, 2 trees per hectare shall be kept reserved, as snags and dens to provide for nesting and resting of wildlife. No fruit tree of wildlife importance shall be marked for felling in the annual coupes.
- While harvesting at least 2 down hollow logs, of low commercial value, per hectare shall be reserved for shelter of wildlife.
- Tendu collection centres or labour camps shall not be allowed near water holes frequented by the large mammals or other important wildlife species. The labour camps shall be established away from areas of high wildlife density.

Water Management: Water management includes maintenance, strengthening of all existing waterholes and creation of new artificial waterholes. Water availability, or the scarcity of it, is one of the major factors that decide 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 or near villages and thereby increases their susceptibility to poaching. Water is a major limiting factor during the summers in these

forests. The water hole density shall be commensurate with the density of wild animals found in the area and as per the wildlife management regulations.

Food/Prey Base: To improve the prey base, care of herbivores should be taken by improving the assured fodder availability in the forest, especially during the summer season, when the forest grasslands are burnt. The open areas in wildlife rich zones should be developed into meadows for the herbivores.

Development of Nesting Sites: To provide suitable nesting places to these birds, seed sowing of species like Babul and stake planting of species like Banyan and other *Ficus spp*. should be done near water-bodies and in the riparian areas.

Eco-Development, Awareness Generation and Eco-Tourism: To seek their willing support and goodwill it is proposed to undertake eco-development works by the division in villages around these sites. It is also proposed to promote and encourage eco-tourism in the Division by extending and developing camping and nature interpretation facilities at sites/spots, rich and unique in natural and cultural beauty and diversity.

8. NTFP MANAGEMENT

General constitution of the working circle: The species of non timber forest produce are available throughout the tract with varying degree. These contribute to a large extent to meet the non wood forest produce demand of local forest dwellers directly or indirectly. They play an important role in generating employment to the local people. The important non wood forest produce Moha flower, Moha seed, Tendu, Myrobalon (Hirda, Behada, Aoala), Charoli, Kulu, Dhawda, Honey.

Area allocation: This chapter covers the entire forest area of the division. The people living in forest mostly supplement their food with Leaves, tubers, flowers and fruits all year around. The medicinal plants play a key role in the health support systems in remote villages.

Special objects of management: The special objects of management are

1. To protect and manage Non Timber Forest Produce and to utilize the existing potential optimally and to enhance the productivity.

2. To improve stocking of various NTFP species in the forest areas and enhance collection of various NTFPs by improved collection techniques.
3. To get enhanced economic returns by training the local communities on value addition techniques and marketability of various NTFPs found in the division.
4. To generate employment and improve the economy of the local people and thereby improving their socio-economic conditions.

Treatment:

Documentation of NTFP Collection: Documentation and collection is an important step in management of NTFPs. During the plan preparation data regarding NTFP was insufficient.

Fire Protection Measures: Effective fire control measures need to be implemented as they affect various NTFP like Tendu etc.

Management of various NTFPs like tendu, gumes, rosha grass and other NTFPs have been prescribed.

Future Interventions:

The NTFP management on sustainable basis has remained a complex process for the last several decades but in the present scenario, there is a need to adopt multipronged strategy, as under, to build up an environment to strengthen community based management and trade of NTFPs which in turn would strengthen the livelihood of poor forest dependant population:

Resource Augmentation: Due to unrestricted & unscientific collection and over-use of products the NTFP resources have greatly been depleted in past years while their regeneration in many forest areas has gone down. Special effort is required for reducing the pressure on forest by cultivating selected species outside forest areas and undertaking intensive conservation of existing forests supported by ANR and other conservation activities.

Detailed inventory and prioritization: NTFP sector is still unorganized. There are no comprehensive studies available on most of the NTFPs. Hundreds of NTFP species are of medicinal value, and are in active trade. Only few species are recognized and traded while no or a little data is available at the division level. Since NTFP collections are seasonal and

may vary from year to year it is difficult to provide demand and supply data until a dedicated system prevails. The first priority would be to prepare a base line data.

Forward and backward linkages: For each prioritized NTFP species, value chain analysis and development needs to be carried out followed by need based infrastructure development, processing facilities, standardization, certification, enterprise development, purchase and selling, arrangements for working capital / loans etc. There is a need to involve financial institutions to promote community based micro-enterprises with clear benefit sharing mechanisms.

Capacity building: Skill/capacity development is very important for the foresters in managing communities in the form of NTFP management protocols.

Research and Development: There is a need of action oriented R & D in areas of developing new/alternate marketability particularly for low value & high volume NTFPs on the basis of a special drive, post harvesting, semi processing, genetics, management, nursery, plantation, collection, storage, chemical analysis for useful contents, etc. Research is required on biological, social, trade and market, and economic dimensions.

9. JFM MANAGEMENT

General constitution: Pusad forest division has a total of 240 JFM committees in the forest fringe villages. The total area for these committees is 38179.15 hectares. This covers around 54% of the total area of the division. JFM committees have taken up plantation activities to the extent of 2902 Ha during the previous plan period. The quality of forest is degraded nearby habitations. The entire forest area of Pusad Division is covered under this chapter for implementation of JFM.

Analysis of crop: In Pusad forest division there are 471 villages of which there 225 villages which are within forests, 124 villages adjoining the forest areas and 122 villages which has no forest area. In this division 240 JFM committees have been formed till 2018. As per the Government GR, the total number of members in a committee is a minimum of 12 and maximum of 24 with one third members from gram panchayat. 50% of the members should be women and the members from SC/ST and OBC. In the 240 JFM committees there are a total of 77359 members. A total of 217 Memorandum of Understanding

(MoU) has been signed and 23 microplans have been prepared. Maharashtra forest department has issued guidelines for grading of JFM committees into A, B and C categories based on various criteria. Based on this, of the 240 JFM committees, 57 committees, 70 committees and 113 committees have been graded into A, B and C category committees respectively.

Special objects of management: Special objects of management are -

1. To strengthen and empower local institutions for protection and conservation of forests and wildlife resources through peoples' participation.
2. To increase the vegetation cover and to carry out soil and moisture conservation works with the active co-operation of local people.
3. To involve local people in forest protection to generate sustainable employment.

General Prescriptions:

- JFM Micro-plans will be prepared for each village through the process of participatory rural approach. Microplans are to be dovetailed with the prescriptions of the approved Working Plan.
- Silvicultural management, maintenance of forest boundary, removal of forest encroachment and control over illicit cutting, illicit grazing and fire should receive high priority.
- Documentation of successful initiatives under the JFM approach must receive importance at the Range and Division level. A compilation of works undertaken in JFM villages in a financial year should be done at division level and published. This work should be given wide publicity in print and electronic media.
- Dedicated NGOs/Civil society groups can aid the village communities in strengthening JFM institution. Their services can be utilized by the FD in areas of capacity building of JFMCs in microplanning, community motivation, eco-tourism initiatives, evolving models for enhancing livelihoods etc.
- Periodic evaluation of JFMCs should be done to identify Performers and Non-Performers. While Performing JFMCs should be rewarded, the Non-Performers should be given opportunity for improvement.

- The JFM villages should also be covered with other source of efficient fuel management like improved chulhas with help from the Maharashtra Biodiversity Board.
- The Division should make all efforts to ensure that all JFM Committees have Public Biodiversity Registers as part of the many records to be kept.

10. MANAGEMENT OF FOREST HEALTH AND VITALITY

General constitution: The forest of this division has pressure of illicit felling, encroachment, grazing and fire because of excessive biotic pressure of the adjoining villagers and nature of vegetation, climate and social factors. As almost 70% forest constitutes teak, the problem of illicit felling is more acute particularly in the forest of Umarkhed range which is adjoining to state border of Telangana and along the Nanded district of Maharashtra. Pusad forest division has 7 ranges with 117 beats. All the beats in this division are considered as hypersensitive.

Special objects of management: Special objects of management are -

1. To protect the forest from illicit felling, encroachment, fire and grazing.
2. To sensitize local people about forest protection and involve them in preventing forest offences with their cooperation.
3. To raise the moral of field staff and strengthen their capabilities to deal with forest offences.

Protection strategy: The strategy to be adopted to protect forest is of integrated approach by undertaking collective measures based on situation and time. The strategy shall be direct field oriented in a participatory manner with active involvement and co-operation of local people especially members of Joint Forest Management committee.

Protection measures: A protection plan is to be prepared at division level in January of every year for taking strict protection measures as per GR dated 13.08.2014.

Fire protection: Prevention of fires and effective control of fires as prescribed in the plan is essential for the forest development.

Grazing control: To control grazing, grazing units are formed in the division. The number of cattle heads is fixed as per the carrying capacity of the area.

Encroachment: Survey and demarcation works should be taken up on top priority. Precast pillars of 1st and 2nd class type shall be erected after the survey is over which can be completed in a phase manner. The existing cairns shall be repaired and maintained under 1/5th boundary demarcation scheme.

11. MANAGEMENT OF SPIRITUAL, CULTURAL ASPECTS OF FORESTS AND ECOTOURISM

Ecotourism is about uniting conservation, communities, and sustainable travel. This means that those who implement, participate in and market ecotourism activities should adopt certain ecotourism principles.

The vegetation of this division is "Southern Tropical dry, deciduous" with varied floristic composition, edaphic and climatic variations. The forest situated along the river Painganga and it tributaries is of better quality which represents site quality III and IV A. Pusad forest division has got many spots with beautiful vegetation. The various ecotourism sites in Pusad forest division are Bhavani tekdi, Bapuji Aane monument, Yedhari, Dundhi, Aamvan talav, Anchaleshwar temple, Dehni mahadev temple.

The forest department will develop the centers of ecotourism with controlled accessable points at strategic places. Eco tourism centres include roads, self guided nature drive, transport options interpretation centers, signs, observation towers, adequate lodging and dining facilities, garbage disposal facility and other amenities as per the requirement. Any development of buildings and other infrastructural facilities shall be eco-friendly.

12. FINANCIAL FORECAST

The prescriptions of this working plan confirms to the emphasis laid in the National Forest Policy 1988. It lays emphasis on protection and conservation of forests, catchment treatment of rivers and streams, preservation of natural forests, increase in productivity of forests, increase in forest cover, protection of rights and concessions of people, tribals, meeting the requirements of people for small timber, fuelwood, NTFP etc. Various prescriptions have been given to achieve the objectives. The implementation of prescription of this working plan will incur expenditure on

establishment, execution of works and also generate ecological services as indirect benefit and revenue and sale proceeds of different produce.

Expenditure on establishment: To run proper administration, an efficient administrative set up is needed. It is a recurring expenditure on the salary and other benefits to officials and staff, maintenance of offices, vehicles, roads, buildings, machines, communication facilities etc.

Expenditure on harvesting forest produce and other activities: During the implementation of the prescriptions forest produce is to be harvested. In SCI and other working circles forest produce in the form of timber, firewood, and other produce like tendu leaves, gums etc will be harvested. The activities incur expenditure on harvesting.

The sources of funds during the last Plan were Plan Schemes, Non-Plan schemes, CAMPA, District Plan (DPDC), MGNREGA, special projects like Jalyukt Shivar, etc. The expenditure and revenue during the implementation of the past working plan period is given in the table below.

Forecast: Since the expenditure on various items is linked with the wage rate and the prevailing salaries of the staff and officers, it is not possible to work out expenditure on all the specific items. The forecast is based on certain assumptions like quantum of work, areas to be tackled, wage rate etc. based on assumptions like these, calculations are made.

13. MISCELLANEOUS REGULATIONS

Boundary demarcation: A well-defined forest boundary is a prerequisite for effective forest protection and its sustainable management. 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. Areas which are undemarcated and forest boundaries adjoining private land shall receive the highest priority to ensure protection of these areas. 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.

Coupe working: Various prescriptions regarding demarcation, treatment map, marking, felling, subsidiary silvicultural operations, thinning, irregular harvesting, natural regeneration, artificial regeneration, nursery operations are given.

Soil moisture conservation works: All soil moisture conservation works shall be carried out on watershed basis.

Watershed treatment methodology: Watershed development in forest areas tries to reduce the volume and the velocity of runoff through a series of interventions. The aim is to lower the water velocity, to make the water flow vertically downwards rather than horizontally across the village. Interventions are considered at diverse points in the village in a location-specific manner utilizing locally available materials and the vast knowledge of the local people regarding water flows and resource availability. Interventions are generally planned according to the "ridge-to-valley principle."

14. SCIENCE AND RESEARCH

During the process of writing of this Plan various papers, articles, reports and documents were referred from these sources and used for the writing of the Plan. As per the new working plan code 2014 many new chapter have been added for which information was not available with the division. There is a lack of research works/paper related to Pusad forest division. The research gap is in almost every aspect of the Working Plan as previous plans has not looked into the new aspects. Various aspects like carbon stock, carbon sequestration, sacred grooves, biodiversity, Climate change, NTFP research, indigenous knowledge, Trees outside forests, Social and cultural aspects of forests, Ecosystem Services etc were found to be wanting in information.

Sample plots: For forest resource assessment in the working plan, sample plots are systematically laid out in the forest area which is indicated on the Survey of India toposheet on the scale of 1:50000. The statistical sampling method namely "Systematic line plot sampling with random start was used. The plot size of 50"x50" (50 seconds x 50 seconds) representing approximately 225 ha on the ground was laid.

15. TREES OUTSIDE FORESTS

Trees Outside Forests" (TOF), these are in the form of small woodlots and block plantations, trees along linear features, such as roads, canals bunds, etc. and scattered trees on farmlands, homesteads, community lands and urban areas.

Forest Survey of India (FSI), an organization under Ministry of Environment and Forests (Government of India), is one of the few organizations in Asia that has been carrying out TOF assessments. This assessment was not carried out for Yavatmal district. Social Forestry Department (SFD) of the State has the mandate for the forestry outside forest area. Since the early 1980s the SFD has carried innumerable plantation and plantation-drives across the state. It has not only conducted such plantations but has backed-up with good awareness and extension efforts which have borne fruits in many ways. The SFD has been carrying out plantations in the private areas since 1982 in which include block plantations, agricultural bund planting and road-side plantations which form a substantial quantity and forest cover in the areas outside forest.

From 2008-09 to 2017-18, Social forestry Yavatmal division has done roadside plantation of 211 kms and block plantation of 30 hectares.

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CHAPTER - I
INTRODUCTION

Vision Statement:

Maharashtra Forest Department is the custodian of Natural Wealth in terms of Forests, Wildlife and Biodiversity, Conservation, Protection and Management are the important parts of the vision statement and sustainability is the basis. People's support through JFM, EDC etc is sought. Eco-tourism in Protected Area/Wildlife areas is important and capacity building of village artisans on Non Timber Forest Produce and its value addition supporting locals for livelihood security is envisaged. Enhancing green cover over non forest area to achieve national target of 33% is priority, use of modern technology for information and communication along with e-governance for monitoring various activities is given importance. Extensive use of digital form for bringing transparency in department's working and easy access for people is very important aspect to gain the people's positive involvement.

Goals and objectives of management:

- Increase the forest cover of the area including forest and non forest area.
- Enhancing stability of the ecosystem.
- Enhancing productivity of resources.
- Ensuring equity of the local stake holders in use of the forest resources especially the bonafide needs of the local people and forest dwelling community.
- Make forestry an important sector in the states' economy.
- Conservation of biodiversity through people's participation.

Objectives:

1. To maintain data on forest resources and undertake periodic resource monitoring.
2. To scientifically mange the forest resources in the area.
3. To prevent soil degradation and improve quality of land through various soil moisture conservation measures.
4. To regulate activities of various stakeholders in forestry sector
5. To identify, augment and conserve biodiversity within the region.

6. To document, sustainably harvest and value addition of NTFP.
7. To develop skilled manpower for protection and management of forests.
8. Utilize modern technology in forest management.
9. Involve local and forest dependent community in forest protection and management.

"SWOT" Analysis for prescription of strategies for achieving the goals and objectives.

SWOT stands for Strengths, Weaknesses, Opportunities and Threats. Strengths and Weaknesses are internal factors and Opportunities and Threats are external factors. Internal attributes are controllable to some extent. Strengths are to be pursued and weakness strategically eliminated or reduced. Considering the vastness of the factors influencing the forestry/biodiversity goals, a few factors are mentioned below in SWOT analysis

STRENGTHS	WEAKNESSES
1. Long history of conservation and scientific management of forests. 2. Strong legislation and policy. 3. Trained and disciplined staff. 4. Strong scientific background of staff. 5. Rich flora and fauna. 6. Most forest land notified as Reserve Forests. 7. Infrastructures in rural and remote area like office, residential, housing, depots, nurseries etc. 8. Organized budget release and monitoring system. 9. Increase in funds to forestry sector over the years. 10. Well established training institutes in the department.	1. Forest land scattered and adjacent o private lands. 2. Predominance of teak forests. 3. Lack of legal awareness. 4. Less mobile connectivity and lack of wireless connectivity. 5. Lack of data, research on NTFP species. 6. Maintenance of infrastructure lacking at times. 7. Long gestation period of forestry activities. 8. Lack of public involvement in forest protection. 9. Deficiency in rapport and communication between stakeholders. 10. Lack of viable alternatives for forest dependent communities. 11. Lack of specific research on flora and fauna.

OPPURTUNITIES	THREATS
1. Many new schemes and fund sources. 2. Use of modern technology in reporting and monitoring. 3. Better coordination among various departments. 4. Documentation and biodiversity studies involving educational and research institutions. 5. Training indifferent facets of wildlife management. 6. Creation of assets and infrastructure from CAMPA. 7. Various training opportunities for all cadres of staff. 8. Better awareness among people regarding nature conservation.	1. Huge gap between demand and supply of forest produce. 2. Increase in illicit felling, poaching, encroachment and grazing. 3. Increasing man- animal conflict. 4. Increase in alien invasive species. 5. Erratic rainfall and drought conditions. 6. Vacancies in sanctioned posts. 7. Staff overburdened with unproductive non forestry work. 8. Lack of sustainability in community attitudes, participation and motivation.

Expected Outcome

During implementation of the plan, the following are the prominent outcomes to be achieved.

- Nations' natural heritage will be conserved by preserving the extensive natural forests with the vast variety of the life forms and genetic resources.
- Forest cover will improve along with the increase in the productivity of the forests to meet the demand local people.
- Because of the plantations and silvicultural operations there will be more and healthy regeneration of desired species in various working circles.
- Forest boundaries will be consolidated leading to better protection and management.
- Various soil conservation measures will be undertaken on watershed basis. Soil erosion and devastation of the forest area will be checked mainly in the catchment area of the river and the existing water bodies. Silt deposition will be reduced thereby helping in increasing life of water bodies and the quality of water will improve.

- Wildlife habitats in the forest area will get improved with respect to the availability of fodder, water and shelter to the wildlife occurring in the division. This will also help in reducing man animal conflict *vis a vis* reduction in damage agricultural crops, injury/death of people and domestic livestock.
- The rights and concessions of the tribal and other rural people living within and near the forests will get protected. Their domestic requirement of fuel wood, fodder, non timber forest produce (NTFP) will be addressed.
- People will be more aware about the value of the trees, wildlife and nature in general through awareness campaign, education and extension.
- Biodiversity conservation will get a boost and many biodiversity committees would be formed and also biodiversity registers at the village level. Documentation and studies on various aspects of biodiversity will be undertaken.
- Local Gramsabhas will be strengthened; JFM/VEDC committees formed will extend active support to the department in the protection of the forests from illicit felling, illegal grazing, unauthorized NTFP collection, forest fires etc.
- As the various activities will be undertaken during the implementation of the plan, local people will get employment in the vicinity of their own villages which will boost the rural economy.
- Formation of Green Army, particularly in the schools, will inculcate values of the conservation in the young students and they will act as agents of positive change in our society.
- There will be considerable revenue generation to the state ex-chequere though this is not the priority of the Government. Ecological values and services are considered much more important than the revenue.

***

ABBREVIATIONS USED

ACF	:	Assistant Conservator of Forests
AR	:	Artificial Regeneration
Av	:	Average
b.h.	:	Breast height
CA	:	Compensatory Afforestation
C.A.I	:	Current Annual Increment
C.B.O	:	Cut Back Operation
^{o}C	:	Degree Celsius
cm	:	Centimeter
C.W.R.	:	Coppice With Reserved
C.C.T.	:	Continuous Contour Trench
cum	:	Cubic Meter
Compt.	:	Compartment
CCF	:	Chief Conservator of Forests
CF	:	Conservator of Forests
D.C.F.	:	Deputy Conservator of Forests
Dt.	:	Date
FCA, 1980	:	Forest Conservation Act, 1980
F.D.C.M.	:	Forest Development Corporation of Maharashtra
F.L.C.S.	:	Forest Labourer's Co-operative Society
F.S.	:	Felling Series
F.R.H.	:	Forest Rest house

F.Y.O.	:	First Year Operation
GDP	:	Gross Domestic Product
Govt.	:	Government
g.b.h.	:	Girth at breast height
ha	:	Hectare
hrs	:	Hours
i.e.	:	That is
Km.	:	Kilometer
Kg	:	Kilogram
m	:	Meter
MD	:	Man Day
mm	:	Millimeter
Max	:	Maximum
Min	:	Minimum
M.A.I.	:	Mean Annual Increment
M.F.P.	:	Minor Forest Produce
MRSAC	:	Maharastra Remote Sensing Application Centre
M.S.L.	:	Mean Sea Level
M.T.	:	Metric Tone
N.A.	:	Not Available
NFAC	:	National Forestry Action Programme
N.T.F.P.	:	Non Timber Forest Produce
N.R.	:	Natural Regeneration

No.	:	Number
NWAP	:	National Wildlife Action Plan
NWFP	:	Non Wood Forest Produce
PB	:	Periodic Block
P.F.	:	Protected Forest
P.P.O.	:	Pre Planting Operation
%	:	Percentage
R.F.	:	Reserved Forest
R.F.O.	:	Range Forest Officer
Rs	:	Rupees
Sq	:	Square
Sr	:	Serial
S.C.I.	:	Selection-cum-Improvement
S.Y.O.	:	Second Year Operation
Temp	:	Temperature
T.Y.O.	:	Third Year Operation
W.C.	:	Working Circle
IV th Y.O.	:	Fourth Year Operation

GLOSSARY OF LOCAL NAMES

Bandhgad	:	Earthen mound
Chunkad	:	Soil with nodular pieces of limestone
Geru	:	Red Ochre or Red earth
Gairan	:	A place for herding cattle
Gaothan	:	A site kept reserved for housing
Gully	:	Channel
Jawari	:	A cultivated millet
Jewan	:	Lunch / Dinner
Jungle	:	Forest
Kacha road	:	Temporary road
Kania	:	Coarse ground grains
Kankar	:	Lime nodules
Kartik	:	October
Kharif	:	Monsoon crop
Mandav	:	A shade
Murram	:	A reddish hard soil
Naka	:	Barrier on road for checking forest produce in transit
Nala	:	A water course
Nadi	:	River
Niahali	:	Morning meal
Nistar	:	Forest produce required for bonafide agriculture or domestic purposes
Padit	:	A barren or waste land
Pansthal	:	Waterhole
Parwana	:	License
Pit	:	Jawari flour

Rabi	:	Winter crop
Ramna/Kuran	:	A grass reserved close to grazing
Regur	:	Black cotton soil
Sarbandh	:	Lines between survey number
Shikar	:	Hunting
Siw	:	Village boundary
Taluka /Tahsil	:	A revenue administrative block.
Tambodi	:	Red coloured
Utarwat	:	Sloping surface
Vilayat	:	Evotic
Walsar	:	Soil with excess of sand

LIST OF FLORA
LOCAL AND BOTANICAL NAMES OF PLANTS OCCURRING IN PUSAD FOREST DIVISION

A. TREES

Local Name	Botanical Name	Family
Achar	*Buchanania lanzan*	Anacardiaceae
Ain	*Terminalia alata*	Combretaceae
Ali/Aal/Bartondi	*Morinda tinctoria*	Rubiaceae
Amaltas/Bahawa	*Cassia fistula*	Caesalpiniaceae
Amta	*Bauhinia malabarica*	Caesalpiniaceae
Apta/Kachnar	*Bauhinia racemosa*	Caesalpiniaceae
Anoxia/Aonla	*Phyllanthus emblica*	Euphorbiaceae
Arjuna/Kahu	*Terminalia arjuna*	Combretaceae
Babul/Babool	*Acacia nilotica*	Mimoseae
Bakain / Baka neem	*Melia azedarach*	Meliaceae
Beheda	*Terminalia bellerica*	Combretaceae
Bel	*Aegle marmelos*	Rutaceae
Bhirra	*Chloroxylon swietenia*	Rutaceae
Biba/Bhilawa	*Semecarpus anacardium*	Anacardiaceae
Bija	*Pterocarpus marsupium*	Fabaceae
Bistendu	*Diospyros montana*	Ebenaceae
Bor/Ber	*Zizyphus mauritiana*	Rhamnaceae
Chandan	*Santalum album*	Santalaceae
Chichwa	*Albizzia odoratissima*	Mimoseae
Chinch	*Tamarindus indica*	Caesalpiniaceae
Dahibaras	*Cordia macleodii*	Boraginaceae
Dhaman	*Grewia tilifolia*	Tiliaceae
Dhaora/Dahwda	*Anogeissus latifolia*	Combretaceae
Dhoban/Phansi	*Dalbergia paniculata*	Fabaceae
Ghoti/Ghot	*Zizyphus glaberrima*	Rhamnaceae

Haldu	*Adina cordifolia*	Rubiaceae
Hiwar	*Acacia leucophloea*	Mimoseae
Hirda/Harra	*Terminalia chebula*	Combretaceae
Jambhul/Jamun	*Syzygium cuminii*	Myrtaceae
Karam.Mundi	*Mitragyna parviflora*	Rubiaceae
Karanj	*Pongamia pinnata*	Fabaceae Flacourtia
Karu(Cassia)	*Cassia siamea*	Caesalpiniaceae
Khair	*Acacia catechu*	Mimoseae
Kusum	*Schleichera oleosa*	Sapindaceae
Kawat	*Limonia acidissima*	Rutaceae
Kulu	*Sterculia urens*	Sterculiaceae
Lendia/Lenda/schena/Asah	*Lagerstroemia parviflora*	Lythraceae
Lokhandi	*Ixora arborea*	Rubiaceae
Medsing	*Dolichandrone falcata*	Bignoniaceae
Moha/Mahuwa	*Madhuca longifolia*	Sapotaceae
Mokha	*Schrebera swietenioides*	Oleaceae
Moyen/Mowai	*Lannea coromandelica*	Anacardiaceae
Neem	*Azadirachta indica*	Meliaceae
Pipal	*Ficus religiosa*	Moraceae
Rohan	*Soymida febrifuga*	Meliaceae
Sag/Sagwan/Teak	*Tectona grandis*	Verbenaceae
Saja/Ain	*Terminalia alata*	Combretaceae
Salai	*Boswellia serrata*	Burseraceae
Semal(Borgu)	*Bombax ceiba*	Bombacaceae
Shiwan/Siwan	*Gmelina arborea*	Verbenaceae
Sirus(Black)	*Albizzia lebbek*	Mimoseae
Sirus(White)	*Albizzia procera*	Mimoseae
Sissoo	*Dalbergia sissoo*	Fabaceae
Sitaphal	*Annona squamosa*	Annonaceae
Tendu	*Diospyros melanoxylon*	Ebenaceae
Tiwas/Tinsa	*Ougeinia oojeinensis*	Fabaceae

B. SHRUBS

Local Name	Botanical Name	Family
Bharati	*Gymnosporia spinosa*	Celasteraceae
Chillari	*Mimosa rubicaulis*	Mimoseae
Chillati	*Caesalpinia sepiaria*	Caesalpiniaceae
Dudhi/Kalakuda	*Wrightia tinctoria*	Apocynaceae
Dhayati	*Woodfordia floribunda*	Lythraceae
Kari Korando	*Carissa spinarium*	Apocynaceae
Karat	*Barleria prionitis*	Acanthaceae
Kuda, Indrajav	*Holarrhena antidysenterica*	Apocynaceae
Muradsheng/Marorphal	*Helicteres isora*	Sterculiaceae
Nirgudi	*Vitex negundo*	Verbenaceae
Sindhi/Chhindi	*Phoenix sylvestris*	Arecaceae(Palmaceae)
Tarwar	*Cassia auriculata*	Caesalpiniaceae
Waghoti	*Capparis horrida*	Capparidaceae
Zingrool/Pharsa	*Grewia orbiculata*	Tiliaceae

C. HERBS

Local Name	Botanical Name	Family
Divali	*Tephrosia hamiltonii*	Fabaceae
Gajargawat	*Parthenium hysterophorus*	Asteraceae
Gokhru	*Tribulus terrestris*	Zygophyllaceae
Hamata	*Stylosanthes hamata*	Caesalpiniaceae
Pivla Dhotra	*Argemone mexicana*	Papaveraceae
Pivili tilwan	*Cleome viscosa*	Cleomaceae
Rantulsi/Bantulsi	*Hyptis suaveolens*	Lamiaceae

Rantur	*Atylosia scarabaeoides*	Fabaceae
Scabra	*Stylosanthes scabra*	Caesalpiniaceae
Tarota	*Cassia tora*	Caesalpiniaceae

D. GRASSES AND BAMBOOS

Local Name	**Botanical Name**	**Family**
Bans/Bamboo	*Dendrocalamus strictus*	Poaceae(Gramineae)
Bhurbhusi	*Eragrostis tenella*	Poaceae
Duswa/Haryalli/Doob	*Cynodon dactylon*	Poaceae
Dongri gavat	*Chrysopogon montana*	Poaceae
Guhar, marwel	*Andropogon annulatus*	Poaceae
Kans	*Saccharum spontaneum*	Poaceae
Khas	*Vetiveria zizanioides*	Poaceae
Kodmor	*Apluda varia*	Poaceae
Kunda	*Ischaemum pilosum*	Poaceae
Kusal	*Heteropogon contortus*	Poaceae
Mushan	*Iseilema laxum*	Poaceae
Paonia	*Schima sulcatum*	Poaceae
Sabai or sum	*Ischaemum angustifolium*	Poaceae
Sheda	*Schima nervosum*	Poaceae
Tikhadi/Rusa/Rosha	*Cymbopogon martini*	Poaceae

E. CLIMBERS

Local Name	**Botanical Name**	**Family**
Bhuikand/Baichend	*Dioscorea daemona*	Dioscoreaceae
Chilati	*Acacia pennata*	Mimoseae
Eruni	*Zizyphus oenoplia*	Rhamnaceae

Gunchi/Gunj	*Abrus precatorius*	Papilionaceae
Khajkuri	*Mucuna pruriens*	Fabaceae
Mahulbel/Mahul	*Bauhinia vahlli*	Caesalpiniaceae
Palasvel	*Butea superba*	Fabaceae
Piwarvel	*Combretum ovalifolium*	Combretaceae
Shatova/Satawari	*Asparagus racemosus*	Liliaceae
Kawavel,Dudhi(Nagvel)	*Cryptolepis buchanani*	Asclepiadaceae

LIST OF FAUNA

COMMON AND ZOOLOGICAL NAMES OF WILD ANIMALS AND BIRDS

A. CHECK LIST OF WILD ANIMALS

Common Name	Scientific Name
Panther/Bibta (M) / Tendua(H)	*Panthera pardus*
Striped Hyena / Taras (M) / Lakkadbagha(H)	*Hyaena hyaena*
Jackal	*Canis aureus*
Indian Fox	*Vulpes bengalensis*
Jungle cat	*Felis chaus*
Black buck	*Antelope cervicapra*
Cheetal	*Axis axis*
Nilgai	*Boselaphus tragocamelus*
Wild boar	*Sus scrofa*
Sloth bear	*Melursus ursinus*
Common langur	*Presbytis entellus*
Porcupine	*Hystrix indica*
Hare	*Lepus nigricollis*

B. CHECK LIST OF WILD BIRDS

Common Name	Scientific Name
Pond Heron or Paddy bird	*Ardeola grayii*
Cattle Egret	*Bubulcus ibis*
White Breasted Waterhen	*Amaurornis phoenicurus*
Grey Partridge	*Francolinus pondicerianus*
Jungle Bush Quail	*Perdicula asiatica*
Yellow Wattled Lapwing	*Vanellus malabaricus*
Rose Ringed Parakeet	*Psittacula krameri*
Blosson Headed Parakeet	*Psittacula cyanocephala*
Alexandrine Parakeet	*Psittacula eupatria*
Koel	*Eudynamys scolopacea*

Crow Pheasant (Coucal)	*Centropus sinensis*
Spotted owlet	*Athene brama*
Common Indian Night Jar	*Caprimulgus asiaticus*
White Breasted Kingfisher	*Halcyon smyrnensis*
Common Kingfisher	*Alcedo atthis*
Green Bee Eater	*Merops orientalis*
Hoopoe	*Upupa epops*
Indian Roller	*Coracias bengalensis*
Golden Backed Wood Pecker	*Dinopium benghalense*
Rufous Backed Shrike	*Lanius schack*
Golden Oriole	*Oriolus riolus*
Black Drongo	*Dicrurus adsimilis*
Brahminy Myna	*Sturnus pagodarum*
Common Myna	*Acridotheres tristis*
House Crow	*Corvus splendens*
Jungle Crow	*Corvus macorthynchos*
Small Minivet	*Pericrocotus cinnamoneus*
Common Iora	*Aegithina tiphia*
Red Vented Bulbul	*Pycnonqus cafer*
Common Babbler	*Turdoides caudatus*
White throated fantail	*Rhipidura albicollis*
Paradise Flycatcher	*Terpsiphone paradisi*
Magpie Robin	*Copsychus saularis*
Indian Robin	*Saxicoloides fulicata*
Gray Wagtail	*Motacilla cinerea*
Pied or White Wagtail	*Motacilla alba*
Grey Tit	*Parus mauor*
Purple Sunbird	*Nectarinia asiatica*
House Sparrow	*Passer domesticus*

OTHER

List of Algae, Fungi Bryphytes, pteridophytes and Lichens found in Pusad Forest Division.

(As provided by Amolakchand Mahavidhalaya, Yavatmal.)

Sr.No.	Species
1	**Algae :-** Spirogyra, Chara, Oedogonium, Hydrodictyon, Mougotia, Oscillatoria, Nostoc, Naviculla, Scendesmus, Cosmarium, Pinularia, Cymbella.
2	**Fungi :-** Aspergillus, Chaetomium, Penicillium, Mucor, Rhizopus, Fusarium, Alternaria, Pyricularia, Curvularia, Helminthosporium.
3	**Bryphytes :-** RIccia, Notothallus, Marchantia, Polytrichum,Sphagnum.
4	**Ptovidophyto :-** Ptcris, Nephrolepis, Azolla, Lsoetes.
5	**Lichens :-** Graphis, Lecanora, Lobaria, Megalaria.

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SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED

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PART - I
SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED

PART - II
FUTURE MANAGEMENT

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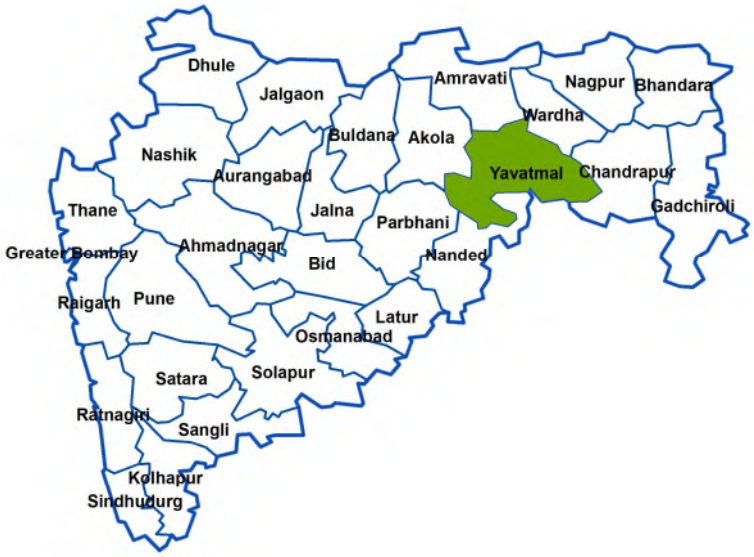
PART – I

SUMMARY OF FACTS ON WHICH PROPOSALS ARE MADE

LOCATION OF PUSAD FOREST DIVISION

MAHARASHTRA



YAVATMAL DISTRICT

PUSAD FOREST DIVISION
RANGES

PUSAD FOREST DIVISION
Beat map

N
W E
S

1:150,000

Legend

- Division boundary
- Beat boundary
- Isapur WLS
- Painganga WLS

0 2.5 5 10 15 20 25
Kilometers

PUSAD FOREST DIVISION
Village map

N
W E
S

1:150,000

Legend

- Division boundary
- Isapur WLS
- Painganga WLS

0 2.5 5 10 15 20 25
Kilometers

CHAPTER – 1

THE TRACT DEALT WITH

1.1: NAME AND SITUATION:

Pusad forest division is one of the four forest divisions in Yavatmal circle, in Yavatmal District of Maharashtra. Pusad forest division is located in the South West of Yavatmal district. The present Pusad forest division was carved out of East Yavatmal and West Yavatmal Division vide Government of Maharashtra Notification No. FDM/1BboF-2/Dt. 29.08.1983. Pusad forest division comprises of Pusad, Digras, Shembalpimpri, Mahagaon, Kali (D), Umarkhed and Marwadi ranges. Area of the division lies in Pusad, Digras, Mahagaon and Umarkhed Talukas of Yavatmal district. The district headquarters is at Yavatmal while the division headquarters is at Pusad.

The total geographical area of the division is 4,45,840 ha and the forest area is 1,12,782.92 ha which is about 25.29% of the total geographical area of the division.

The total forest area of Pusad forest division is 69,035.94 ha out of which 68,549.79 ha is Reserved Forests, 231.07 ha is Protected Forests and 255.08 ha is Un-classed Forests. The boundaries of Pusad forest division includes Painganga Wildlife Sanctuary (42,489 ha) and Isapur Wildlife Sanctuary (2483 ha). A total 69035.94 ha area shall be dealt with in this working plan excluding the area of two wildlife sanctuaries. The compartment wise details is given in **Appendix-I.** The forests of this division lies between longitude 77°18’ to 78°12’ East and latitude 19°26’ to 20°15’ North.

Boundaries: The boundaries of the division are as follows-

North	:	Darwha taluka of Yavatmal district
North East	:	Arni taluka of Yavatmal district
North West	:	Manora taluka of Washim district
South	:	Hadgaon taluka of Nanded district and Painganga river
South East	:	Kinwat taluka of Nanded district and Painganga river
South West	:	Kalamanuri taluka of Hingoli district and Painganga river
East	:	Kinwat taluka of Nanded district and Painganga river
West	:	Washim taluka of Washim district.

1.2: CONFIGURATION OF THE GROUND:

The area consists of masses of hilly country broken by broad valleys and partially surrounded by plains. Painganga river gives a strip of plains in many parts of its course along the border of the division. The tributaries of Painganga again have formed valleys. Most of the tract lies on a high level plateau at an average elevation of 350m to 450m above mean sea level and edge of plateau facing Painganga is more rugged as it has high elevation, ranging from 600 to 700 m above mean sea level.

1.3: GEOLOGY, ROCK AND SOIL:

The dominant parent material all over the district is Deccan trap but Purana formations (shales, slates, limestones and sandstones) are also noticed. Achaeans, which comprise granites, granitic gneisses and schists occur in Umarkhed taluka. In these rocks only weathered portions and jointed zones possess water-bearing capacity and ground water occurs under unconfined condition in the area.

The limestones as such are massive but wherever they are cavernous they are capable of holding water. The gondwana consists of kamthi and barakar sandstone. Sandstone is usually friable and possesses primary porosity due to its granular nature. They are most productive water bearing formations in the district. Alluvium occurs in patches along the banks of Painganga rivers and their major tributaries and consists of clay and silt with lenticular bodies of sand and gravel. Ground water in alluvium occurs both under unconfined and semi-confined conditions. Deccan trap basalt is widely spread and forms important water bearing formation, which occupies almost entire district.

The soils which are derived from the deccan trap vary in their characteristics according to their location in the respective catchments. While the deep black soils occupy the low lying areas, the brownish soils, comparatively coarser in texture occur on the higher elements of relief. The shales are deep red, fine grained with somewhat nodular structure much jointed, but irregularly breaking up into small minute angular fragments. The reddish brown coarse textured soils locally known as barad or murmad occur at still higher elevations. The medium black soil which is the predominant type occurs extensively in different parts.

1.4: CLIMATE PARAMETERS:

Yavatmal district comes under Deccan plateau Hot Semi-Arid Eco region. The climate is hot and dry with moderately cold winters with four seasons such as -

a. The hot season (March and extends upto the first week of June) - the summer season from March to May has continuous rise in both day and night temperature. May is generally the hottest month of the year with the mean daily temperature at about 42° C. The heat in summer season is intense and on some days in May and June the maximum temperature may rise up to about 46° C.

b. The Southwest monsoon season (June second week to first week of September) - with the onset of the Southwest monsoon, there is an appreciable fall in the temperatures and the weather becomes pleasant. The air is humid and the skies are heavily clouded to overcast.

c. The post monsoon season (2nd week of September to 1st week of December) - With the withdrawal of monsoon, day temperature increases slightly while the night temperature progressively decreases and by the end of November both day and night temperatures fall rapidly.

d. The cold season (2nd week of December till February) - December is usually the coldest month of the year with mean daily minimum temperature at about 13° C. The minimum temperatures may drop upto 7° C.

Table No.1.1: Average minimum and maximum temperature

Year	Station	Minimum	Maximum
2009	Yavatmal	11.20	46.60
2010	Yavatmal	19.00	44.00
2011	Yavatmal	17.00	44.00
2012	Yavatmal	17.00	42.00
2013	Yavatmal	19.00	42.00
2014	Yavatmal	19.00	43.00
2015	Yavatmal	18.00	42.00
2016	Yavatmal	19.00	43.00
2017	Yavatmal	18.00	43.00
2018	Yavatmal	20.91	42.71
Average Temperature		17.81	42.23

RAINFALL

Precipitation is quite variable and shows fluctuations in its distribution and quantity that have significant implications on forestry, wildlife, agricultural productivity, food security, land use as well as ecological impacts. Almost 80% space of the total annual rainfall is received during the Southwest monsoon **(Appendix-II)**. Rainfall begins in July and retreats in the second week of October. Most of the rainfall is received during July, August and September. The normal annual rainfall varies from about 850 to 1150 mm. The average annual rainfall for the last ten years is given in the table below.

Table No. 1.2: Rainfall (mm)

Station	Digras	Pusad	Mahagaon	Umarkhed	Total	Average
2008	528.10	885.40	690.60	570.70	2674.80	668.70
2009	738.70	618.10	638.00	667.30	2662.10	665.53
2010	1246.00	1335.80	1137.00	792.50	4511.30	1127.83
2011	864.00	818.00	839.40	865.00	3386.40	846.60
2012	934.40	1049.00	912.00	765.00	3660.40	915.10
2013	1152.10	1072.30	1500.40	1538.70	5263.50	1315.88
2014	495.90	402.20	355.90	452.00	1706.00	426.50
2015	513.90	594.90	485.40	418.40	2012.60	503.15
2016	865.40	911.20	1041.50	709.60	3527.70	881.93
2017	525.00	680.10	361.80	438.80	2050.70	512.67

***

CHAPTER – 2

MAINTENANCE/INCREASE IN THE EXTENT OF FOREST AND TREE COVER

2.1: AREA OF FORESTS UNDER DIFFERENT LEGAL CLASSES (RF, PF, UF AND OTHERS):

The Reserve Forests have been declared from time to time out of the changes of Government land by notifications or occasionally through acquisition under Land Acquisition Act. For the first time in 1871 the State forests were promulgated by the Forest Rules of 1871 which effected demarcation of Reserved Forests at that time. In 1892 under Berar Forest Law, State forests have been notified from time to time. Forests was notified again in detail in 1911, when Indian Forest Act was applied to Berar State and also the constitution of State forest under the Berar Forests Law was confirmed by issuing a general notification. Since then the changes in area or classification are notified under the Indian Forest Act.

There are basically two kinds of forests in the division namely Reserved Forests as declared under Indian Forest Act and Ex-private forests. The Reserved Forests are divided into 'A' and 'C' class according to the principles of forest management. In 'A' class Reserve Forest, the rules of fire protection are strict, closed for grazing and felling was regulated. However, in 'C' class Reserve Forests, rules for fire protection, grazing are not enforced but regulated with few restrictions on felling. The Ex-private forests were taken by Forest department for management but not declared either as Protected Forests or Reserved Forests and the Indian Forest Act was not applicable to these areas. The private forests were completely vested with the Government with the effect of abolition of corporate act 1951 and were taken over by Revenue department. The Revenue department utilized the excess areas for various purposes of villages under the recommendations of nistar officer Yavatmal and they have been subsequently taken over by Forest department. Later on these areas were declared as Reserve Forest under Indian Forest Act. Pusad forest division was reorganized in the year 2013 vide PCCF.M.S. Nagpur, letter No.D-7/

Estt-1/C.R.-139/Reorg.Ytl/140, dt.9/05/2013. The forest area changes during various working plans are as under:

1. Total geographical area (after re-organization in 2013) :4,45,840.00 ha.
2. Total forest area at the time of creation of Pusad forest division :1,12,782.92 ha.
3. Area handed over to Painganga WLS in the year 1996-97 :29,973.57 ha.
4. Area dealt in Shri. Gupta's Plan (1996-97 to 2005-06) : 82,809.35 ha.
5. Excluded Area
    a. Area given to FDCM (2000-01) :3,389.84 ha.
    b. Additional area handed over to Painganga WLS (2010-11) : 10,098.07 ha.
6. Area received for compensatory afforestation : 113.82 ha.
7. Area dealt in Shri. Tyagi and Rao's plan (2008-09 to 2017-18) :69,435.26 ha.
8. Area received
    a. From Yavatmal division (2014-15) :873.02 ha.
    b. From FDCM (2009-10) :1,093.17 ha.
    c. For compensatory afforestation (2012-13) :1,459.53 ha.
9. Area handed over to
    a. Yavatmal division (2014-15) : 730.70 ha.
    b. FDCM against Koka WLS (2014-15) :610.60 ha.
    c. Area notified as Isapur WLS : 2,483.74 ha.
10. Total Area dealt in this working plan : 69035.94 ha.

The total forest area of Pusad forest division is 69035.94 ha out of which 68,549.79 ha is Reserved Forests, 231.07 ha is Protected Forests and 255.08 ha is Un-classed Forests. The details of the notification are mentioned in **Appendix-III.** The land acquired for compensatory afforestation remained as Un-classed Forest which needs to be proposed for declaration as Reserved Forest. The area details are summarized in the table given below.

Table No. 2.1: Rangewise distribution of the forest area (ha)

Sr. No.	Range	No. of Compts.	Total Area	RF		PF	Un-classed Forest
				A-Class	C-Class		
1	Digras	57	12864.43	7191.25	5673.18	0.00	0.00
2	Pusad	34	7798.06	7274.54	523.52	0.00	0.00
3	Shembalpimpri	42	7533.15	4369.04	3164.11	0.00	0.00
4	Umarkhed	49	10240.54	9818.98	361.67	0.00	59.89
5	Mahagaon	51	14100.49	12359.66	1556.83	0.00	184.00
6	Kali (D)	36	8934.78	6564.24	2139.47	231.07	0.00
7	Marwadi	31	7564.49	7112.68	440.62	0.00	11.19
	Total	300	69035.94	54690.39	13859.40	231.07	255.08

The total area dealt in this plan is 69035.94 ha.

2.2: FOREST AREA UNDER DIFFERENT WORKING CIRCLE:

The area under the different working circles in the division is given in the following table.

Table No. 2.2: Area allocation to different working circles

Sr. No.	Working Circle	Area in (ha)	Percentage
1	Selection-Cum-Improvement WC	35984.18	52.12%
2	Catchment Area Treatment WC	16414.79	23.78%
3	Afforestation WC	13679.82	19.82%
4	Fodder Improvement WC	1307.27	1.89%
5	Miscellaneous WC	1649.88	2.39%
Total		69035.94	100%

The range-wise allocation of area under the different working circles is given in the following table.

Table No. 2.3: Range-wise area allocation to different working circles

Sr.No	Range	SCI WC	Aff WC	CAT WC	Fod Imp WC	Misc WC	Total
1	Digras	4432.14	3803.91	3598.57	159.95	869.86	12864.43
2	Pusad	4825.61	533.79	1848.30	521.66	68.70	7798.06
3	Shembalpimpri	4089.14	790.36	2391.37	0	262.28	7533.15
4	Umarkhed	6543.57	1880.67	1784.29	0	32.01	10240.54
5	Mahagaon	9698.20	1584.98	2206.02	291.38	319.91	14100.49
6	Kali (D)	3642.51	4957.99	0	334.28	0	8934.78
7	Marwadi	2753.01	128.12	4586.24	0	97.12	7564.49
Total		35984.18	13679.82	16414.79	1307.27	1649.88	69035.94

2.3: PERCENTAGE OF FOREST WITH SECURED BOUNDARIES:

The forests were clearly demarcated in the past and the boundaries of the forest areas are maintained. The total length of the external boundary of the Reserved Forests is 1281.386 kms, out of which 1255.982 kms is artificial boundary and 25.404 kms is natural boundary. The boundaries are maintained regularly under $1/5^{th}$ boundary demarcation scheme. There is a clearcut demarcation between 'A' class and 'C' class and also 'C' class and Protected Forests.

The boundary demarcation adjoining to private lands is not properly maintained. The demarcation of 'A' Class Reserved Forests is well maintained as compared to the demarcations of Protected and Un-classed Forests. The pre cast pillars are not erected in the field. Proper boundary demarcation and maintenance of boundaries is the need of the hour; encroachments are increasing day by day specially on those forests which are adjoining to private lands.

2.4: LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF):

The total area dealt with in the previous plan was 69,435.26 hectares. Over the period of ten years from 2008-09 to 2017-18, certain area was received from Yavatmal division (873.02 ha), from FDCM (1093.17 ha) and for compensatory afforestation (1459.53 ha). Also during the past ten years, forest land was handed over to Yavatmal division (730.70 ha), to FDCM (610.60 ha). An area of 2483.74 ha was notified as Isapur Wildlife Sanctuary. The area disforested prior to 1980 is given in **Appendix-IV.** The total area dealt in this plan is 69035.94 ha.

2.4.1 : A total area of 488 ha for 11 projects was diverted for non forestry purpose under the provisions of Forest Conservation Act 1980 **(Appendix-V(A) and V(B)).**

2.4.2 : Area diverted for non-forestry purposes under Forest Rights Act 2006 :

The status of implementation of FRA 2006 in Pusad forest division (upto March 2018) is as below.

Table No.2.4: Status of implementation of FRA 2006 (till March 2018)

Sr. No.	Type of FRA	No. of Proposals	No. Proposal accepted	Total Area (ha)
1	Individual Forest Right	18	18	24.06
2	Community Forest Right	81	81	19961.5
3	FRA U/S 3 (2)	20	20	8.157
	Total	119	119	19993.72

The diversion of forest land to the traditional forest dwellers has fragmented the area of the division. The details are given in **Appendix-VI**.

2.5: THREATS TO THE FOREST:

The forests of Pusad forest division mostly suffer from unregulated grazing, illicit felling, encroachments and repeated forest fires. They can disrupt the flow of goods and services from forests by affecting tree growth and survival, water quality and yield, and biodiversity. The other agencies which caused injury to the forests such as droughts, frost, floods, plants and insects are negligible.

Illicit felling: Illicit felling is common and also increasing day by day both for commercial and domestic purposes. As this forest is adjoining to border district of Nanded, people within the district and from adjoining areas indulge in illicit felling in areas where the good quality teak forests are available *i.e.* along the Painganga river. Sometimes the people from adjoining State of Telangana come in groups, cut teak timber and transport it to Telangana illegally where they get higher prices. These organized gangs indulge in systematic illicit felling along the border of Telangana. Local people in and around the forest area of the division may indulge in illicit felling for meeting their domestic needs such as requirement of fuel, small timber, firewood as there is a huge gap between demand and supply of forest produce. People generally indulge in illicit felling due to unemployment, higher prices of some of the forest products in the market like teak. Lopping of trees and shrubs for rab burning of field has further deteriorated the situation. In general, illicit felling, lopping and pollarding of forest species has further deteriorated the forest crop in terms of quality and quantity of the forests.

Fire: Forest fires are most destructive in dry season from February and continuous up to June. During this period the forests are vulnerable to fires and the fires that take place by end of winter and at the beginning of summer are not that much damaging. Most of the fires that take place in these forests are man made and accidental which hamper the establishment of natural regeneration. The damage is very severe when freshly felled material is lying in the coupe and fire takes place in the plantation. Young regeneration suffers a lot mainly of teak and other species as they get damaged or killed due to die back. In this area fires are ignited by grazers, intentionally or unintentionally or by villagers who go for Mahua collection to forest. Repeated fires in the forest areas of this dry zone during the dry season cause to extensive damage to the tree growth and reproduction. Late fires in the grassy areas or in closed coupes result in fire calamity. In this area fires are generally ground fires and creeping fires which may not reach to crown level as in case of conical forests. Fires cause lot of damage not only to regeneration but also to wildlife. It also destroys various microbes in the soil which convert leaf litter into humus. The total area of forests affected due to forest fires is 2375 ha (2009-2018).

Table No. 2.5 (A) : List of offence cases

Year	Fire	Grazing	Illicit felling	Others	Total
2008-2009	12	11	746	114	883
2009-2010	9	7	567	79	662
2010-2011	7	1	890	93	991
2011-2012	64	0	773	9	846
2012-2013	15	0	675	22	712
2013-2014	20	8	593	39	660
2014-2015	12	6	743	46	807
2015-2016	41	9	654	60	764
2016-2017	42	9	778	41	870
2017-2018	74	3	727	3	807
Total	296	54	7146	506	8002

Grazing: Grazing is another damaging agency of forests which destroys young regeneration, plantation due to trampling of the areas and excessive movement of cattle population leads to compaction of soil resulting in less porosity of the soil. This makes the soil less conducive for the establishment of young regeneration. Uncontrolled cattle movement is very much common in the forests around the villages. Continuous,

unrestricted grazing is very much harmful for the tree growth and also for the establishment of regeneration. The forests establish well in the areas where there is regulated grazing or no grazing. On the contrary, considerable damage has been noticed in the areas where there is uncontrolled excessive grazing more than the carrying capacity of the forests. Grazing in the forests is not uniform as cattle population is restricted to village areas. The grazing pressure is very much serious in the forests especially in summer season *i.e.* February to June. During this period the forests go dry and some areas, the graziers indulge in lopping of trees to feed their cattle. Sheeps and goats are not allowed to graze in the forests which are meant for production of timber. However, the forests are still suffering from grazing of sheep and goats in this region.

Encroachments: The encroachments though may not be serious in this area but forest areas adjoining to agricultural fields of farmers are being encroached especially during the month of monsoon. Some of the forest areas have been cleared, denuded and utilized for agricultural purposes.

Table 2.5 (B) : Rangewise encroachment on forest area

Sr.No.	Name of Range	Compartment No.	Encroached Area (ha.)
1	2	3	4
1	Marwadi	832	0.37
2	Kali (D)	332, 793, 809, 812, 815	38.07
3	Umarkhed	758	15.865
	Total		54.305

Damage by wild animals: In this area Nilgai, Sambar and Chital cause lot of damage to the young regeneration due to grazing by these animals. Also wild pigs, hares, and porcupines cause damage in the plantation. Wild pigs' damage is noticed in bamboo plantation at the young stage. Porcupines usually eat the rhizome, bark of Haldu, Moha and Amaltas near the base of the tree, which hampers the proper establishment of the tree. Monkeys cause considerable damage to flowers, and fruits of the trees. Chital cause damage to the bark of the Shivan at the base thereby girdling the tree, which results in the death of the tree. The damage caused by wild animals is not that much serious when compared to damage caused by the other domestic animals.

Insects and fungi: In this area teak skeletonizer (*Eutectona machaeralis)* and teak defoliator (*Hyblaea puera)* are common. The insect attack is noticed mostly during rainy season and estimated loss due to teak defoliator is around 10% in this forest. Insects also attack young crop of Dhawda, Aonla.

Invasive alien species: Among the major threats faced by native plants and animal species (and their habitats), the one posed by the invasive alien species is truly scaring since it is considered second only to that of the habitat loss. Damage by climbers mostly confines to the forests along the river bank of Painganga and along the nalla banks in this area. Cheelati, Ironi are the main climbers which cause harm to the forest in this area. Sometimes damage by Lantana is also noticed affecting both regeneration and growth by covering forest growth and competing for spaces.

Drought: The erratic and scanty rainfall in every year caused drought like conditions in the recent past. Drought affects the growth of plantation, establishment of regeneration and also growth of forest crops as the soil moisture and water are vital ingredients of growth and regeneration.

Frost: Injury due to frost is not seen in this area.

Wind storms: No considerable damage is noticed due to wind storms in this area.

Soil erosion: Soil erosion is noticed in this area especially along the river Painganga and its tributaries. Sheet erosion is very common in the entire area. Gully formation takes place due to erosion along the river banks. In some of the areas, roots of trees are exposed due to excessive erosion of the soil leading to the windfall of the trees.

2.6: DISTRIBUTION OF DIFFERENT FOREST TYPES:

2.6.1: The forest of Pusad forest division falls under the category of "Tropical, dry deciduous forest" of Champion and Seth's revised survey of forest types of India and belongs to sub group 5A/Cib "Southern Tropical dry, deciduous" and the climax sub types are categorized on the basis of various local factors like soil texture, depth, soil moisture, topography and also environmental conditions. Most of these forests suffer from biotic factors like heavy grazing, illicit felling and repeated fire incidences and also to some extent encroachments. The forests of Pusad division are situated under soils derived from

underlying trap characterized by presence of teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. These forests are characterized by the presence of quite high proportion of teak (upto 70%).

2.6.2: Majority forest area of Pusad forest division represents site quality IVa and IVb. However, some of the forest areas adjoining to Painganga Sanctuary belong to site quality III where the soil is formed both from trap rock and indigenous are situated along with of Painganga and its tributaries. The forests of this area are characterized by better quality of teak with good patches of natural regeneration of teak and miscellaneous species such Ain, Dhawda, Lendia, Kalam, Tiwas, Tendu, Satpudi, Bhirra, Rohan, Salai, Semal, Behada, Sisam, Bija, Bel, Amaltas, Aonla, Char, Dudhi, Ghoti, Palas, Dhaman, Mohin, Bartondi, Lokhandi, etc.

2.7: TREE COVER OUTSIDE FOREST AREA:

An accurate assessment of forest and tree resources in the country is essential for formulating sound strategy for forestry sector. Precise data and latest information on forest cover and volume of growing stock of forests/trees and trends of changes therein are basic ingredients for policy and planning purposes. Generally, extensive tree wealth exists outside continuous forested areas in every country. Termed as 'Trees Outside Forests" (TOF), these are in the form of small woodlots and block plantations, trees along linear features, such as roads, canals bunds, etc. and scattered trees on farmlands, homesteads, community lands and urban areas. Traditionally, these were not inventoried and little quantitative information existed about TOF. However, lately a lot of interest has been generated worldwide on TOF. Besides providing support to rural economy, these trees are now a source of substantial forest produce in every country. Tree population along avenues has been taken up extensively since early 1950s mainly along roads, railway tracks, bunds, canals, riverbanks, in parks, in blocks and other blank areas. Farm forestry, agro-forestry and wasteland afforestation activities have subsequently increased the tree wealth of the state.

TOF Area: All lands (rural and urban) outside the Recorded Forest Area.

TOF Area (rural): The TOF area includes all areas outside the traditional/notified Reserved and Protected Forests but excludes areas of Municipality, Corporation, Cantonment Board or a notified area Committee etc. which has population more than 5000 and more than 75% male working population are engaged in non-agricultural occupation.

Trees outside forest (urban) Area: The definition of urban area followed in this survey is same as followed in the decennial Population Census of Urban areas in 1991 Census and consist of:

(i) All places with a Municipality, Corporation, and Cantonment Board or Notified Town area Committee etc.

(ii) (ii) All other places which satisfy the following criteria: A minimum population of 5000 At least 75% of male working population being engaged in non-agricultural (and allied) activities; and, A population density of at least 400 persons per sq.km (or 1,000 per sq.mile)

(iii) (iii) Places having distinct urban characteristics such as major project colonies, areas of intensive industrial development, railway colonies, important tourist centres - even though such places may not strictly satisfy the criteria of (a) and (b) under (ii).

Forest Survey of India (FSI), an organization under Ministry of Environment and Forests (Government of India), is one of the few organizations in Asia that has been carrying out TOF assessments. This assessment was not carried out for Yavatmal district. The total plantation activities carried out by the Social Forestry wing outside the forest areas is mentioned. From 2008-09 to 2017-18, Social forestry Yavatmal division has done roadside plantation of 211 kms and block plantation of 30 hectares. The details are given in **Appendix-VII.**

2.8: SHIFTING CULTIVATION (JHUMMING):

In Pusad forest division shifting cultivation is not practiced.

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CHAPTER – 3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

3.1: FOREST COMPOSITION AND DISTRIBUTION:

The forest of Pusad forest division falls under the category of "Tropical, dry deciduous forest" of Champion and Seth's revised survey of forest types of India and belongs to sub group 5A/Cib "Southern Tropical dry, deciduous" and the climax sub types are categorized on the basis of various local factors like soil, texture, depth, soil moisture, topography and also environmental conditions. Most of these forests suffer from biotic factors like heavy grazing, illicit felling and repeated fire incidences and to some extent encroachments. The forests of Pusad division are situated under soils derived from underlying trap characterized by presence of teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. These forests are characterized by the presence of quite high proportion of teak. Majority forest area of Pusad forest division represents site quality IVa and IVb. However, some of the forests areas adjoining to Painganga Sanctuary belong to site quality III where the soil is formed both from trap rock. The forests of this area are characterized by better quality of teak with good patches of natural regeneration of teak and miscellaneous species such as Ain, Dhawda, Lendia, Kalam, Tiwas, Tendu, Satpudi, Bhirra, Rohan, Salai, Semal, Behada, Sisam, Bija, Bel, Amaltas, Aonla, Char, Dudhi, Ghoti, Palas, Dhaman, Mohin, Bartondi, Lokhandi, etc.

The forests of Pusad forest division are distributed into following types as per the revised classification of Champion and Seth given as good quality teak forests, poor quality teak forests and degraded forests.

3.1.1: Floristic composition:

Good quality teak forests: This type of forests are distributed as narrow strip along the bank of river Painganga where the soil is formed from trap rock and gneiss and

it is characterized by deep and accumulated soil formed due to siltation from cuts of river Painganga. Teak represents 70% of growing stock in this area as per the enumeration data done by SOFR unit Amravati in 2016. Density of crop varies from 0.5 to 0.7 and crop is generally middle age to mature. The topography of the area is almost plain. Natural regeneration is scanty as young regeneration noticed in the monsoon fails to establish due to impact of both climatic conditions and biotic pressure. The floristic composition represented in these areas is as under.

Upper Storey: Teak (*Tectona grandis*) is principal species and main associates are Dhawda (*Anogeisus latifolia*), Ain (*Terminalia alata*), Tiwas (*Ougenia dalbergioides*), Lendia (*Lagerstroemia parviflora*) and Tendu (*Disopyros melanoxylon*). Some of the other associates are satpudi (*Dalbergia paniculata*), Bhirra (*Chlooxylon swetenia*), Kalam (*Mtragyna parviflora*), Rohan (*Soymida febrifuga*), Salai (*Boswellia serrata*), Semal (*Bombax ceiba*), Beheda (*Terminalia bellirica*). Shisham (*Dalbergia latifolia*), Bija (*Pterocarpus marsupium*) and Bel (*Aegle marmelos*).

Under Storey: The understorey consists of trees, shrubs, grasses and climbers. The major species are-

Trees: Amaltas (*Cassia fistula*), Aonla (*Emblica officinalis*), Char (*Buchanania lanzan*), Dudhi (*Wrightia tinctoria*), Ghoti (*Zizyphus xylocarpa*), Palas (*Butea monosperma*), Dhaman (*Grewia tiliaefolia*), Moyen (*Lannea grandis*), Bartondi (*Morinda tinctoria*), Lokhandi (*Ixora parviflora*).

Shrubs: Bharati (*Gymnosporia montana*), Parijatak (*Nyctanthus arbortristis*), Morogphali – (*Helicteres ixora*), Dhayati (*Woodfordia fructicosa*), Raimonia (*Lantana camara*), Tendu (*Diospyros melanoxylon*).

Grasses: Bhurbhusi (*Eragrostis tenella*), Kodmor (*Apluda varia*), Marvel (*Andropogon annulatus*), Dub (*Cynodon dactylon*), Paonya (*Schima sulcatum*).

Climbers: Palasvel (*Butea superba*), Mahul (*Bauhinia vahlli*), Pivervel (*Combretum ovalifolium*), Chilati (*Acacia pinnata*), Iruni (*Zizyphus oenoplia*), Gunj (*Abrus precatorius*), Ran kand (*Dioscorea bulbifera*), Ran draksh (*Vitex tenuifolia*).

3.1.2: Poor quality teak forests:

The majority of forest areas of Pusad forest division is covered by poor quality teak forests which is mainly of coppice origin. The forests of Digras, Pusad, Singad, Shembalpimpri, Mahagaon fall in this category of local sub type. The site quality in these areas is mostly IVb with site quality IVa at very few places especially in the valleys. The area of these forests is mostly undulating and hilly. The density of the crop varies from 0.2 to 0.6. In this area presence of teak is noticed from 55 to 60% of the area and generally height of the top story is 10 to 12 meters. The status of natural regeneration is very poor though few young regeneration noticed in rainy season which fail to establish owing to climatic conditions and biotic pressure. The soil of these forests areas is of hard murum, highly compact, dry with lot of boulders and with poor soil depth. The floristic composition is almost similar to that of good quality teak forests.

3.1.3: Degraded scrub forests:

These forests are highly degraded with malformed stunted teak growth. These forests are characterized by very little tree growth and some patches without any tree growth. Some of these forests were managed under pasture, under fodder reserved in the previous Working Plans. The "C" class reserved forests of this division falls in this category of the forests. The floristic composition is similar to that of good quality teak forests except that they have a very few trees and mainly contain scrub and grasses. Majority of these areas are situated adjoining to the villages bearing heavy biotic pressure for a long time and degradation had taken place over the years due to unregulated grazing, frequent fires and illicit felling. The soil is generally murumy, very dry, highly compact open without any humus. The degradation of the soil has taken place over the

years and due to this the moisture content and the absorption capacity of most of these forests is very low.

3.2: PLANT SPECIES DIVERSITY:

Trees: Teak (*Tectona grandis*) is principal species and main associates are Dhawda (*Anogeisus latifolia*), Ain (*Terminalia alata*), Tiwas (*Ougenia dalbergioides*), Lendia (*Lagerstroemia parviflora*) and Tendu (*Disopyros melanoxylon*). Some of the other associates are satpudi (*Dalbergia paniculata*), Bhirra (*Chlooxylon swetenia*), Kalam (*Mtragyna parviflora*), Rohan (*Soymida febrifuga*), Salai (*Boswellia serrata*), Semal (*Bombax ceiba*), Beheda (*Terminalia bellirica*). Shisham (*Dalbergia latifolia*), Bija (*Pterocarpus marsupium*) and Bel (*Aegle marmelos*), Amaltas (*Cassia fistula*), Aonla (*Emblica officinalis*), Char (*Buchanania lanzan*), Dudhi (*Wrightia tinctoria*), Ghoti (*Zizyphus xylocarpa*), Palas (*Butea monosperma*), Dhaman (*Grewia tiliaefolia*), Moyen (*Lannea grandis*), Bartondi (*Morinda tinctoria*), Lokhandi (*Ixora parviflora*).

Shrubs: Bharati (*Gymnosporia montana*), Parijatak (*Nyctanthus arbortristis*), Morogphali – (*Helicteres ixora*), Dhayati (*Woodfordia fructicosa*), Raymunya (*Lantana camara*), Tendu (*Diospyros melanoxylon*).

Grasses: Bhurbhusi (*Eragrostis tenella*), Kodmor (*Apluda varia*), Marvel (*Andropogon annulatus*), Dub (*Cynodon dactylon*), Paonya (*Schima sulcatum*).

Climbers: Palasvel (*Butea superba*), Mahul (*Bauhinia vahlli*), Pivervel (*Combretum ovalifolium*), Chilati (*Acacia pinnata*), Iruni (*Zizyphus oenoplia*), Gunj (*Abrus precatorius*), Ran kand (*Dioscorea bulbifera*), Ran draksh (*Vitex tenuifolia*).

3.3: STATUS OF BIODIVERSITY CONSERVATION IN FORESTS:

India is one of the 12 mega-diversity countries of the world, which together possess 60 to 70% of the world's biodiversity. Forests are one of the most biologically rich terrestrial systems with diversity in their forest types. These types provide habitats for plants, animals and micro-organisms and harbour the vast majority of the world's

terrestrial species. Furthermore, forest biodiversity is interlinked to a web of other socio-economic factors, providing an array of goods and services that range from timber and non-timber forest resources to mitigating climate change and genetic resources. At the same time, forests provide livelihoods for people worldwide and play important economic, social and cultural roles in the lives of many indigenous communities. Therefore, forests and forest biological diversity are innately linked to ecosystem and human well-being.

The Convention on Biological Diversity (CBD) is a landmark in the environment and development field, as it envisages for the first time a comprehensive rather than a sectoral approach to the conservation of Earth's biodiversity and sustainable use of biological resources. It was in the year 1984 that the need to have in place a global convention on biological diversity started gaining momentum. In response to it, the United Nations Environment Programme (UNEP) in the year 1987 recognized the need to streamline international efforts to protect biodiversity. The Convention on Biological Diversity (CBD) was negotiated and signed by nations at the UNCED Earth Summit at Rio de Janeiro in Brazil in June 1992. The Convention came into force on December 29, 1993. India became a Party to the Convention in 1994. At present, there are 175 Parties to this Convention (NBA, 2004).

Biological Diversity Act, 2002: The Central Government has brought Biological Diversity Act, 2002 with the following salient features -

1. To regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources and associated knowledge relating to biological resources.
2. Conservation and sustainable use of biological diversity.
3. To respect and protect knowledge of local communities related to biodiversity;

4. To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources.
5. Conservation and development of areas of importance from the standpoint of biological diversity by declaring them as biological diversity heritage sites.
6. Protection and rehabilitation of threatened species. 252 Biodiversity - The Dynamic Balance of the Planet.
7. Involvement of institutions of State governments in the broad scheme of the implementation of the Biological Diversity Act through constitution of committees (NBA, 2004).

A National Biodiversity Authority has been set up at Chennai vide Gazette Notification dated 1 October 2003 under Biological Diversity Act 2002. The Act also provides for establishment of State level Boards and Local level Biodiversity Management Committees to deal with any matter concerning conservation of Biological Diversity, its sustainable use and fair and equitable sharing of benefits arising out of the use of biological resources and associated knowledge. Maharashtra has already established the Maharashtra State Biodiversity Board at Nagpur. In Pusad forest division, till March 2018, no Biodiversity Management Committees (BMC) have been formed.

3.4: STATUS OF SPECIES PRONE TO OVER EXPLOITATION:

There has been no study with relation to species being overexploited.

3.5: CONSERVATION OF GENETIC RESOURCES:

Forest Genetic Resources refer to the heritable materials that are of actual or potential economic, scientific or societal value. Genetic resources can appear as whole communities, populations or single individuals as well as seed, pollen or soma-banks and even cloned DNA fragments. Forest genetic diversity represents the sum total of genetic variability occurring within and among tree species whereas forest genetic resource is the genetic material of actual or potential benefit to human. In other words, forest genetic

resources form a subset of forest genetic diversity, which in turn appears as a subset of forest biodiversity. Tree genetic studies described so far are limited to less than 1% of total available tree species leaving vast tree resources unexplored, which may harbour potential useful traits for mankind. This lack of knowledge on variation patterns and potentials along with changes in forest land use, deforestation, warming temperature exert a huge pressure on forest genetic resources. Hence, forest genetic resources should be conserved for a sustained harvest of benefits from forests and trees. The steps and strategies followed in conserving genetic resources are based on the nature of the material, timeframe, end product and scope of the measure. In general, two basic approaches are employed to conserve genetic resources. They are *in situ* (on site) conservation and *ex situ* (off site) conservation. Genetic resources of several important timber, fruit and other non-timber tree species are conserved *ex-situ* in gene banks or maintained in field collections. Nevertheless, *in situ* conservation in forests and on farms is in the case of most tree species the most important measure to protect their genetic resources.

The social functions of forests are very important, as the forest fringe villages comprise 28% of the total number of villages in the country. Forests are inseparably linked with the livelihoods of people living on the forest fringes, as they depend on forest produce for self consumption and cash income. More than 34 crore people in India depend on forest-based livelihoods such as collection, processing and sale of fuel wood and NTFP. Most of the indigenous tribes depend upon many forest product species for their sustenance and cash economy. Forests are used for collection of head loads of firewood. It is reported that more than 30 lakh people are employed in the tendu leaf collection and beedi-rolling industry and nearly 5 lakh people are employed in safety-match making, saw milling and wood carving. This indicates that the livelihood of considerable number of people greatly depends upon sustained production and management of forest genetic resources.

The full implications of the loss or deterioration of forest genetic resources for humankind are not known. However, the loss of forest resources can lead to diminished income and food generating capacity for forest dependent communities, higher rates of soil erosion and siltation of waterways, loss of species and genetic diversity and an increase in carbon emissions, which contribute to global warming. Forests need to be managed in a way that ensures their sustainable utilization, safeguarding the ecological process and genetic diversity essential for the maintenance of the resource base. Human dependence on forests for livelihoods is met with a cost to the ecosystem. It may be in reduction of local species productivity or a decline in ecosystem functioning. In the recent past, large-scale commercial extraction driven by national and global market forces has led to enormous pressure on forest products.

For effective conservation and management genetic resources the following activities are essential.

- Coordination and promotion of *in situ* and *ex situ* conservation of genetic resources.
- Facilitation of the exchange of genetic material and information.
- Enhancement of public awareness of the need to conserve genetic resources.
- Strengthen capacities pertaining to research and development activities. Infrastructural facilities should be improved by enhanced and continual allocation of monetary resources for conducting advanced research, human resource development of scientific/technical personnel through trainings.
- Coordination to evolve integrated genetic conservation/tree improvement programmes for threatened/economically important tree species.
- Constitution of forest genetic resource information, research network and dissemination mechanism for scientific progress as well as awareness.

3.6: FAUNA AND THEIR HABITATS:

The forests of Pusad forest division has been a natural habitat for a wide range of wild animals especially the forest adjoining to river Painganga and its tributaries. Therefore, the concentration of wildlife has been mostly in this forest though they are present throughout the division. The forest of this division serves as buffer to Painganga Wildlife Sanctuary and Isapur Wildlife Sanctuary. The forest areas of both these sanctuaries provide a good source population of carnivores (Panther, hyaena etc.) and herbivores. The wild animals occurring in this tract are-

(a) Mammals:

Panther/Leopard (*Panthera pardus*)**:** They have a wide range of habitation and were frequently seen in Marwadi, Umarkhed and Shembalpimpri ranges.

Hyena (*Hyaena hyaena*)

Barking deer (*Muntiacus muntijak*)

Nilgai (*Boselaphus tragocamelus*)**:** These animals are generally found in large number distributed in all the regions of the division mostly concentrated in open area.

Sambar (*Cerrus unicolor*)**:** These are found in small number mostly in dense forest which are usually sighted in single or pairs but seldom in herds.

Chinkara (*Gazella gazella*)**:** These are found in large number distributed all over the division mostly found on dry hilly sides and scrub forests.

Spotted deer (*Axis axis*)**:** These animals are mainly found in the entire division.

Black Buck (*Antilope cervicarpa*)**:** These are very rare animals in the division and are noticeable only in Kharoni.

Sloth Bear (*Melursus arsinus*)**:** These are rare and confined to cool and sheltered places, particularly found in forests in Shembalpimpri range.

Wild Pig (*Sus corfa*)**:** The populations of these animals are found in the entire division.

Wild Dogs (*Duon alpinus*)**:** There animals move in packs in the forests and do considerable damage to wild animals. Mostly these animals concentrated in Marwadi range.

(b) Birds: The forests of Pusad forest division supports the following avifauna. Pea fowl (*Pavo cristatus*), Grey Jungle fowl (*Gallus sonneratii*), Painted partridge (*Francolinus pictus*), Grey partridge (*Francolinus pondicerianus*), Common quail (*Coturnix coturnix*), Crow pheasant (*Centropus sinensis*), Greater coucal (*Centropus sinensis*), Golden backed woodpecker (*Dinopium benghalense*), Black drongo (*Dicrurus adsimillis*) etc.

(c) Reptiles: Red Sand boa (*Eryx conicus*), Indian Cobra (*Naja naja*), Python (*Python molurus*), Rat snake (*Ptyas mucosus*), Varanus sp, Chameleon sp.

(d) Fish: Catla (*Catla catla*), Rohu (*Labio rhoita*), Carp (*Cyprinus carpio*).

Table No. 3.1: Wildlife population estimation

Sr. No.	Species	Wildlife census				
		2014	2015	2016	2017	2018
1	Leopard	13	0	2	0	2
2	Hyena	3	0	0	0	1
3	Wild dog	0	6	4	0	5
4	Jackal	39	32	28	31	15
5	Wolf	0	0	3	4	18
6	Sloth bear	0	0	1	3	3
7	Chausinga	36	0	0	0	0
8	Spotted deer	0	14	4	28	0
9	Blackbuck	2	0	8	0	7
10	Barking deer	192	20	54	9	63
11	Nilgai	1504	411	704	722	633
12	Peafowl	49	62	141	103	127
13	Jungle Cat	5	2	7	6	3
14	Palm civet	0	0	0	0	2
15	Mongoose	0	0	2	0	3
16	Wildpig	25	265	747	639	459
17	Hare	107	10	25	40	25
18	Common langur	1142	286	761	323	459

3.7: THREATS AND CHALLENGES TO WILDLIFE:

The forests of Pusad forest division used to support a variety of wild animals especially the forest adjoining to river Painganga and its tributaries. Improvement of road

network, various developmental activities, increase of human and cattle population coupled with fragmentation and deterioration of the area and quality of forest have adversely affected the distribution and population of the wildlife in this area.

3.7.1: Poaching: Poaching is one of the main factors for the destruction and depletion of wildlife in Pusad division. Though there is no organized poaching in the area, incidences of poaching of wild pigs are noticed. Electrocution is a common method for hunting of wild animals. The details of death of wild animals owing to different reasons is given below.

Table No. 3.2: Statement of poaching/natural/accidental deaths of wild animals

Sr. No.	Year	Offence cases booked	Poaching		Natural death		Accidental death	
			Panther	Other	Panther	Other	Panther	Other
1	2008-2009	5	0	1	0	2	0	2
2	2009-2010	6	0	0	2	3	0	1
3	2010-2011	5	1	0	0	1	0	3
4	2011-2012	2	0	0	0	2	0	0
5	2012-2013	0	0	0	0	0	0	0
6	2013-2014	7	0	0	0	4	0	3
7	2014-2015	11	1	2	1	7	0	0
8	2015-2016	9	0	1	1	0	0	7
9	2016-2017	6	0	2	0	2	0	4
10	2017-2018	12	0	3	0	3	0	6
Total		63	2	9	4	24	0	26

3.7.2: Fire: Forest fire is frequent especially during dry seasons. Repeated forest fires occur in the tract. Forest fire damages natural habitat and drives the animals towards human habitations resulting in human wildlife conflict.

3.7.3: Water: Water is scarce in forests and is confined to only few places. Rainfall is also erratic during monsoon leading to acute shortage of water in summer. Most streams and water sources will dry up during summer season. Animals use a very few water holes available during pinch period.

3.7.4: Grazing: During the last ten years there is a rise in cattle population. The total livestock population in this division is 356354. Grazing pressure has increased manifold in the past few years. Heavy grazing in forest areas takes away available fodder for most

wild herbivores. Grazing also leads to spread of diseases to wild animals besides affecting the habitat severely. The details of the livestock population are given in the table below.

Table No. 3.3: Cattle population (as per 19th Livestock Census 2011)

Taluka	Buffalo	Calf of Buff.	Cow	Calf of Cow	Sheep	Goat	Horse	Total Cattle
1	2	3	4	5	6	7	8	9
Digras	3884	1175	28737	6640	3366	18456	11	62269
Mahagaon	3544	1544	41323	9891	32	23119	6	79459
Pusad	7989	2646	56342	13420	142	40600	7	121146
Umarkhed	6329	2424	48545	12085	139	23953	5	93480
Total	21746	7789	174947	42036	3679	106128	29	356354

(Data collected from Animal Husbandry Deptt., Yavatmal)

3.8: PROTECTION AND MANAGEMENT OF FAUNA:

3.8.1: General history of management: It was stated in Berar gazette of 1870 that tigers and panthers were numerous in the area and it was dangerous to travel in Yavatmal district. Prior to reorganization of state wildlife conservation was ensured under the provisions of Indian Forest Act 1927. Shooting rules were framed by the Government and detailed in the appendix of C.P. and Berar Manual Vol. 2, combined with Wild Birds and Animal Protection Act 1912. The Conservator of Forests in consultation with Divisional Forest Officer used to declare certain blocks of Reserve Forest as open for shooting. Then shooting permits were issued by the Divisional Forest Officer.

In 1952 the Indian Board for wildlife was constituted with an object of devising methods and means for conservation of wildlife through coordinated legislative and practical method. Subsequently the Bombay Wild Animals and Wild Birds Protection Act 1951 was enacted and it was considered as the most comprehensive legislation which was made applicable to Vidarbha region in 1961. This act did not propose any significant changes in the management of the game, however it was important as its provisions allowed to operate even in the areas outside the Reserve Forests. As per the provisions laid down in this act arms license holders had to register themselves with wildlife preservation officer. Hunting license was categorized into 4 kinds *i.e*.1. Small game, 2. Big game, 3. Special Big game and 4. Pet animals. The provisions of this act did not allow to

carry out any trade in wildlife trophies without a separate trophy dealer license. For the purpose of hunting the forest division was divided into 20 shooting blocks.

3.8.2: Legal Position: The forest area of this division was a part and parcel of C.P.and Berar State. The provisions in Berar Forest Law in 1886 were passed on Oct. 22nd 1886. There was no separate act regarding protection of Wildlife in vogue at that time. It was, under Sec. 3, Sub rule (7), the deformation of the forest produce included "skins, tusks, bones and horns". Under Sec. 8 of the said act "any person who acts in contravention of the said act in the state forests was punishable with the fine which may go up to Rs.50/- when the damage resulting from his offence amounts to more than Rs.25/- , to double the amount of such damage". Under Sec.10, Sub Sec. (4) of the said act "the residency by orders may regulate any part of the state forest for the hunting, shooting, fishing, poisoning of water or setting trap or snares". The Berar Law of 1886 was amended by the Berar Forest Law of 1891. Under this amendment Sec.7 (b) states that, forest produce includes the following found in, brought from a forest *i.e.* to say wild animals, skins, tusks, horns, bones, cocoons, honey, wax and all other parts or produce of animals or forest produce. Sec. 7(2) (B) states offence was punishable with the fine which may extend upto Rs.50/- or when the damages resulting from the offence amounts to more that Rs.25/- , to double the amount of such damage.

In the year 1911 vide Notification No/GIFD/2197-1-B the definition of wildlife as forest produce was included under Sec. 2 (B) (III). Under Sec. 25 (1) of the said act, that any person in contravention of any rules made under this act, which local Government may from time to time prescribe, kills or catches elephants, hunts or shoots fishes, poisons water or sets traps shall be punishable with imprisonment for a term which may extend to 6 months or with the fine not exceeding Rs.500/- or in both in addition to compensation for the damage done to the forests.

After the enactment of Indian Forest Act 1927, rules related to wildlife regulations were framed under Sec. 26 (1), 76 (d) which was essential to regulate hunting of wild animals and were given in the appendix VIII of M.P. forest Manual Volume 2.

Wild Birds and Animal Protection Act 1912 as amended in 1935 also ensured protection to certain animals and a check of hunting of animals. Shooting block system was initiated in the year of 1947 under the provisions of these two acts. The Conservator of Forests in consultation with the Divisional Forest Officer concerned used to declare the areas having abundant game as open to hunting and the Divisional Forest Officer accordingly issued shooting permits were in the type of game and the number allowed to be hunted together with, the other relevant conditions.

The Bombay Wild Animals and Wild Bird Protection Act 1951 was extended to Vidarbha region, which has enhanced the scope of management of game outside Reserve and Protected Forest also. Under the provisions of this act regulations were made for registration of armed license holders, categorization of game into small game, big game, special big game and pet animals and also regulated transaction in trophies and other wildlife products. Under this act the statutory wildlife advisory board was constituted in order to advice the Government on various important matters regarding wild animals. In 1952 the Indian Board of wildlife was constituted with the main object of devising ways and means for conservation wildlife through coordinated approach of legislative and political measures and sponsoring the measures to reconstitute National Parks and Wildlife Sanctuary. The comprehensive and unified National and State Park Act of 1971 was passed to provide for appointment of any advisory committee to advise in continuation and declaration of National Parks and Sanctuary and formulation of administrative policy.

In 1972 Parliament enacted Wild Life (Protection) Act 1972 which came into force in the state since 1st of June 1973 and superseded all other acts related to wildlife protection and management in the State. The subsequent rules made under the act are as follows.

1. The Wild Life (Stock declaration) Rules 1973 (came into force in the State since 1st of June 1973).
2. The Wild Life (Transactions and Taxidermy) Rules 1973 (came into existence since 1st June 1973).

3. The Wild Life (Protection) Rules 1975 (came into force since 6th March 1975).
4. The Wild Life (Protection), Licensing (additional matter consideration) Rules 1983 became effective since 14th April 1983.

The Wild Life (Protection) Act is a comprehensive legislation that facilitates for effective protection and preservation of Wildlife, moreover it enabled restrictions on hunting and regulation of trade in wild animals as well as the articles made out of wild animals.

Hunting of wild animals is strictly prohibited unless specially permitted as per laid down procedure. Under this act, wild animals have been categorized into V schedules and those animals which are included in schedule I, II and III received the privilege of stringent protection.

The wild animals included in the schedule are permitted to eliminate if they become threat to or cause damage to life or property and the animals included in schedule II become disabled completely or deceased beyond recovery. Whereas, only vermin included in scheduled V were excluded from strict protection.

Hunting of young and female of any wild animal other than vermin is strictly prohibited unless permitted (Sec.15). The persons who possess any wild animal trophies are required to declare in a specified proforma under the provisions of this act. The Government of India specified vide letter Dt. 18th Sept 1975 that, the management authorities are vested with the control over the tanks and rivers in National Parks and Sanctuaries.

The delegation of powers and duties of the Chief Wild Life Warden to the Police Sub Inspector for the purpose of Sec. 41 (1) and Sec. 55 of the Wild Life (Protection) Act 1972 was granted by G.R. No. WLP-1973/197578 –F-1, Dt. 5th April 1976. The schedules are revised by the Government from time to time as it was required under Sec. 61 of the Wild Life (Protection) Act 1972. The Government of Maharashtra framed rules under Sec. 64 of Wild Life (Protection) Act 1972 vide its letter No. WLP- 1679/95507 / F-5.

The Wild Life (Protection) Act was again amended hereinafter called as “Wild Life (Protection) Amendment Act 1986” and became effective since 25th November 1986.

Under Sec. 44 of the Wild Life (Protection) Act 1972 the Government vide letter No/WLP/1682/100208/CR-43(1)/F-5 permitted the trapping of Cobra and Russell vipers by a licensed dealer for the purpose of extracting venom. Under the power conferred under sub Sec. (1) and sub Section (2) of the Section 64, the Government of India vide letter No. WLP/1682/10020 (iii)/F-5 framed the new rules called "Wild Life (Frog Leg Industry) Rules 1987" and it came into force from November 25, 1987. The Government of India vide letter No. F. no. 1-2/91/WL/I, Dt. October 21, 1991 further amended the Wild Life (Protection) Act 1972. Subsequently Wild Plants have been brought under the provisions of this act. The zoo and circus have been defined and included in this act whereas the game reserves have been completely dropped. A total ban has been imposed on hunting of wild animals specified in schedule II, III, IV and I except as provided under Section 11 and 12 by amending Section 9 of Wild Life (Protection) Act 1972.

In 2003 compressive amendment was made to impose heavy penalty and stringent punishment in case of wildlife offences. Under the provisions of Section 17 of Wild Life (Protection) Act, the following acts are prohibited.

1. Hunting of wild animals from or by means of wheeled or mechanically propelled vehicles in water or on land or by air craft.
2. Use of mechanically propelled vehicles for the purpose of stampeding any wild animals.
3. Use of chemicals, explosives, pit falls, poisons, poisoned weapons, snares or traps except related to capture of wild animals under wild animal trapping license.
4. Hunting of special game or big game other than with a rifle unless specially authorized by the licensee.
5. Setting fire to vegetation for the purpose of hunting, using artificial light for the purpose of hunting except when specially authorized to do so under license in the case of carnivore over a kill. Hunting during night time except when specially authorized.

6. Hunting of any animals on water hole or a salt-lick or other drinking places or on path or approaches to the path except water birds or sand goose.
7. Hunting of any wild animals on any land not owned by the Government without the consent of the owner or his agent.
8. Hunting during closed period under Section 16.
9. Hunting with the help of dogs, any wild animals except water bird, partridge or quail.
10. The Government of Indian has passed Wild Life (Protection) Amendment Act 1991 with effect from October 2nd 1991 except the Section 35, 44, 55(c) Chapter III A, IV A. The main features of this amended act are given below.

i. The words "game reserve", "big game" and "small game" have been deleted from the act. Hunting of wild animals included in schedule I, II, III and IV of the act has been prohibited except as per the provisions of Section 11. Specified plants have been included in a new scheduled for the protection of the same by introducing Chapter 3 A.

ii. The Section 29 has been amended which prohibits any exploitations in National Parks and Sanctuaries.

iii. A new section has been added in the act to provide that no new armed license shall be issued within the 10 Km of Sanctuary without prior permission of the Chief Wild Life Warden of the State.

iv. Imposed ban on dealing with imported ivory and articles made there from.

v. Introducing new Chapter IV A for Central Zoo authority and recognition of Zoos.

vi. The penalties related to wildlife offences have been enhanced substantially. Section 39 of the act has been amended to the effect that vehicles, vessels, weapons, traps or tools which have been used for committing an offence and have been seized, shall become the property of Government.

vii. Section 61 (1) of the act has been amended which provides the power to make any change in the schedules of the act vests only with the Central Government.

3.8.3: Measures adopted for protection of wildlife: Some of the developmental activities for the protection and management of wildlife have been taken up in this division. Concept of taking up of soil and moisture conservation works such as construction of nalla bund to augment the water source, no felling of trees along the nalla and water sources, identification of sites of seasonal water sources, development of new water holes by nalla bunds and construction of check dams.

3.8.4: Other methods adopted for protecting wildlife:

Apart from legal methods under the Wild Life (Protection) Act 1972 the following measures have been introduced to protect wildlife from time to time.

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 wild animals viz; Tiger, Panther, Sloth Bear, Bison, Wild Pigs, Jackal, Wolf, Hyena, Elephant, Crocodile, Wild Dogs is covered under the scheme. Present rates of compensation have been fixed through GR No.WLP-0718/C.No.267/F-1, Dated 11.07.2018 and 28.11.2018. These are as follows:

1) Death — Rs.15.00 lakhs to legal heir
2) Permanent Disability — Rs.5.00 lakhs to legal heir
3) Major injury — Rs.1.25 lakhs to the individual injured
4) Minor injury — Rs.20,000/- per individual.

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

1) Such attacks 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 Government Medical Officer.
5) Compensation due to death is to be given only to a 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 and ACF vide GR No.WLP-413/C.No.123/F-1, dated 25/11/2013.

Compensation for the injury to and 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(1 SA)) due to attack of a Tiger, Panther or any other wild animal. The present rates of compensation as per the GR No.WLP-0718/C.No.267/F-1 of 11/07/2018 and GR No.WLP-0718/C.No.267/F-1 of 28/11/2018 are as follows and compensation is to be paid within 3 months.

Table No.3.4: Rates of compensation for livestock

Sr.No.	Particulars	Amount to be paid
1	Cow, Buffalo, Bullock	75% of the market price or Rs.60000/- whichever is less;
2	Sheep, Goat, other livestock	75% of the market price or Rs.10000/- whichever is less;
3	Cow, Buffalo, Bullock became permanently handicapped	50% of the market price or Rs.12000/- and whichever is less;
4	Injury to Cow, Buffalo, Bullock, Goat	Treatment cost. (Government or ZP Hospital) 25% of the market price or Rs.4000/- whichever is less.

The compensation to livestock damage has to be given as per the terms and condition mentioned in the GR No.WLP-1008/C.No.270/F-1 of 02/07/2010 and WLP-0915/C.No.305/F-1 of 11/11/2016. Some the conditions to be fulfilled are as under:

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.
6. No compensation in case the livestock was grazing illegally.

Compensation for crop damage:

Introduced vide GR No. WLP/1008/C.No.-270/F-1 dated 02nd July 2010, it provides for compensating losses to the agricultural crops due to wild animals. A compensation of minimum Rs.700/- per hectare is paid to the farmers subject to maximum of Rs.18000/-. Now by GR No.WLP-2012/C.No.326/F-1, Dated 09.07.2015 and GR No.WLP-2012/C.No.326/F-1, Dated 23.12.2015 damage to agricultural crops and Fruit Trees (Orchard) by Wild Pig, Deer (Sarang, Kurang), Bison, Nilgai, Monkey and Elephant is covered. The present rate of compensation have been fixed as follows; by above GRs Dated 09/07/2015 and 23/12/2015.

Table No.3.5: Rates of compensation for agricultural crops

Sr.No.	Details	Compensation to be paid
1	Crop damage upto Rs.10000/-	whole amount but Minimum Rs. 1000/-
2	Crop damage above Rs.10000/-	Rs.10000/- plus 80% of above amount but maximum Rs.25000/-
3	Sugar cane damage	Rs.800/- per M.T. maximum Rs.25000/-

Table No.3.6: Rates of compensation for horticultural crops

Sr.No.	Details	Compensation to be paid
1	Coconut (Naral)	Rs.4800/- Per Tree
2	Nut (Supari)	Rs.2800/- Per Tree
3	Mango Kalmi	Rs.3600/- Per Tree
4	Banana (Keli)	Rs.120/- Per Tree
5	Orange / Mosambi	Rs.2400/- Per Tree
6	Other Fruit Trees	Rs.500/- Per Tree

The details of year wise poaching of wild animals and the compensation paid towards cattle kill/injury caused to human beings by wild animals is given in **Appendix-VIII.** The amount of compensation paid to the people is given in the table below.

Table No. 3.7: Details of compensation paid

Sr. No.	Year	No. of persons attacked by Wild Animals	Amount of Compensation
1	2008-2009	4	8987
2	2009-2010	2	14944
3	2010-2011	4	29500

Sr. No.	Year	No. of persons attacked by Wild Animals	Amount of Compensation
4	2011-2012	12	548844
5	2012-2013	19	278040
6	2013-2014	13	202239
7	2014-2015	5	34458
8	2015-2016	19	190277
9	2016-2017	15	164878
10	2017-2018	21	955018
Total		114	2427185

3.8.5: Rights and concessions:

No rights and concessions or privileges are granted to any person over wildlife except a person of Scheduled Tribes can pick up or collect or possess in the district in which he resides any specified plants or plant derivatives thereof for his bonafide personal use subject to the provisions of chapter IV of Wild Life (Protection) Act. The Chief Wild Life Warden can grant the permits for special purposes of education, scientific research and collection of specimen for recognized zoos, museums and scientific institutions.

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CHAPTER – 4

MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

4.1: STATUS OF REGENERATION:

Data on regeneration status was collected by SOFR unit Amravati during collection of enumeration data. The seedlings were enumerated in the following three categories as R1 upto 1 m height, R2 with 1 to 2 m height and R3 above 3 m height. The data is analysed and used to devise prescriptions for natural and artificial regeneration of forest areas. The status of natural regeneration is extremely poor. The natural regeneration of teak and its associates is very poor and restricted to a few patches of selected sites. Whatever regeneration occurs in the rainy season, fails to establish owing to climatic as well as biotic factors. Heavy grazing, fire incidences, trampling due to cattle movement, human population pressure to meet their demands like firewood and small timber, poor site quality and erratic rainfall are major factors that influence the establishment of regeneration in this forest area. The regeneration data shows that there are 25 seedlings of upto 1 m height, 24 seedlings between 1 to 2 m height and 17 seedlings above 3 m height in a hectare in these forests. The total number of seedlings is 66/ha. The table of regeneration is given below.

Table No.4.1: Regeneration status

Sr. No.	Range	No. of sample	No of seedlings/ha			Total
			R1	R2	R3	
1	Umarkhed	41	4.02	3.43	1.67	50.11
2	Digras	76	2.46	3.31	1.88	83.65
3	Shembalpimpri	56	3.31	3.71	1.92	64.95
4	Pusad	38	3.99	3.45	2.22	47.66
5	Marwadi	33	4.64	4.40	2.87	44.90
6	Mahagaon	67	3.39	2.78	3.37	76.54
7	Kali (D.)	52	3.34	2.98	3.15	61.47
	Total	363	25.15	24.07	17.08	66.29

4.2: AREA AFFECTED BY FOREST FIRE:

The area of Pusad forest division is prone to fires due to deciduous nature and the dry climate. Fire is one of the most destructive agencies of forest development which

takes place during the dry season that starts from February continuous up to June. The details of forest fire is given in **Appendix-IX.** During this period the forests are very much vulnerable to fires and the fires that take place by end of winter and at the beginning of summer are not that much damaging. Most of the fires that are taking place in these forests are man made and accidental which hamper the establishment of natural regeneration. The leaf litter on the ground and highly combustible undergrowth of grasses catch fire immediately and spreads instantly. The damage is very severe when freshly felled material is lying in the coupe and fire takes place in the plantation. Young regeneration suffers a lot mainly of teak and other species get damaged or killed due to die back. In this area fires are put by graziers, intentionally or unintentionally, villagers who go for Mohua collection to forest. Repeated fires in the forest areas of this dry zone during the dry season cause extensive damage to the tree growth and reproduction. Late fires in the grassy areas or in closed coupes result in fire calamity. In this area fires are generally ground and creeping fires. Fire causes extensive damage to the forests especially forest growth, regeneration, ground flora, soil micro-organisms and soil productivity. The area affected by forest fire is given in the table below.

Table No. 4.2: Incidences of fire

Sr.No.	Year	No. of cases	Area (ha)
1	2008-09	8	13.1
2	2009-10	9	43.5
3	2010-11	17	176
4	2011-12	63	981
5	2012-13	25	198
6	2013-14	25	202
7	2014-15	16	57.6
8	2015-16	79	302.66
9	2016-17	43	120.25
10	2017-18	83	280.54
Total		368	2374.65

4.3: AREA DAMAGED BY NATURAL CALAMITIES:

Drought: The erratic and scanty rainfall in every year caused drought like conditions in the recent past. The drought effects the growth of plantation, establishment of regeneration and also growth of forest crops as soil moisture and water are vital ingredients of growth and regeneration.

Frost: Injury due to frost is not seen in this area.

Wind storms: No considerable damage is noticed due to wind storms in this area.

Soil erosion: Soil erosion is noticed in this area especially along the river Painganga and its tributaries. Sheet erosion is common in the entire area. Gully formation takes place due to erosion along the river banks. In some of the areas the roots of trees are exposed due to excessive erosion of soil leading to windfall of trees.

4.4: AREA PROTECTED FROM GRAZING:

Grazing by domestic animals damages forests by destroying young regeneration, plantation due to trampling of the areas and excessive movement of cattle population leads to compaction of soil resulting in the less porosity of the soil which is less conducive for the establishment of young regeneration. Uncontrolled cattle movement is common in the forests around the villages. The incidences of grazing are high in and around the forest areas where villages are situated. Continuous, unlimited grazing is very much harmful for the tree growth and also for the establishment of regeneration. The forest will establish in the areas where there is regulated grazing or no grazing, while considerable damage has been noticed in the areas where there is excessive grazing more than the carrying capacity of the forests. Grazing in the forests is not uniform as cattle population is restricted to village areas and villages in turn are nearer to water spots. The grazing pressure is high in the forests especially in summer season *i.e.* February to June. During this period the forests go dry and in some areas, the graziers indulge in lopping of trees to feed their cattle. The sheep and goats are not allowed to graze in the forests which are meant for production of timber. However, the forests are still suffering from grazing of sheep and goats in this region.

4.5: LOPPING PRACTICES:

Lopping is seen mostly in forest areas adjacent to the villages. Graziers also do lopping while grazing their cattle.

4.6: AREA INFESTED BY INVASIVE WEED SPECIES IN FORESTS:

Damage by climbers mostly confined to the forests along the river bank of Painganga and along the nalla banks in this area. Cheelati, Ironi are the main climbers

which cause harm to the forest in this area. Sometimes damage by Lantana is also noticed affecting both regeneration and growth by covering forest growth and competing for spaces.

4.7: INCIDENCES OF PEST AND DISEASES:

In this area teak skeletonizer *(Eutectona machaeralis)* and teak defoliator *(Hyblaea puera*) are common. The insects attack is noticed mostly during rainy season. Insects also attack young crop of Dhawda and Aonla.

4.8: FOREST DEGRADATION AND ITS DRIVERS:

The forests of Pusad forest division mostly suffer from unregulated grazing, illicit felling, encroachments and repeated fires significant damage caused by these agencies coupled with erratic rainfall. The other agencies which caused injury to the forests such as droughts, frost, floods, plants and insects are negligible.

Degraded scrub forests: These forests are highly degraded with malformed stunted teak growth. These forests are characterized by a very little tree growth and in some patches without any tree growth. Some of these forests are managed under pasture, under fodder reserved in the previous Working Plans. The "C" class Reserved Forests of this division falls in this category of the forests. The floristic composition is like that of good quality and crooked quality teak forests except that they have a very few trees and mainly contained scrub and grasses. Majority of these areas situated adjoining to the villages bearing heavy biotic pressure for a long time and degradation taken place over the years due to unregulated grazing, frequent fires and heavy illicit felling. The soil is generally murumy, very dry, highly compact open without any humus. The degradation of the soil takes place over the years and due to that the moisture content and the absorption capacity of most of these forests are very low.

Illicit felling: Illicit felling is common and also increasing day by day both for commercial and domestic purposes. As this forest is adjoining to border district of Nanded, people within the district and from adjoining areas indulge in illicit felling in areas where the good quality teak forests are available *i.e.* along the Painganga river. Sometimes the people from adjoining State of Telangana come in groups, cut teak timber

and transport it to Telangana illegally where they get higher prices. These organized gangs indulge in systematic illicit felling along the border of Telangana. Local people in and around the forest area of the division may indulge in illicit felling for meeting their domestic needs such as requirement of fuel, small timber, firewood as there is a huge gap between demand and supply of forest produce. People generally indulge in illicit felling due to unemployment, higher prices of some of the forest products in the market like teak. These social causes make the people to indulge in illicit felling. Lopping of trees and shrubs for rab burning of field has further deteriorated the situation. In general, illicit felling, lopping and pollarding of forest species has further deteriorated the forest crop in terms of quality and quantity of the forests.

Table No. 4.3: List of offence cases

Year	Fire	Grazing	Illicit felling	Others	Total
2008-2009	12	11	746	114	883
2009-2010	9	7	567	79	662
2010-2011	7	1	890	93	991
2011-2012	64	0	773	9	846
2012-2013	15	0	675	22	712
2013-2014	20	8	593	39	660
2014-2015	12	6	743	46	807
2015-2016	41	9	654	60	764
2016-2017	42	9	778	41	870
2017-2018	74	3	727	3	807
Total	296	54	7146	506	8002

Encroachments: Encroachment is not so serious in this area but forest areas adjoining to agricultural fields of farmers are being encroached especially during the month of monsoon. Some of the forest areas have been cleared, denuded and utilized for agricultural purposes. The total area under encroachment in the division is 54.305 ha. The details of encroachment are given in **Appendix-X.**

Damage by wild animals: In this area Nilgai, Sambar and Chital cause lot of damage to the young regeneration due to grazing by these animals. Also wild pigs, hares, and porcupines cause damage in the plantation. Wild pigs' damage is noticed in bamboo plantation at the young stage. The porcupines usually eat the rhizome, bark of Haldu, Moha and Amaltas near the base of the tree, which hampers the proper establishment of

the tree. Monkeys cause considerable damage to flowers, and fruits of the trees. Chital cause damage to the bark of the Shivan at the base thereby girdling the tree, which results in the death of the tree. The damage caused by wild animals is not that much serious when compared to damage caused by the other domestic animals. Moreover, the wild animals damage to the forests is compensated both in the form of propagation of regeneration activities and maintaining the health of forests by removing excess of the certain trees and hence maintaining biodiversity.

Mining: Mining is prohibited in the forest area by the Act. There is no report of illegal mining/quarrying in the forest area.

4.9: POLLUTION CONTROL AND PROTECTION OF ENVIRONMENT:

Environmental pollution is the introduction of contaminants into the natural environment that causes adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from overconsumption, heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control.

Pollution is the outcome of human activities, particularly carried out in connection with industrial development. As such pollution is a recent phenomenon. Nevertheless some of the pollutant substances such as smoke, ash, lava and toxic gases that have come to be categorized as air pollution were already being produced by jungle fire and volcanic eruptions long before man came on this earth. Problem of environment pollution became serious, when man arrived on the scene a million years ago. As the activities of human being have increased, problems of environment pollution too have become acute.

Though there is no severe pollution in forest areas of Pusad division, incidences of water pollution due to heavy usage of fertilizers for agricultural crops in fields adjacent to forest areas are noticed. Air pollution occurs due to vehicular traffic on roads and brick kilns operating in the areas adjacent to forest areas. There is no heavy pollution caused by industries in this division.

Law relating to environment protection:

In the Constitution of India there was no entry on environment protection in the legislative lists. In 1976 the Indian Parliament through 42nd amendment to the Constitution of India incorporated two articles. 48-A and 51-A(g) relating to environment. Article 48-A directs the State endeavour to protect and improve the environment in forest and wildlife field of the country. Article 51-A (g) imposes on the citizens of India, a fundamental duty to protect and improve the natural environment.

In 1992, by way of the seventy fourth amendment, article 343-W and the Twelfth Schedule entry of 8 were incorporated in the Constitution of India. Accordingly a State legislature can pass legislation on Urban Forestry, protection of the environment and promotion of ecological aspects.

1. The environment (Protection) Act 1986 (EPA) was passed under the provisions of Article 253 of the Constitution to achieve the following objectives;
2. To implement the decisions taken at the UN conference on Human Environment held at Stockholm in June 1972.
3. To enact general law on environment protection which could cover gaps in the areas of major environmental hazards as the existing laws generally focused on specific types of pollution.
4. To coordinate activities of the various regulatory agencies under the existing laws and creation of an authority or authorities for environment protection.
5. To provide for deterrent punishment to those who endanger human environment safety and health.

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PUSAD FOREST DIVISION
Drainage map

N
W E
S

1:150,000

Legend

- Division boundary
- Range boundary
- Isapur WLS
- Painganga WLS
- drainage

0 2.5 5 10 15 20 25
Kilometers

CHAPTER – 5

CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

5.1: AREA TREATED UNDER SOIL AND WATER CONSERVATION MEASURES:

Soil conservation refers to the measures and practices which protect the soil against loss and help in maintaining its fertility with a view to establishing sustainable forestry.

5.5.1: Soil Conservation:

Soil conservation is based on certain basic principles, which include;

- Protection of soil from impact of rain drops.
- To slow down the water from concentrating and moving down the slope in a narrow path.
- To slow down the water movement when it flows along the slope.
- To encourage wind velocity near the ground by growing vegetation cover, ridging the land etc.
- To grow the strips of stubble or other vegetation cover to hold the moving particles of soil.
- To increase the size of soil particle.

5.1.2: Water Conservation:

Considering how little water is actually available for use, conservation of water and efficient management of water sources are more critical than ever before. Sustainable water conservation is carried out by the following methods.

- Construction of dams and water reservoirs to control floods, ensure year around supply of water and generation of electricity.
- Building of small reservoirs wherever possible.
- Developing small catchment dams and protecting wetlands.
- Diversion of water bodies through canals to increase water supply in drier areas.
- Regular dredging and desiltation of rivers, streams and other water bodies.

Soil and moisture conservation works needs to be carried out on watershed basis as forests are customarily at the top of a watershed. Good forest management secures

water at its source. Appropriate forest management strategies produce clean and abundant water for our watersheds, as well as healthy forests.

Trees and forests perform an incredible role in reducing storm water in several ways and removing or filtering pollutants that would otherwise wind up in our waterways. Forests filter and regulate the flow of water, in large part due to their leafy canopy that intercepts rainfall, slowing its fall to the ground and the forest floor, which acts like an enormous sponge, before gradually releasing it to natural channels and recharging ground water.

5.1.3: Watershed: A watershed comprises an area of land that conveys all the water running under it and draining off it into a body of water. It combines with other watersheds to form a network of rivers and streams that progressively drain into larger water areas.

The topography of any region may be subdivided into several ecological units, each of which drains to a common point. Each such ecological unit is referred to as watershed. Strictly speaking, the higher land that separates each such unit is called a watershed and the unit itself being termed as the catchment area. The size of a watershed may vary from a few hectares to thousands of square kilometres. The details of mega watersheds in Pusad forest division is given in the table below.

Table No. 5.1: Mega watersheds in Pusad forest division

Sr. No.	Taluka in Mega watershed	Mega watershed No		Geographical area (Sq.kms)
1	Dharwa, Digras	PGA	3	30930
2	Digras	PGAA	1	13722
3	Digras	PGAA	3	17697
4	Digras	PGAA	4	15900
5	Digras	PGAA	2	22700
6	Digras, Mahagaon	PGD	1	30930
7	Digras, Ner	PGA	6	24620
8	Digras+Ghatanji	PGA	9	16917
9	Mahagaon	PGP	4	23789
10	Mahagaon	PGP	5	23600
11	Mahagaon,Umarkhed	PG	4	31180
12	Pusad	PG	1	33670
13	Pusad	PGP	1	34520
14	Pusad	PGP	2	24807
15	Pusad, Mahagaon	PGP	3	24750

Sr. No.	Taluka in Mega watershed	Mega watershed No		Geographical area (Sq.kms)
16	Umarkhed	PG	5	16060
17	Umarkhed	PG	6	28730
18	Umarkhed	PG	7	23140
19	Umarkhed	PG	2	31559
20	Umarkhed	PG	3	21339

Watershed management is the rational utilization of land and water resources for gaining optimum production and with minimum hazards to natural resources. It essentially relates to the practice of soil and water conservation in the watershed, which means proper land use, protecting land against all forms of deterioration, building and maintaining soil fertility, conserving water for farm use, proper management of local water for drainage, flood protection and sediment reduction and increasing productivity from all prevailing land uses. The principal factors influencing watershed operations are -

Physiography: It includes the following aspects;

Size: Both runoff volume and runoff rate increases with the watershed size. However, both the rate and the volume per unit of watershed decrease with an increase in its area. The size of the watershed is thus an important parameter in determining the peak rate of runoff.

Shape: Elongated and narrow watersheds are likely to have more extended time of concentration resulting in the lower runoff rates as compared to the square shaped watersheds of the identical size. The time of concentration equally affects the amount of water that will eventually infiltrate into the soil in the watershed.

Land slope: Slope in addition provides a significant implication for the land use. The speed and extent of runoff depend on the slope of the land. The greater the slope, greater will be the velocity of flow of the runoff water.

Drainage density and pattern: The drainage density equally affects the runoff pattern and intensity. High drainage density drains runoff water rapidly, decreases the lag time and also increases the peak of hydrograph. Drainage density = total length of all stream (km)/catchment area (km^2).

Soils and Geology: The soil and the geology of the watershed determine the amount of percolating water and also governed by the corrective measures, which may be taken for improvement.

Vegetative cover: The type and quality of vegetative cover on watershed land have a substantial influence on runoff, infiltration rate, erosion and sediment production and also on the rate of evaporation. A dense cover of vegetation is a most powerful tool for reducing erosion.

Peak runoff: It is the main design parameter for designing the soil and water conservation measures.

Precipitation: The amount and nature of precipitation are the most important factors, which determine what will happen in a watershed. Rainfall evenly distributed throughout the year has a different impact as compared to sudden, sharp showers or seasonal rainfall.

In Pusad forest division over the past ten years various soil and moisture conservation measures have been undertaken under various schemes. A total of 203 forest tanks, 10 cement check dams and 138 earthen bandhs have been created. The details of the various works undertaken are given in **Appendix-XI.**

5.2: DURATION OF WATER FLOW IN THE SELECTED SEASONAL STREAMS:

River Painganga and its tributaries Pus, Arunavati and Adan drain the entire area. Painganga and Pus are perennial sources of water. There are other small rivers and nalas from forest that have water in their streams till December. There are three major, three medium and fourteen minor irrigation projects which form the major source of irrigation. Many areas feel the shortage of water during summer. Erratic rainfall further worsens the situation. The drainage is poor due to high compact soil.

5.3: WETLANDS IN FOREST AREAS:

Wetlands are amongst the most productive ecosystems on the Earth provide many important services to human society. However, they are also ecologically sensitive and adaptive systems. Wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant species, and soil and

sediment characteristics. Globally, the areal extent of wetland ecosystems ranges from 917 million hectares to more than 1275 m ha with an estimated economic value of about US$15 trillion a year.

Ramsar Convention on Wetlands, which is an international treaty signed in 1971 for national action and international cooperation for the conservation and wise use of wetlands and their resources, defines wetlands as “areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”.

As per the Ramsar Convention definition most of the natural water bodies (such as rivers, lakes, coastal lagoons, mangroves, peat land, coral reefs) and manmade wetlands (such as ponds, farm ponds, irrigated fields, sacred groves, salt pans, reservoirs, gravel pits, sewage farms and canals) in India constitute the wetland ecosystem. As a result many freshwater wetlands ecosystems are threatened and many are already degraded and lost due to urbanization, population growth, and increased economic activities.

Wetlands provide many valuable services at population, ecosystem and global levels. These signify the importance of wetlands and the need for their conservation. The value of the wetlands in terms of the economic systems perceived by the human being and the need to consider the value of a wetland as a part of an integrated landscape differ with each other and most of the times conflicting. It is needless to mention that wetlands are highly productive ecosystems and are essential for preserving the biodiversity and ecological security. The interactions of physical, chemical and biological components of wetlands enable it to perform the vital functions. The following are the significant functions, values and attributes of wetlands.

a) Functions

- Water storage
- Storm protection and flood mitigation
- Shoreline stabilisation
- Ground water recharge and discharge

- Water purification
- Retention of sediments, nutrients and pollutants
- Stabilisation of local climate particularly temperature and rainfall.

b) Values

- Water supply – maintenance of quantity and quality
- Fisheries
- Agriculture – through maintenance of water table
- Grazing, Timber production, Energy sources such as peat and plant matter
- Wildlife resources
- Recreation and tourism opportunities

c) Attributes

- **Biological diversity:** Wetlands support avifauna, especially waterfowl; fish, reptiles, mammals, and invertebrate species as well as several plant species, besides a variety of micro-organisms like plankton of both phyto and zoo origin.
- **Cultural heritage:** Open landscapes, wildlife and local traditions.

The negative economic, social, and environmental consequences of declining water quality in wetlands are also an issue of concern for India. The problem of deteriorating water quality is particularly more alarming in the case of small water bodies such as lakes, tanks and ponds. In the past, these water sources performed several economic (fisheries, livestock and forestry), social (water supply), and ecological functions (groundwater recharge, nutrient recycling, and biodiversity maintenance). These freshwater bodies are often subject to changes in land use in their catchments leading to reduction in inflows and deteriorating quality of the "runoff" traversing through agricultural fields and urban areas. On the other hand, many of them act as the "sink" for untreated effluents from urban centres and industries.

In Yavatmal district a total of 797 wetlands are mapped including 212 small wetlands (< 2.25 ha) with 34192 ha area. The district is dominated by manmade wetland types. Reservoir/barrage is the major wetland type. There are 7 Reservoir/barrage mapped with 13250 ha area (38.75%). There are 440 Tank/pond mapped with 33.10%

area. Rivers/streams occupy 27.53 % area. Aquatic vegetation is slightly more during pre monsoon (2936 ha) than during post monsoon (812ha). Open water spread of the wetlands is significantly higher in post monsoon (32303 ha) than during pre monsoon (13786 ha), indicating the rainfall dependence of the wetlands in the state, particularly the dryness of rivers is very prominent.

5.4: WATER LEVEL IN THE WELLS IN THE VICINITY (UP TO 5 Km) OF FOREST AREA:

Ground water level is one of the basic data-element which reflects the ground water regime in an area. Central Ground Water Board (CGWB) monitors, ground water levels four times a year during January, April/May, August and November through a network of observation wells spread throughout the country. The primary objective of monitoring the ground water level is to record the response of ground water regime to the natural and anthropogenic stresses of recharge and discharge parameters with reference to geology, climate, physiography, land use pattern and hydrologic characteristics. Natural conditions affecting the regime include climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumpage from the aquifer, recharge due to irrigation systems and other practices like waste disposal etc. the details of water level data of four Talukas in Pusad forest division is given in the table below.

Table No. 5.2: Water level data (2011) with long term data trend (2001-2010)

Taluka	Net annual ground water availability	Existing gross ground water draft for irrigation (ham/yr)	Existing gross ground water draft for domestic and industrial use (ham/yr)	Existing gross ground water draft for all uses (ham/yr)	Allocation for domestic and industrial requirement supply to next 25 years (ham/yr)	Net ground water availability for future irrigation develop-ment (ham/yr)	Stage of ground water develop-ment (%)
Digras	6008.47	2311.95	270.54	2582.48	538.74	3294.83	42.98
Mahagaon	9384.42	3096.26	360.61	3456.87	719.04	5534.93	36.84
Pusad	12583.09	5309.13	399.53	5708.65	786.01	6569.43	45.37
Umarkhed	14873.34	4416.75	342.52	4759.27	694.91	9791.75	32.00

5.4.1: Depth to water level: The depth to water levels in the district ranges between 1.00 m bgl (Metres below ground level) and 16.60 m bgl during premonsoon. Shallow water levels within 10 m bgl are seen in almost entire district except few isolated patches where water level ranges between 10-20 m bgl.

Depth to Water Level – Post monsoon (Nov-2011): The depth to water levels during post monsoon ranges between 0.90 m bgl and 15.20 m bgl. Shallow water levels within 10 m bgl are observed in entire district with dominant range being 2-5 m bgl. Very shallow water level of less than 2 m bgl is observed in south western part of Pusad taluka.

Information regarding well within 5 kms from forest boundary for Pusad forest division is not available with forest department. In due course of working plan period the information of water level in wells will be collected in pre-monsoon and post-monsoon periods.

5.5: STATUS OF AQUIFERS:

Various rock formations with different hydrogeological characteristics act as distinct aquifer systems of varying dimensions. The aquifer systems of India can be broadly categorized into 14 principal groups. Pusad forest division predominantly falls under the Basaltic aquifers.

Hydrogeology:

Deccan Trap Basalt is the predominant water bearing formation, followed by Gondwana formation having Sandstone and Shale sequence. Penganga and Quaternary Alluvium aquifers are spread in limited areas. Archean aquifers are limited and have less significance in the area.

Archean: Achaeans, which comprise granites, granitic gneisses and schists occur in Umarkhed taluka. These rocks as such have limited ground water potential. In these rocks only weathered portions and jointed zones possess water-bearing capacity and ground water occurs under unconfined condition in the area.

Vindhyan: In Vindhyans, Limestones are water bearing formation while Sandstone, due to their hard and compact nature and have poor ground water potential and the limestones as such are massive but wherever they are cavernous they are capable of holding water. The ground water occurs under unconfined condition in the area.

Gondwana: The Gondwana consists of Kamthi and Barakar Sandstone and Shale. Sandstone is usually friable and possesses primary porosity due to its granular nature. They are most productive water bearing formations in the district. The ground water occurs under semi confined to confined conditions in the area and water bearing zones have been encountered down to depth of 470 m.

Deccan Trap Basalt: Basalt is a basic volcanic rock which forms alternate layers of compact and vesicular beds of lava flows as seen in the Deccan trap area. The groundwater occurrence in basalts are controlled by nature and extent of weathering, presence of vesicles and lava tubes, thickness of flows, number of flows and the nature of inter-trappean layers. Basaltic aquifers have usually medium to low permeability. Groundwater occurrence in the Deccan Traps is controlled by the contrasting water bearing properties of different flow units, thus, resulting in multiple aquifer system, at places. The water bearing zones are the weathered and fractured zones. Deccan Trap Basalt is widely spread and forms important water bearing formation, which occupies almost entire district except south eastern part. On the whole, Deccan Trap Basalt exhibits a multi aquifer system. It is observed that weathered Vesicular Basalt mainly forms the predominant shallow aquifer down to the depth of 20 m bgl. Massive Basalt is also encountered at the top thereby forming poor yielding aquifer and also restricting the ground water recharge to the underlying porous Vesicular Basalt. Fractured Basalt is also observed in certain places with limited to significant thickness. In Deccan Trap Basalt phreatic aquifer generally occurs down to 25 m, however, fracture zones have occurred within 80 m range except at few places where it occurs down to 158 m also.

Alluvium: Alluvium occurs in patches along the banks of Painganga river and their major tributaries and consists of clay and silt with lenticular bodies of sand and gravel. It is observed that sand zones are found in the depth range of 20-25 m bgl, while the top 15-16 m is full of clay and silt. Ground water in Alluvium occurs both under unconfined and 8 semi-confined conditions. Regarding the status of aquifers, GSDA, Pune and CGWB, Central Region Nagpur have reported in 2011. The details of nature and yield potential of aquifers of four talukas in Pusad forest division are given in the table below.

Table No. 5.3: Nature and yield potential of aquifers

Sr.No	Taluka	Main aquifer	Yield potential	Type of wells suitable
1	Digras	Basalt	Low	Dugwell, DCB
2	Mahagaon	Basalt	Medium	Dugwell, DCB
3	Pusad	Basalt	Low to medium	Dugwell, DCB
4	Umarkhed	Basalt	Medium to high	Dugwell, DCB

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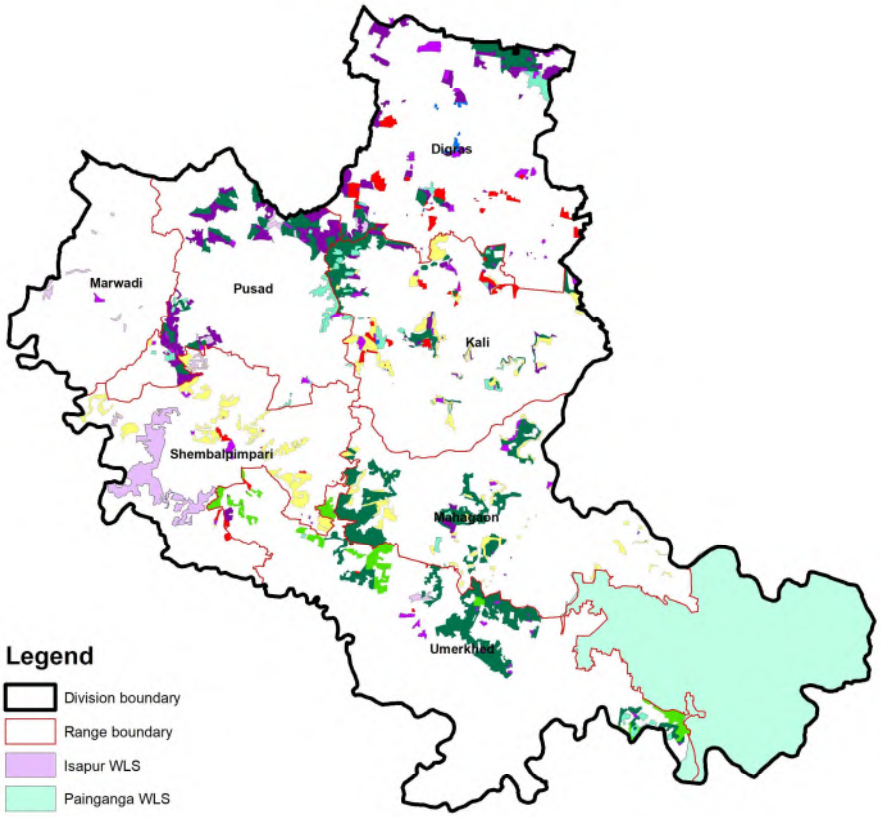
PUSAD FOREST DIVISION
Stock map

1:150,000



Legend

- Division boundary
- Range boundary
- Isapur WLS
- Painganga WLS
- Teak IV A
- Teak IV B
- Miscellaneous
- Plantation
- Scrub
- understocked
- Open area
- Encroachment
- Water bodies

CHAPTER – 6

MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1: GROWING STOCK OF WOOD:

STOCK MAPPING:

Reserved Forests of the division were stock mapped at the time of revision of the Working Plans. The stock maps were revised with each revision of the working plan. At the time of preparation of this working plan stock maps were prepared compartment wise during 2018 by staff of territorial division. The stock maps have been digitized in the GIS cell of Yavatmal Working Plan Division. Forest Cover mapping (Density classes) done by Forest Survey of India was also procured and used in GIS platform. The results of stock mapping are given in table below.

Table No. 6.1: Results of stock mapping

Quality	Area (ha)	Area wrt to WP area (%)
Teak IV A	8040.12	11.65
Teak IV B	24636.71	35.69
Miscellaneous IV A	3623.27	5.25
Miscellaneous IV B	9529.02	13.80
Plantation	3218.08	4.66
Understock	12347.83	17.89
Blank	3771.18	5.46
Eroded and Scrub	222.76	0.32
Encroachment/ Cultivation	3308.47	4.79
Water Bodies	338.50	0.49
Total	69035.94	100.00

6.2: GROWING STOCK OF BAMBOO:

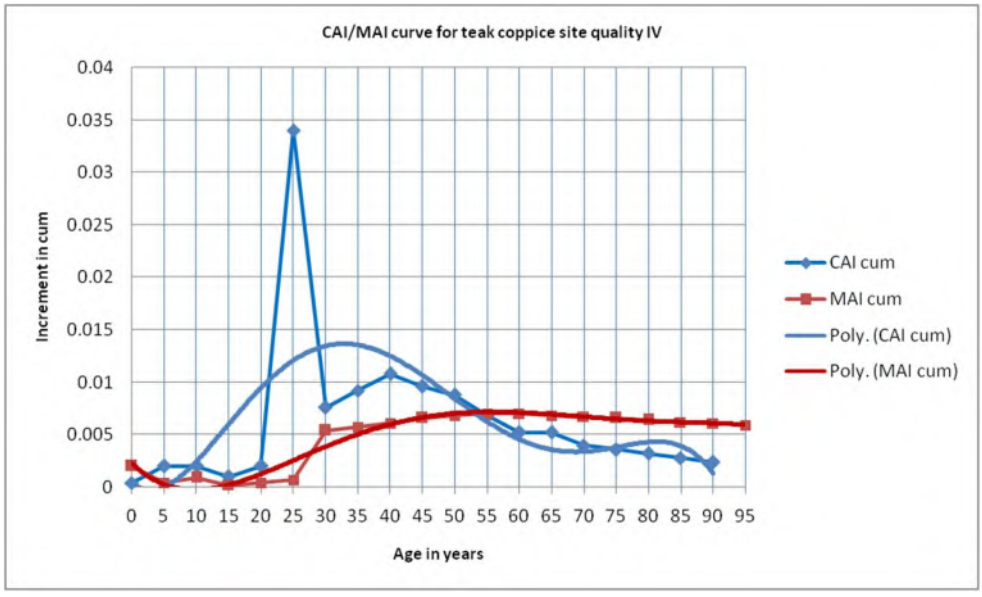
Bamboo presence is very scarce in Pusad forest division. Hence growing stock of bamboo was not assessed.

6.3: INCREMENT IN VOLUME OF IDENTIFIED TIMBER SPECIES:

During revision of this plan stem analysis for teak was carried out in May 2018, by selecting four representative teak trees of seedling origin and coppice origin for site quality IV in compartment no. 429 of Beldari-1 beat (Mahagaon range), 391 of Marwadi beat (Marwadi range), 366 of Mokhad beat (Pusad range). The result of stem analysis is given in **Appendix-XII**. It is summarized in the table below.

Table No. 6.2: Stem analysis for coppice origin Teak (Site quality IV)

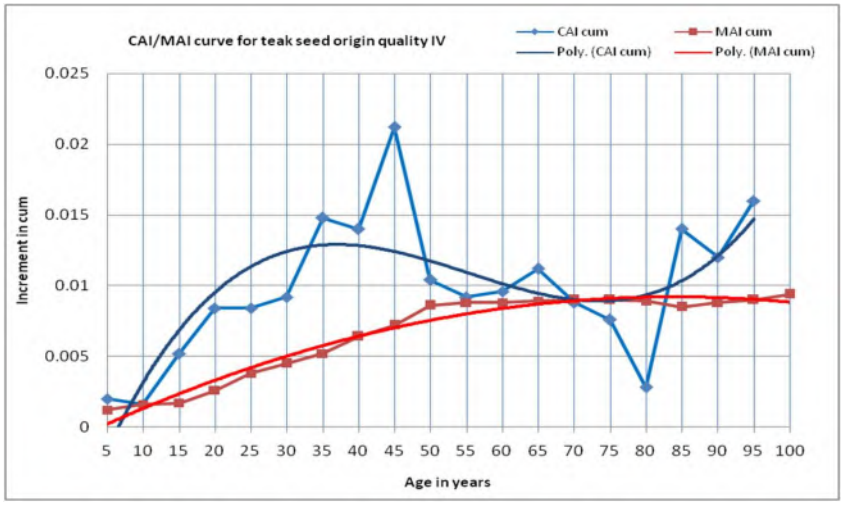
Sr. No.	Age	Height (m)	DBH ob (cm)	GBH ob (cm)	Volume (m^3)	CAI(m^3)	MAI(m^3)
1	5	1.90	2.80	8.80	0.002	0	0.002
2	10	3.20	5.70	17.90	0.004	0.0004	0.0004
3	15	5.20	8.70	27.31	0.014	0.002	0.0009
4	20	6.80	11.70	36.73	0.005	0.002	0.0002
5	25	8.0	14.70	46.16	0.010	0.001	0.0004
6	30	9.70	17.40	54.63	0.022	0.002	0.0007
7	35	11.10	19.50	61.23	0.192	0.034	0.0054
8	40	13.0	21.40	67.19	0.230	0.0076	0.0057
9	45	13.90	22.90	71.90	0.276	0.0092	0.0061
10	50	15.40	24.30	76.30	0.330	0.0108	0.0066
11	55	16.80	25.60	80.38	0.378	0.0096	0.0068
12	60	18.20	26.80	84.15	0.422	0.0088	0.0070
13	65	19.60	27.90	87.60	0.456	0.0068	0.0070
14	70	20.70	28.80	90.43	0.482	0.0052	0.0068
15	75	21.70	29.60	92.94	0.508	0.0052	0.0067
16	80	22.70	30.40	95.45	0.528	0.0040	0.0066
17	85	23.50	31.10	97.65	0.546	0.0036	0.0064
18	90	24.60	31.80	99.85	0.562	0.0032	0.0062
19	95	25.10	32.40	101.73	0.576	0.0028	0.0061
20	100	25.80	33.0	103.62	0.588	0.0024	0.0059



The periodic CAI and MAI curves intersect at 55th year. The girth (OB) corresponding to this exploitable age is 79 cms. The exploitable girth is hence fixed at 75 cms for teak coppice.

Table No. 6.3: Stem analysis for seed origin Teak (Site quality IV)

Sr. No.	Age	Height (m)	DBH (OB)	GBH (OB)	Volume (m^3)	CAI (m^3)	MAI (m^3)
1	5	1.50	2.3	7.22	0.006	0	0.0012
2	10	2.80	5.6	17.60	0.016	0.002	0.0016
3	15	4.20	8.9	27.94	0.026	0.0016	0.0017
4	20	5.80	12.7	39.90	0.052	0.0052	0.0026
5	25	7.20	15.9	49.90	0.094	0.0084	0.0038
6	30	8.60	18.3	57.46	0.136	0.0084	0.0045
7	35	10.10	20.4	64.0	0.182	0.0092	0.0052
8	40	11.50	23.1	72.53	0.256	0.0148	0.0064
9	45	12.90	24.9	78.18	0.326	0.014	0.0072
10	50	14.40	26.4	82.90	0.432	0.0212	0.0086
11	55	15.80	27.8	87.29	0.484	0.0104	0.0088
12	60	17.20	29.3	92.0	0.53	0.0092	0.0088
13	65	18.60	30.7	96.39	0.578	0.0096	0.0089
14	70	19.90	32.0	100.48	0.634	0.0112	0.0090
15	75	21.20	33.3	104.56	0.678	0.0088	0.0090
16	80	22.30	34.6	108.64	0.716	0.0076	0.0089
17	85	23.40	35.8	112.41	0.730	0.0028	0.0085
18	90	24.40	36.0	113.04	0.800	0.014	0.0088
19	95	25.30	38.2	119.94	0.860	0.012	0.0090
20	100	26.00	39.3	123.40	0.940	0.016	0.0094



The periodic CAI and MAI curves intersect at 71st year. The girth (OB) corresponding to this exploitable age is 105 cms. The exploitable girth is hence fixed at 120 cms for teak of seed origin.

6.4: EFFORTS TOWARDS ENHANCEMENT OF FOREST PRODUCTIVITY THROUGH QUALITY PLANTATION ACTIVITIES:

In Pusad forest division plantation activities have been carried out in the past ten years is given in **Appendix-XIII**. A total of 4609 hectares of plantation has been done during the plan period. Plantations include teak and miscellaneous species. The summary of plantations is given in the table below.

Table No.6.4 : Plantation carried out by forest department

Sr. No.	Year	Area (ha)	No. of Plants
1	2009	862	1002981
2	2010	127	208528
3	2011	759.16	486730
4	2012	565	998500
5	2013	177.33	269000
6	2014	335	413000
7	2015	150	165000
8	2016	317	224050
9	2017	502.75	488791
10	2018	813.8	770430
Total		**4609.04**	**5027010**

6.5: CARBON STOCK:

Forests play an important role in combating climate change. In addition, it has the potential to provide ecosystem services, such as carbon storage. In forest ecosystem, enormous carbon is stored which is classified in five pools by GPG. The living portion of biomass carbon is classified in two pools; the 'above ground biomass' (AGB) and 'below ground biomass' which are stores of significant amount of carbon. The 'dead organic matter' (DOM) is also classified into two pools; 'dead wood' and 'litter'. The fifth pool is 'Soil organic matter' (SOM) which contains substantial amount of organic carbon. Above and below ground Carbon sequestered in the forests of Pusad Division has been derived by using growing stock values obtained from enumeration data. Initially, teak and non-teak biomass was calculated using wood density value of teak (0.55 g/cm3)and non-teak species (0.67 g/cm3) and using the growing stock data. Teak and non teak biomass was multiplied by carbon fraction (CF) 0.47 default value (IPCC 2006) to get above ground carbon stock. Below ground carbon stock was calculated using 0.27 (IPCC Default value)as a multiple factor to the above ground carbon stock. Total above and below ground carbon stock is 11.81 lakh tones as shown in table 6.5 (A). Whereas, soil carbon stock is 8.45 lakh tones, as

shown in the table no 6.5 (B). Total Carbon Stock of India and Maharashtra is 7082 million tones and 493 million tones, respectively. Total Carbon Stock (Above ground, Below ground and Soil carbon stock) of Pusad Division comes approximately2.026 million tones. Working circle wise,above and below ground Carbon Stock and soil carbon stockin Pusad forest Division is given below.

Table No. 6.5 (A) : Above & Below Ground Carbon Stock in different working circles

Sr. No.	Working Circle	Total Area (ha)	Average growing stock (m3/ha)	Total growing stock (in lakh m3)	Teak & Non Teak Growing Stock (in lakhs m3)		Biomass Teak and Non Teak (in lakhs tonnes)		Carbon sequestration tonnes (above ground) (in lakhs tonnes)		Carbon sequestration tonnes (below ground) (in lakhs tonnes)		Total Carbon sequestration (in lakhs tonnes)
					Teak 70%	Non Teak 30%	Teak	**Non Teak**	Teak	Non Teak	Teak	Non Teak	
1	SCI	35984.18	69.41	24.98	17.48	7.49	9.62	5.02	4.52	2.36	1.22	0.64	8.74
2	AWC	13679.82	11.74	1.61	1.12	0.48	0.62	0.32	0.29	0.15	0.08	0.04	0.56
3	CAT	16414.79	43.15	7.08	4.96	2.12	2.73	1.42	1.28	0.67	0.35	0.18	2.48
4	FIWC	1307.27	8.55	0.11	0.08	0.03	0.04	0.02	0.02	0.01	0.01	0.00	0.04
5	MISC	1649.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**69035.94**	**0.00**	**33.78**	**23.64**	**10.13**	**13.00**	**6.79**	**6.11**	**3.19**	**1.65**	**0.86**	**11.81**

Table No. 6.5 (B) : Soil Carbon Stock in different working circles

Sr. No.	Working Circle	Soil organic carbon (SOC) (%)	Soil bulk density (g/cm3)	total depth (cm)	SOC of stratum (gm/ cm2)	SOC of Stratum (tonnes/ ha)	Area (ha)	Soil carbon stock (in lakhs tonnes)
1	SCI	0.34	1.20	30	12.24	1224	35984.18	4.41
2	Afforestation	0.34	1.20	30	12.24	1224	13679.82	1.67
3	CAT	0.34	1.20	30	12.24	1224	16414.79	2.01
4	Fodder improvement	0.34	1.20	30	12.24	1224	1307.27	0.16
5	Miscellaneous	0.34	1.20	30	12.24	1224	1649.88	0.20
							69035.94	**8.45**

SOC = r_bx d x **%C ,** where, SOC = soil organic carbon stock per unit area (t/ha), r_b = soil bulk density (g/cm^3) – **Default value is1.2**; d = total depth at which sample was taken (cm), %C = carbon concentration 0.34% C is expressed as 0.0034. *Source: Pearson et al (2005).*

6.6: CARBON SEQUESTRATION AND MITIGATION: In this plan an area of 13679.82ha is proposed under Afforestation WC which is to be implemented during the plan period. This will add to the forest cover of the division and contribute to the carbon sequestration of the forest. Natural regeneration prescribed in the plan will also add biomass and carbon in the form of vegetation.

6.7: SOIL ANALYSIS: Soil samples were collected from different compartments of Pusad forest division. These samples were analysed for various physical and chemical properties. The details are given in **Appendix-XIV**.

CHAPTER – 7

OPTIMIZATION OF FOREST RESOURCE UTILIZATION

7.1: RECORDED REMOVAL OF TIMBER:

Timber is mainly in demand for the purpose of construction, furniture making and preparation of agriculture implements by the local people. The main preferred species is Teak, which is followed by Ain, Dhawda, Kalam, Tiwas, Bija, Behada and Khair. Most of these species are also in demand locally for various construction purposes. Local demand of timber is met from the timber removed from the forest division. The timber depot at Singad (Digras range) and Nagapur (Umarkhed range) cater to the needs of the local population.

Table No.7.1: Timber auctioned and revenue realized

Sr.No.	Year	Timber (m^3)	Revenue (Rs.)
1	2008-2009	418.752	5025818
2	2009-2010	1125.182	14951075
3	2010-2011	844.520	14450100
4	2011-2012	422.390	8079620
5	2012-2013	510.520	9953370
6	2013-2014	261.171	5001700
7	2014-2015	455.674	12571400
8	2015-2016	523.259	13618000
9	2016-2017	694.132	19617100
10	2017-2018	1032.164	22534770

7.2: RECORDED REMOVAL OF FUEL WOOD:

With the introduction of modern cooking fuels like LPG gas, electric implements dependence on fuelwood has decreased. But still firewood is the main cooking fuel for most of the villagers as well as people of Pusad town. Dhawda as fuel wood is the most sought after species for fuel wood. The other hard wood species like Khair, Ain, Babul etc. are also preferred over some of the soft wood species like Salai, Moyen, Behada. As the demand exceeds supply, illicit lopping of the trees and carrying of head loads of lopped branches mostly by the women is frequently noticed in this area. Majority of the ginning mills and processing factories of the area use alternatives such as coal and oil than firewood.

Table No.7.2: Firewood auctioned and revenue realized

Sr.No.	Year	Quantity (m^3)	Revenue (Rs.)
1	2008-2009	0.000	0
2	2009-2010	307.614	262930
3	2010-2011	478.876	172881
4	2011-2012	95.000	172800
5	2012-2013	159.500	201910
6	2013-2014	123.483	200660
7	2014-2015	112.320	24670
8	2015-2016	63.600	42600
9	2016-2017	71.280	149000
10	2017-2018	46.000	56850

7.3: RECORDED REMOVAL OF BAMBOO/RATTANS:

Availability of bamboo is very scarce hence there is no record of recorded removal of bamboo or rattans.

7.4: RECORDED REMOVAL OF LOCALLY IMPORTANT NTFPs INCLUDING MAPs:

7.4.1: Non timber forest produce: Tendu perhaps is one of the major revenue earning forest produce of non timber forest produce. There are 11 Tendu units in Pusad forest division. The trade of Tendu units is fluctuating. The quantum of revenue realized has increased over the years. The scattered distribution of tendu leaves, lesser areas available for collection and quality of tendu leaves determine the price of the tendu leaves. The detail of sale of tendu leaves is given in the table below.

Table No.7.3: Tendu units auctioned, standard bags collected and revenue realized

Sr. No.	Year	Unit Auctioned	Target (Std Bags)	Actual Yield (Std Bags)	Revenue (Rs.) (Actual)
1	2009	8	20300	17525.014	9931684
2	2010	9	22100	14164.29	13354000
3	2011	0	22100	0	0
4	2012	7	20400	15148.208	7575000
5	2013	1	21200	1955.622	369000
6	2014	1	2190	1955.786	427000
7	2015	3	21100	6285.039	1987200
8	2016	11	17550	12537.931	19802887
9	2017	11	17150	15806.39	49675086
10	2018	8	10511	8148.556	9483240

7.4.2: Dhawda gum: Dhawda gum is highly demanded as edible gum in the market. For collection purposes of Dhawda gum the entire division is divided into 3 units, which are

sold through open auction. The collection of Dhawda gum ranges from 45 quintals to 200 quintals. The quantity and revenue realized by sale of gum is mentioned in the table below.

Table No.7.4: Quantity of gum auctioned and revenue realized

Sr.No.	Year	Gum (Qt.)	Revenue (Rs.)
1	2008-09	45.00	113000
2	2009-10	57.00	56300
3	2010-11	54.00	53000
4	2011-12	171.15	114000
5	2012-13	37.43	131000
6	2013-14	95.25	222000
7	2014-15	355.72	240000
8	2015-16	206.15	180000
9	2016-17	149.65	70000
10	2017-18	150.00	122000

7.4.3: Rosha grass (*Cymbopogon martini)*: The species distributed mainly in Mahagaon, Pusad and Umarkhed ranges. The total division is divided into 3 units. The revenue earned out of the sale proceeds of the Rosha grass is very meagre. Other non wood forest produce like Moha flowers and seeds, Charoli, Biba, Hirda and Behada seeds apart from the fruits of Tendu, Char, Jamun, Aonla, Imli etc. have good demand in the market. However, the production of these forest produce are very limited. The details of the NTFP units are given in **Appendix-XV**.

7.5: DEMAND AND SUPPLY OF TIMBER AND IMPORTANT NON-TIMBER FOREST PRODUCE:

7.5.1: Demand and supply of forest produce and pressure on the forest:

Timber is an essential commodity. It is used for various purposes by the rural and urban people. This estimation of consumption of timber *i.e.* demand per family is calculated for the four talukas of Pusad forest division. Forest Survey of India came out with estimates of requirement of timber for housing, furniture and agricultural implements along with some other estimations in State of the Forest Report (2011). As per these estimates for Maharashtra State the requirements for housing, furniture and

agricultural implements was 55.61 million cum, 4.602 million cum and 5.101 million cum respectively. Taking into account the population of Maharashtra in 2011 (11.24 crores), the per capita requirement comes as 0.495m^3 (housing), 0.041m^3 (furniture) and 0.045 m^3 (agricultural implements). As per these estimates the demand of timber for the four talukas of Pusad forest division is given below.

Table No.7.5: Demand of timber

Sr. No.	Taluka	Population	Housing @0.495 m^3 /person/year	Furniture @0.0.041 m^3 /person/year	Agrl impl. @0.045 m^3 /person/year	Total cum/year
1	Digras	1,54,122	76269.413	6311.668	6996.049	89577.13
2	Mahagaon	1,90,252	94148.846	7791.278	8636.095	110576.219
3	Pusad	3,41,186	168840.632	13972.39	15487.432	198300.454
4	Umarkhed	2,59,357	128346.415	10621.295	11772.974	150740.683
Total		9,44,917	467605.306	38696.63	42892.549	549194.486

7.6: IMPORT AND EXPORT OF WOOD AND WOOD PRODUCTS:

There is no record of the import or export of wood and wood based products into or from Pusad. The produce that is produced from Pusad is utilized locally.

7.7: IMPORT AND EXPORT OF NTFPs:

There is no record of the import or export of NTFPs.

7.8: REMOVAL OF FODDER:

Grass from grass birs, closed coupes and a plantation is available on cutting basis. As per the existing Government orders annual lease of grass birs for removal of grass on cutting basis, is first offered to Gram Panchayats, Co-operative Milk Societies and other Public Bodies at a price fixed by the Forest Department, considering current market trend and availability of grass. The lease of those areas which could not be disposed off in this way is sold by auction. The grass from the areas which remain unsold by any of the above methods is sold on rated passes. In drought years grass from grass birs is kept reserved under the orders of the Collector and is cut and supplied to the drought affected areas.

7.9: VALUATION OF THE PRODUCTS:

The details of the quantity revenue realized from sale of timber, firewood, tendu and gums are mentioned in table Nos. 7.1, 7.2, 7.3 and 7.4.

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PUSAD FOREST DIVISION
JFM VILLAGES

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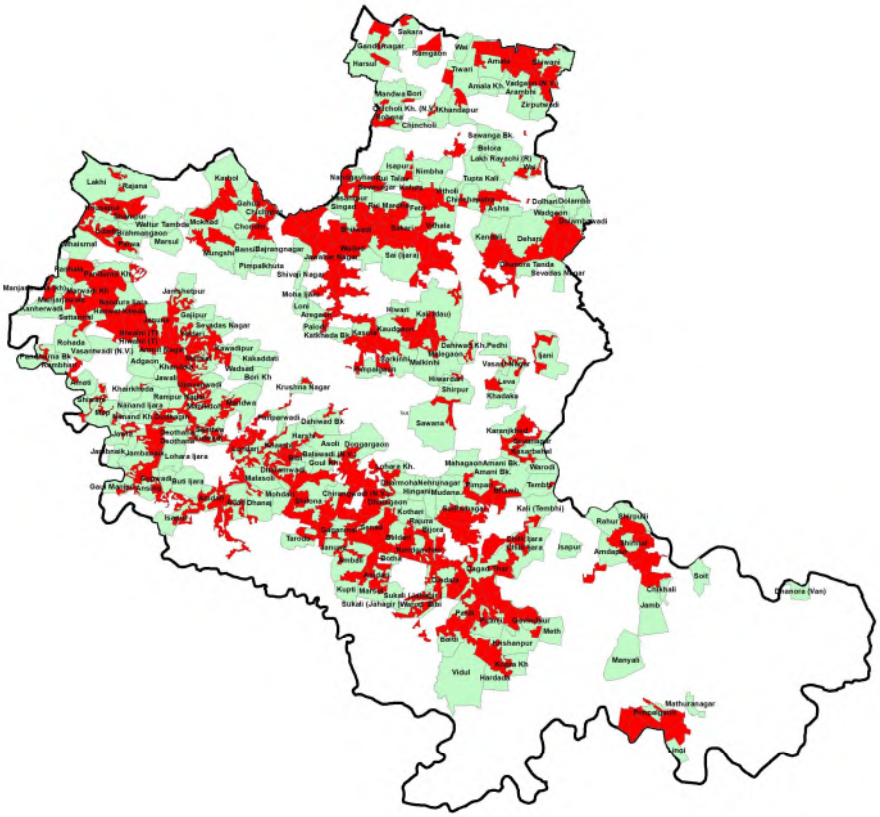

Legend

- Compatrment boundary
- JFM villages
- Division boundary

0 2.5 5 10 15 20 25
Kilometers

CHAPTER – 8

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

8.1: NUMBER OF JFM COMMITTEES AND AREA(S) PROTECTED BY THEM:

Since the inception of community participation in forest management, JFM committees play an important role in conservation and management of forest and wildlife resources. In recent times they have become an integral part of peoples' participation. Pusad forest division has a total of 240 JFM committees in the forest fringe villages. The total area allotted for these committees is 38129 ha. This covers around 55% of the total area of the division. JFM committees have taken up plantation activities to the extent of 2647 ha during the previous plan period.

8.2: STATUS OF EMPOWERMENT OF JFMCs:

In Maharashtra JFM committees in the forest division are guided by Government of Maharashtra Resolution dated 16th March 1992, 5th October 2011 and 10th July 2012. In Pusad forest division there are 471 villages, out of which 225 villages are within forests, 124 villages adjoining the forest areas and 122 villages which have no forest area. In this division 240 JFM committees have been formed till March, 2018. As per the Government Resolution the total number of members in a committee is a minimum of 12 and maximum of 24 with one third members from gram panchayat, 50% of the members should be women and two members from SC/ST and OBC. In the 240 JFM committees there are a total of 77359 members. The details are given in the **Appendix-XVI**. A total of 217 Memorandum of Understanding (MoU) has been signed and 23 micro-plans have been prepared.

Maharashtra Forest Department has issued guidelines for grading of JFM committees into A, B and C categories based on various criteria. Based on this, of the 240 JFM committees, 57 committees, 70 committees and 113 committees have been graded into A, B and C category committees respectively. General body meetings and executive

committee meetings of JFM committees are conducted periodically. The overall attendance in general body meetings is 60% and executive committee meetings is 80%. The details are given in **Appendix-XVII**. During these meetings various resolutions pertaining to the concerned JFM committee are approved. Various registers are also maintained at the committee level.

8.3: LABOUR WELFARE:

Members from the JFM villages are given priority in all the activities for semi skilled and unskilled labour. Works of plantations, protection, boundary pillar repairs, fire line tracing and all other works are done primarily through JFM Committee members. In Pusad forest division there are Forest Labour Cooperative Societies which perform tree felling activity in their allotted coupes after due approval.

8.4: USE OF INDIGENOUS KNOWLEDGE:

The availability of medicinal plants within the forests are collected and used for various ailments. Though the exact quantum, methodology and usage is not recorded but local medical practitioners or vaidhyas have many indigenous and traditional knowledge. They use forest based resources to create various formulations which are still used by local villagers. Apart from this, presence of other indigenous knowledge cannot be ruled out. Indigenous and traditional knowledge related to forest and environment needs to be documented.

8.5: EXTENT OF CULTURAL/SACRED GROVES:

There are no sacred groves in this division. There are sites of cultural significance in the division. Ansuleshwar temple in compartment number 414 of Shembalpimpri range draws huge crowds during Shivratri. Lots of devotees throng to the temple. Bhavani tekadi in compartment number 803 of Digras range is also visited by large number of devotees during dussehra to visit the goddess temple. Harshi temple in Shembalpimpri range is also significant culturally for the local population.

8.6: ECOTOURISM AREAS AND ACTIVITIES:

Various important ecotourism sites have been identified in the division. Some of the sites have been developed while there is a need to develop other sites. A separate chapter is given for the ecotourism.

8.7: SOCIAL CUSTOMS:

Social customs relevant to the forest or its conservation are not noticed.

8.8: STATUS OF COMPLIANCE OF FOREST RIGHT ACT (FRA):

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 was passed by the Parliament of India and the assent to this Act was received from the President of India on 29th December, 2006. The said Act was notified in the Gazette of India on 2nd January, 2007. For implementation of the said Act, the Central Government notified the Rules for Recognition of Forest Rights on 1st January, 2008. These Rules were further amended by the Central Government vide notification dated 6th September, 2012.

8.8.1: Salient Provisions of the Forest Rights Act, 2006:

(I) **Section 3 (1):** The following rights which secure individual or community tenure or both, shall be the forest rights under the Act. They are:

(a) Right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a Forest Dwelling Scheduled Tribes or Other Traditional Forest Dwellers;

(b) Community rights such as *nistar*, by whatever name called, including those used in erstwhile Princely States, Zamindari or such intermediary regimes;

(c) Right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries;

(d) Other community rights of uses or entitlements such as fish and other products of water bodies, grazing and traditional seasonal resource access of nomadic or pastoralist communities;

(e) Rights including community tenures of habitat and habitation for primitive tribal groups and pre-agricultural communities;

(f) Rights in or over disputed lands under any nomenclature in any State where claims are disputed;

(g) Rights for conversion of *Pattas* or leases or grants issued by any local authority or any State Government on forest lands to titles;

(h) Rights of settlement and conversion of all forest villages, old habitation, unsurveyed villages and other villages in forests, whether recorded, notified or not into revenue villages;

(i) Right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use;

(j) Rights which are recognised under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribals under any traditional or customary law of the concerned tribes of any State;

(k) Right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;

(l) Any other traditional right customarily enjoyed by the Forest Dwelling Scheduled Tribes or Other Traditional Forest Dwellers, as the case may be, which are not mentioned in clauses (a) to (k) but excluding the traditional right of hunting or trapping or extracting a part of the body of any species of wild animal;

(m) Right to *in situ* rehabilitation including alternative land in cases where the Scheduled Tribes and Other Traditional Forest Dwellers have been illegally evicted or displaced from forest land of any description without receiving their legal entitlement to rehabilitation prior to the 13th day of December, 2005.

(II) **Section 3(2):** Notwithstanding anything contained in the Forest (Conservation) Act, 1980, the Central Government shall provide for diversion of forest land for the following facilities managed by the Government which involve felling of trees not exceeding 75 trees per hectare, namely:

(a) Schools;

(b) Dispensary or hospital;

(c) Anganwadis;

(d) Fair price shops;

(e) Electric and telecommunication lines;

(f) Tanks and other minor water bodies;

(g) Drinking water supply and water pipelines;

(h) Water or rain water harvesting structures;

(i) Minor irrigation canals;

(j) Non-conventional source of energy;

(k) Skill upgradation or vocational training centres;

(l) Roads; and

(m) Community centres;

Provided that such diversion of forest land shall be allowed only if, the forest land to be diverted is less than one hectare in each case; and the clearance of such developmental projects shall be subject to the condition that the same is recommended by the Gram Sabha.

(III) **Section 5:** The holders of any forest right, Gram Sabha and village level institutions in areas where there are holders of any forest right under this Act are empowered to (a) protect the wildlife, forest and biodiversity; (b) ensure that adjoining catchment area, water sources and other ecological sensitive areas are adequately protected; (c) ensure that the habitat of Forest Dwelling Scheduled Tribes and Other Traditional Forest Dwellers is preserved from any form of destructive practices affecting their cultural and natural heritage; (d) ensure that the decisions taken in the Gram Sabha to regulate access to community forest resources and stop any activity which adversely affects the wild animals, forest and the biodiversity are complied with.

(IV) **Section 6(1):** The Gram Sabha shall be the authority to initiate the process for determining the nature and extent of individual or community forest rights or both that may be given to the Forest Dwelling Scheduled Tribes and Other Traditional Forest Dwellers within the local limits of its jurisdiction under this Act by receiving claims, consolidating and verifying them and preparing a map delineating the area of each recommended claim in such manner as may be prescribed for exercise of such rights and the Gram Sabha shall, then, pass a resolution to that effect and thereafter forward a copy of the same to the Sub-Divisional Level Committee.

(V) **Section 6(3):** The State Government shall constitute a Sub-Divisional Level Committee to examine the resolution passed by the Gram Sabha and prepare the record of forest rights and forward it through the Sub-Divisional Officer to the District Level Committee for a final decision.

(VI) **Section 6(5):** The State Government shall constitute a District Level Committee to consider and finally approve the record of forest rights prepared by the Sub-Divisional Level Committee.

(VII) **Section 6(6):** The decision of the District Level Committee on the record of forest rights shall be final and binding.

(VIII) **Section 11:** The Ministry of the Central Government dealing with Tribal Affairs or any officer or authority authorised by the Central Government in this behalf shall be the nodal agency for the implementation of the provisions of this Act.

8.8.2: Status of implementation of FRA 2006: The status of implementation of this Act (up to March 2018) is summarized in the table below.

Table No. 8.1: Status of implementation of FRA 2006 till March 2018

Sr. No.	Type of FRA	No. of FRA Proposal	No. of FRA Proposal accepted	Total Area (ha)
1	2	3	4	5
1	Individual Forest Right	18	18	24.06
2	Community Forest Right	81	81	19961.5
3	FRA u/s 3(2)	20	20	8.157
	Total	119	119	19993.72

8.9: OTHER RIGHTS AND CONCESSIONS:

As per Forest Policy of 1988, the first charge on the forest produce is that of tribal and other villagers living in and around the forest. Accordingly, the forest produce obtained from the forest will first be supplied to the people living in the villages notified for nistar purposes at the rate fixed by the Deputy Conservator of Forests in consultation with the District Collector. Only the surplus forest produce, which is not required by the local people, will be sold in open auction. Small timber and poles required for agricultural purpose and repairs to houses as well as firewood for domestic use will be supplied from the depots at concessional rates to the villagers living near the forests, depending upon the availability of these produce. Depots will be opened at suitable places, throughout the division, so that people have to traverse minimum possible distance to procure these produce. Range, Round or Beat head quarters can be used for this purpose, so that supervision and maintenance of these depots become convenient.

In Pusad forest division the Reserved Forests are not burdened with any adverse rights and concessions however Protected Forests are heavily burdened by grazing concessions.

The Grazing concessions are allowed as per “Grazing Policy” of Maharashtra State depending upon the cattle unit and carrying capacity of forests. The Grazing Rules have been framed vide Government Resolution No.MFP-1365/132211-Y, dated 6th December, 1968 and Grazing Rules issued vide No.MFP-1371/237035-Z, dated November 3, 1973. However, no grazing beyond carrying capacity shall be permitted.

8.10: DEPENDENCY OF LOCAL PEOPLE ON NTFPs:

The species of NTFP are available throughout the tract with varying degree. These produce meet the NTFP demand of local forest dwellers directly or indirectly. They not only play an important role in economy but also generate employment to the local people. The important NTFP are Tendu, Moha flower, Moha seed, Hirda, Behada, Aoala, Charoli, Kulu, Dhawda and honey.

A rich variety of medicinal plants are found in the forest tract of the Pusad forest division which yield medicines that are used for curing of different ailments by the local people. The medicinal plants play an important role in socio-economic cultural, spiritual and medicinal values of local villagers. Their conservation, sustainable management and harvesting can conserve biodiversity retaining human, environmental health and generate employment.

8.11: OTHER ASPECT :

Local people depends upon forest for grazing of their cattle. They have cow, Buffalos and Ox on large scale. The Range wise grazing block have been formed in Digras, Pusad, Marwadi, Shembalpimpri, Umarkhed, Mahagaon and Kali (Daulat) ranges for the purpose of grazing for cattle of local peoples. The grazing passes are issued to such local peoples for grazing purpose every year. The details of grazing passes issued and Revenue obtained in last ten year is as under.

Year	No. of grazing passes issued	Revenue Obtained (Rs.)	Total No. of animals		
			Cow	Buffalo	Ox
2008-09	10024	32938.00	26625	2628	5055
2009-10	7693	31834.00	28074	1692	4453
2010-11	9085	32770.00	29670	1662	3362
2011-12	6712	30855.00	30169	1951	3526
2012-13	7778	29413.00	26374	1464	3058
2013-14	8092	27979.00	29478	1539	2922
2014-15	4294	24376.00	22424	1918	2012
2015-16	4991	27314.00	25848	1255	1613
2016-17	5574	28712.00	26561	1379	2097
2017-18	5230	30748.00	28352	1615	2207

Local people also collect and store fodder grasses for summer season. Natural regeneration is found adversely affected in those area as whever rotational grazing system is not followed properly, likewise, porporation of non fodder grasses is slowly increasing ins such area. Therefore, grazing in such area needs to be managed properly to avoid adverse effect on quantity and quality of fodder species.

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CHAPTER – 9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

9.1: EXISTING POLICY AND LEGAL FRAMEWORK AND THEIR COMPLIANCE:

9.1.1: National forest policy for India was first enacted in 1894. This policy considered public benefit as the main objective of public forest management. It suggested the maintenance of forests in hilly areas for preservation of climatic conditions and protection of agriculture from hill torrents. The objectives of the forest policy 1894 were -

a. To preserve climatic and physical conditions of the country.
b. To preserve minimum amount of forest necessary for general well being of the country.

The other priorities of 1894 Forest Policy were -

1. Priority to cultivation over forestry.
2. To meet the public demand for forest produce at concessional rates on priority in comparison to revenue consideration.
3. Realization of maximum revenue after meeting the demands of local people.

National forest policy 1952:

Indian republic formulated its first National Forest Policy in 1952. The factors that influenced the policy makers were deteriorating environmental conditions, world wars, dependency of defence on forest produce and reconstruction schemes on forestry.

The following needs were identified while making forest policy.

1. The need for evolving a system of balanced and complimentary land use.
2. Need for checking of denudation of mountainous regions, erosion along the treeless banks of great rivers and on vast undulating waste lands.
3. Need for establishing tree lands, to ameliorate physical and climatic conditions for general well being of the people.

4. The need for progressively increasing demands for grazing, fire wood and small timber for agriculture implements.
5. The need for realization of revenue in continuity.

The National Forest Policy 1952 states that, the State Government can regulate, frame the policies for forest administration and legislation for conservation and utilization of forest resources, provided those policies do not adversely affect the general economy and physical balance of adjoining states and in general the Forest Policy of the Central Government.

9.1.2: National forest policy 1988:

Forests have been brought to the concurrent list from state list with the effect of 42nd amendment to the constitution of India which enables the Central Government to exercise more authority in forestry matters. This was clearly reflected in National Forest Policy 1988. The reasons for such changes were, inadequacy of protection measures, diversion of forest lands to non forestry uses, tendency to maximum revenue realization, growing demands for timber, wood and fodder. The Forest Policy of 1988 clearly states that, the forests are to be managed mainly for preservation, maintenance, sustainable utilization, restoration and enhancement of natural environments. The governing objects of National Forest Policy are as follows.

1. Maintenance of environmental equilibrium through preservation and restoration of ecological balance.
2. Conserving national heritage by preserving the remaining natural forests with great variety of flora and fauna which represents commendable biodiversity and genetic resources of the country.
3. Checking soil erosion and desiltation in catchment areas of rivers, lakes, reservoirs through soil and water conservation measures in order to mitigate floods, droughts and siltation of reservoirs.
4. Substantial improvement in the forests and tree cover in the country through massive afforestation, Social Forestry programmes specially on denuded, degraded and unproductive lands.

5. Meeting the demands for fuel wood, minor forest produce, fodder and small timber of rural and tribal populations.
6. Increase the productivity of forest to meet essential needs of the nation.
7. Efficient utilization of forest produces by introducing modern techniques and maximum substitution of wood.
8. Ensuring massive peoples movement by creating awareness and involvement of women for achieving these objects and to minimize the dependency on existing forests.
9. The basic emphasis of the policy is on the management of existing forests and forest lands by protecting and increasing their productivity and conservation of total biological diversity by strengthening and improving network of national parks, sanctuaries, biosphere reserves and other protected areas.

The objects of 1988 forest policy are as follows:

1. Restrictions on schemes and projects which interfere with the forest that cover steep slopes, catchment of rivers, lakes and reservoirs.
2. No working of forests without approval of management plans by the Central Government.
3. Exotic species are not to be introduced without long term scientific trails.
4. The rights and concessions including grazing be regulated by carrying capacity of the forests.
5. The rights and concessions for forest produce of the tribal should be protected and their domestic needs for fuel, fodder, non wood forest produce and small timber for construction should be provided on priority.
6. Forest management plans to take special care about wildlife conservation.
7. Effective action to prevent encroachment on forest land the existing encroachments should not be regularized.
8. Forest based industries should raise their raw material needed by them, making arrangement from private cultivators without depending on forests.

9. Survey of forest resources shall be completed on scientific lines for updating information.

9.1.3: National forestry action programme:

Government of India formulated National Forestry Action Plan in order to reverse the process of degradation of forests and for sustainable development of forests. It is a compressive strategic plan to address major problems of the forestry sector. The major thrust of National Forestry Action Programme to enhance the contribution of forestry and tree resources for ecological stability and people centered development through qualitative and quantitative improvement in forest resources.

The identified issues in forestry sector:

The aim of the National Forestry Action Programme is to evolve issue based programme on the lines of provisions of National Forestry Policy 1988. It is to integrate forestry development programme in the country within the frame work of National Five Years Plans. Under National Forestry Action Programme five inter-related basic issues have been identified and these are the basis of the following programme structure.

The programme targets the rehabilitation and increase in productivity of degraded forests and enhance in the areas of forest and tree cover to the extent of 33% of the total area of the country within 20 years. The five inter related issues identified and to be addressed in the programme are-

1. Protect existing forest resources.
2. Improve forest productivity.
3. Reduce total demand.
4. Strength policy and institutional frame work.
5. Expand forest area.

The basic objectives of National Forestry Action Programme are as follows:

1. To achieve sustainability of the forest, productivity of forest plantations to be enhanced at least 3 to 5 cubic meter per ha., per annum, by regeneration and enrichment plantations.
2. Improvement of hygiene of the forest through perpetual silviculture practices.

3. Efforts are to be made to bring 1/3rd geographical area of the country under forests and tree cover by plantations on all category of waste lands on farm lands (Agro-forestry).
4. Expansion of protected area network and maintenance of biodiversity conservation.
5. Non forest waste lands to be planted with mostly fuel wood species as 70% of wood produced from the forest is used as fuel wood. The species of industrial wood and pulp wood may be increased in farm forestry.
6. Peoples' participation in protection and development of degraded forests and fringe forests to be strengthened.
7. Non-wood forest species to be developed and value addition may be promoted at village level.
8. Regulation of grazing in forest as per the carrying capacity and silvicultural needs.
9. Infrastructure for forest inventory, research and development to be strengthened. Human resource development should also be improved.
10. Investment for this sustainable development of forest should be rational and in proportionate to the total production.
11. Supreme Court rulings and other rules of the land should be scrupulously followed.

9.1.4: Hon'ble orders of Supreme Court of India:

Hon'ble Supreme Court passed an Order in Writ Petition (202 of 1995) in the matter of "Godavarman Thirumulpad V/s Union of India". The order speaks about the felling of trees in all forests is to remain suspended except in accordance with the working plans of the State Government, as approved by Central Government.

Hon'ble Supreme Court passed an Order on 22.09.2000 in Interlocutory Application No.424 saying that regeneration of forest should be commensurate with felling carried out under a working plan. To achieve this, it must be ensured that no felling be carried out without allocating necessary fund to regenerate the felled areas. In

the event of failure in regeneration or any shortfall in carrying out regeneration operation no further felling shall be undertaken until the failure/shortfall is made up.

Following the directions of Hon'ble Apex Court in their Order dated 22.09.2000 in IA No.424; a core group was constituted to decide the extent of felling. As per these Orders, fellings are to be carried out by the State Governments only after obtaining the permission from core group constituted by the Ministry of Environment and Forests, New Delhi, which is complied with by the Department.

9.1.5: Forest Rights Act, 2006:

After the enactment of this Act, the administration of forest will be greatly influenced, as this Act recognizes several individual as well as the community rights over the forest land and its produce. All the provisions of this Act will have to be taken into consideration while managing the forest.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 was passed by the Parliament of India and the assent to this Act was received from the President of India on 29th December 2006. The said Act was notified in the Gazette of India on 2nd January 2007. For implementation of the said Act, the Central Government notified the Rules for Recognition of Forest Rights on 1st January 2008. These Rules were further amended by the Central Government vide notification dated 6th September 2012.

In Pusad forest division the number of claims received were 119, and all 119 cases were accepted. Of this, 18 cases are of individual claims covering an area of 24.06 ha. and 81 claims are of community rights which cover an area of 19961.5 ha. The division is in the process of digitizing the polygons of the areas handed over to the villagers. There is a need to guide and train the villagers on how best to use the forest land to meet all their needs and keep them away from their dependency on the forests.

9.1.6: Biological Diversity Act, 2002:

This Act aims to provide for conservation of biological diversity and sustainable use of biological resources. These issues are reflected in various Working Circles and the prescriptions made thereunder.

India is a party to the United Nations Convention on Biological Diversity signed at Rio de Janeiro on the 5th day of June 1992. This Convention reaffirms the sovereign rights of the States over their biological resources. Therefore, legislation was enacted by the Indian Parliament in 2002 to give effect to the United Nations Convention.

This Act aims to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto. The State Government has established the State Biodiversity Board and this body looks into the various aspects of biodiversity conservation and benefit sharing, if any, arising out of the biodiversity.

In Pusad forest division, till March 2018, no Biodiversity Management Committees have been formed. There is a need to establish Village Biodiversity Management Committees at least in all the Gram Panchayats where JFM is being implemented.

9.1.7: National Wildlife Action Plan (2002-2016):

National Wildlife Action Plan was first adopted in 1983 and it had outlined the strategies and directions for action for wildlife conservation in the country. The action plan 1983 has been in force for a long time. In the changing scenario of the country some problems have become more acute and the new concerns have become apparent which forced a change in priorities. Increase in commercial use of natural resources, growth of human and live stock population and changes in consumption patterns are carrying greater demographic impacts. Therefore, biodiversity conservation has attained a focus of interest. The National Forest Policy was also formulated in 1988 in which priority was given to conservation; hence this new National Wildlife Action Plan was adopted.

Overview:

1. Wildlife includes all uncultivated flora and wild fauna of the nature, every species has right to live and every species must be protected.

2. Water, wilderness and wildlife are inseparably inter-linked owing to demographic, agriculture and industrial pressures. The wilderness areas which are richest repositories of wildlife and biodiversity have either shrunk or disappeared.
3. Effective ecosystem conservation is fundamental for long term ecological and economic stability. The natural process, forest and wildlife habitats recharge aquifers, maintain water regimes and moderate impact of floods and cyclones, thereby they ensure food security and regulate climate change. They also ensure a source of food, fodder; fuel and other products supplement the sustenance of local communities.
4. India is one of the 12 mega biodiversity countries of the world. Conservation of biodiversity is directly linked with conserving ecosystems and thus with the water and food security.
5. Planning commission has not considered the adverse ecological consequences of shrinkage and degradation of wildlife from the pressure of human and animal population and commercialization of the forests. The situation has resulted in alarming degradation of nation's natural heritage which consists of rivers, aquifers, forests, grass lands, mountains, waste lands, coastal and marine habitats, arid lands and deserts. This has adversely affected natural phenomenon such as breeding, ranging and migration of wildlife and geo morphological features.
6. The frequency and intensity of natural disasters, plummeting fertility late of our soils and accelerated degradation of our fresh water resources have further crippled the financial position of the nation. This situation has compelled to realign development priorities to take into account ecological imperatives including the protection of wildlife which sustain and enhance natural habitats for their survival.
7. The rural development schemes for forest dwellers and other wilderness regions have suffered both from inadequate recourses as well as in appropriate

measures. It has failed to address their very dependence upon natural biomass resources as well as shrinking and degrading resources base. The productivity in agriculture has also declined due to lack of proper support, causing impoverishment and enhanced pressure on natural resources, which resulted in greater pressure on the biomass of our forest in turn leading to wide spread alienation of people from the goals of nature conservation efforts.

8. The developmental projects such as hydroelectric dams, mines, etc. compounded the problems of wildlife conservation.
9. The habitat loss has been compounded by illegal trade of wild animals and its products for their lucrative prices in the international market.

POLICY IMPERATIVES:

Ecological security:

In order to maintain and protect the long term ecological security of India, the national development agenda must identify the impact of natural ecosystems from over exploitation, contamination and degradation. Moreover, to maintain long term ecological security short term economic gains must not be permitted to undermine the ecological security.

Priority to conservation:

Priority must be assigned both at the central and the state level for conservation. The integration of conservation must be ensured in all developmental programmes evolving proper funding mechanism, enhancement of financial allocation and provision of adequate personnel with requisite experts in order to arrest further degradation and restore wildlife and its habitats.

National land use policy:

The Non Wood Forest Produce cannot be implemented in isolation, restricted to protected area as wildlife is not restricted to National Park and Sanctuaries. Areas outside protected area network are often formed vital ecological corridor and these must be protected to prevent isolation of fragments of biodiversity. The policy of land and water use will lead to accept the imperative of strictly protecting ecologically feigned habitats as well as regulating use elsewhere.

Primacy for water and sustenance:

The water resource must be recognized as prime product of our forest and these forests must be managed to protect and optimize the hydrological systems. The National Forest Policy 1988 clearly emphasizes conservation of our natural heritage in the form of natural forest, flora and fauna. A critical imperative also to recognize forest, water, land and other natural habitats as a source of survival of millions of people.

***In Situ* and *Ex-Situ* Conservation:**

Emphasis must be accorded to *in situ* conservation, the sheer anchor of wildlife conservation. *Ex-situ* measures in zoological parks and gene banks may supplement these objectives without depleting scarce wild resources.

People's support for wildlife:

The local communities traditionally depend upon natural biomass and they have first lien on such resources. These benefits are subjected to assumption of basic responsibility to protect and conserve these resources. The conservation programmes must attain to reconcile livelihood security with wildlife protection through creative zonation and by adding new protected areas in consultation with the local people such as an inviolative core, conservation buffer, community buffer and multiple use area.

Man - animal conflict:

This is the outcome of shrinkage, fragmentation and degradation of habitats which has caused destruction of wildlife and generated animosity against wild animals and protected areas which is a crucial management issue that needs to be addressed by innovative approaches.

Strategy for action:

Adopting and implementing strategies and the needs out lined above will require action for covering the following parameters.

1. Strengthen and enhancing the protected area network.
2. Effective management of protected area.
3. Conservation of wild and endangered species and their habitats.
4. Restoration of degraded habitats outside protected areas.

5. Control over poaching, taxidermy and illegal trade in wild animal and plant species.
6. Research and monitoring.
7. Human Resource Development and personnel planning.
8. Encouragement of people participation in wildlife conservation.
9. Conservation awareness and education.
10. Wildlife tourism.
11. Domestic legislation and international convention.
12. Enhancing financial allocation for ensuring fund flow to the wildlife sector.
13. Integration of national wildlife action plan with other sectoral programmes.

9.2: STATUS OF APPROVED WORKING PLAN AND COMPLIANCE:

The previous working plan for the division was for the period from 2008-09 to 2017-18. The sanctioned working plan was implemented but all due coupes could not be worked owing to paucity of funds, restrictions of eco-sensitive zone of Painganga wildlife sanctuary and Isapur wildlife sanctuary etc.

9.3: NUMBER OF FOREST OFFENCES:

The forest offences that were registered during the plan period are given below **(Appendix-XVIII)**.

Table No.9.1: Offence cases registered

Year	Fire	Grazing	Illicit felling	Others	Total
2008-2009	12	11	746	114	883
2009-2010	9	7	567	79	662
2010-2011	7	1	890	93	991
2011-2012	64	0	773	9	846
2012-2013	15	0	675	22	712
2013-2014	20	8	593	39	660
2014-2015	12	6	743	46	807
2015-2016	41	9	654	60	764
2016-2017	42	9	778	41	870
2017-2018	74	3	727	3	807
Total	296	54	7146	506	8002

9.4: STATUS OF RESEARCH AND DEVELOPMENT:

There is very limited research and development at the divisional level. At present there is no experimental or sample plot within Pusad forest division.

9.5: HUMAN RESOURCE CAPACITY BUILDING EFFORTS:

The forest staff is the backbone of the department. Frequent trainings and exposure to all levels of field staff is necessary. In recent times Forest Department is making huge strides in the field of Information technology. Hence, all officers and field level staff need to be adept in using the modern technology.

For officers at the DCF, ACF and RFO level various trainings as capacity building measures are being taken up by the department. Leading institutions like Forest Research Institute, Forest Survey of India and Wildlife Institute of India provide trainings to the officers in forestry and wildlife related developments. Other institutions across India are roped in to provide training and exposure in various fields related to forestry and climate change.

For training Foresters and Forest Guards, various state training institutes and Rangers' College are utilized. Apart from regular training the field and technical staff are trained in developments in remote sensing and GIS and IT related fields. Technical staffs like Ranger Surveyors, Surveyors are also provided with regular trainings to update their skills in different land management software such as Geo media professional.

Field staff has been provided with Personal Digital Assistant (PDA) for various field activities like plantation, offence cases, fire, encroachment, grazing, boundary demarcation etc. Various apps have been developed by the IT cell of the forest department which is being used by the frontline staff.

9.6: FOREST RESOURCE ACCOUNTING:

The forest of Pusad division is tropical dry, deciduous forest dominated by Teak distributed throughout the forest along with its natural associates like Dhawda, Ain, Lendia, Tiwas, Tendu, Behada, Salai, Bija, etc. The Teak is of mostly coppice origin. There are around 100 varieties of timber species exist in this forest and all of them may not be economically profitable. An attempt has been made here to calculate the total capital

value of the forest. The capital value has been calculated for various working circles as the stocking position is different in various working circles.

Table No.9.2: Capital value of the forests of Pusad forest division

Sr. No.	Working Circle	Value of forest (Rs.in Lakh)
1.	Selection-cum-Improvement Working Circle	241397.27
2.	Catchment Area Treatment Working Circle	70610.19
3.	Afforestation Working Circle	1698.31
4.	Fodder Improvement Working Circle	1916.51
	Total :	315622.00

9.7: BUDGETARY ALLOCATIONS TO THE FORESTRY SECTOR:

Non Plan/Plan Schemes: Works prescribed by the Working Plan are done through the funds of plan and non Plan. They are mainly required for felling of coupes and subsequent silvicultural operations and operations to secure adequate natural regeneration.

FDA: Works like Entry Point Activity, creation and maintenance of plantations and soil and moisture conservation works etc. will be done through this funding source.

EGS/MREGS: Works like fire protection, soil and moisture conservation works and eradication of Lantana will be done through this source.

Jalayukth Shivar and DRDA: Soil and moisture conservation works are done through this funding source.

Table No. 9.3: Statement showing revenue and expenditure

Sr. No.	Year	Revenue (Rs. In lakhs)	Expenditure (Rs. In lakhs)
1	2008-2009	202.49	189.53
2	2009-2010	200.27	205.04
3	2010-2011	380.35	514.27
4	2011-2012	251.32	404.51
5	2012-2013	244.29	379.78
6	2013-2014	76.53	1280.12
7	2014-2015	95.40	1327.55
8	2015-2016	78.57	1693.48
9	2016-2017	160.60	2021.38
10	2017-2018	312.23	1639.39
	Total	2002.05	9655.04

The department has an independent evaluation cell headed by an officer of the rank of CCF at the head office. Annual evaluation reports on various activities of the department including plantations, soil and moisture conservation works, civil works, nurseries, etc. The evaluation is guided by the evaluation code.

9.8: EXISTENCE OF MONITORING, ASSESSMENT AND REPORTING MECHANISM:

Monitoring and assessment is done at RFO, ACF, DyCF, CCF (T) and DyCF and CCF working plan levels as per GR No. Sankirna-2011/F.No.289/F-7, Dt.29/09/2011. Monitoring and assessment is also being done online for many of the activities. New technological interventions are being used for monitoring, assessment and reporting.

9.9: PUBLIC AWARENESS AND EDUCATION:

Public awareness is created by the territorial division as well as social forestry wing of the department. Activities such as tree plantation programmes, wildlife week, world forestry day and various other activities are used to reach the public. In recent times Forest Department has exclusive publicity and information officer who crates public awareness through print, digital and social media.

Activities such as van mahotsav, wildlife week, green army, eco-clubs educate lots of students, teachers and public about forestry, wildlife and conservation.

9.10: ADEQUATE MANPOWER IN FOREST DIVISION:

The headquarters of Pusad forest division is at Pusad. There is no Government accommodation for the office of Deputy Conservator of Forests. The Deputy Conservator of Forests is the head of the office. The administrative setup of the division is as under.

Table No. 9.4: Details of staff in Pusad forest division

Sr.No.	Name of Post	No. of Post/posts				
		Sanc.	Perm.	Temp.	Filled	Vacant
Class – I						
1	Deputy Conservator	1	1	0	1	0
2	Asst. Conservator	4	3	1	3	1
	Total – I	5	4	1	4	1
Class – II						
1	Range Forest Officer	12	8	4	9	3
2	Office Superintendent	1	0	1	1	0
	Total – II	13	8	5	10	3

Sr.No.	Name of Post	No. of Post/posts				
		Sanc.	Perm.	Temp.	Filled	Vacant
Class – III						
1	Forester	53	42	11	46	7
2	Forest Guard	157	114	43	150	7
3	Chief Accountant	1	1	0	1	0
4	Accountant	12	10	2	11	1
5	Clerk	16	15	1	14	2
6	Surveyor	2	2	0	2	0
7	Jeep Driver	4	4	0	4	0
8	Hatyari Police	1	1	0	1	0
9	Truck Driver	1	1	0	1	0
10	Tractor Driver	2	1	1	2	0
	Total – III	249	191	58	232	17
Class – IV						
1	Naik	1	1	0	1	0
2	Daftari	1	1	0	1	0
3	Peon	5	3	2	5	0
4	Mali	1	1	0	1	0
5	Watchman	4	3	1	3	1
6	Choukidar	1	1	0	1	0
7	Tractor Cleaner	1	0	1	1	0
8	Truck Cleaner	1	1	0	1	0
9	Vanmajur Male-47, Female-3	63	63	0	63	0
	Total – IV	78	74	4	77	1
	Grand Total	345	277	68	323	22

9.10.1: Labour supply: In Pusad forest division there are no major industries. Labourers mostly depend upon agriculture, forest and developmental works taken up by the other departments. Labour availability is not adequate for the forestry operations in this division. During rainy season labour supply becomes very scarce due to agriculture works. The main labour forces constituted in the area belong to the caste of Aandh, Gond, Pardhan and Banjara. Large number of vanmajoors have been regularized in the recent past. They execute watch and ward operation of the plantations and assist in patrolling of forest area along with regular staff.

9.10.2: Accommodation: The staff sanctioned for Pusad forest division is of 345. The required and available accommodations as per Government norms are as under.

Table No. 9.5: Accommodations available and required

Sr. No.	Designation	No. of Post	Available accommodation	Requirement of accommodation
1	D. C.F.	1	1	0
2	A.C.F	4	3	1
3	R.F.O.	12	9	3
4	Office Superintendent	1	1	0
5	Forester	53	46	7
6	Forest Guard	157	150	7
7	Chief Accountant	1	1	0
8	Accountant	12	11	1
9	Clerk	16	14	2
10	Surveyor	2	2	0
11	Jeep Driver	4	4	0
12	Police Hatyari	1	1	0
13	Truck Driver	1	1	0
14	Tractor Driver	2	2	0
15	Naik	1	1	0
16	Daftari	1	1	0
17	Peon	5	5	0
18	Mali	1	1	0
19	Watchman	4	3	1
20	Choukidar	1	1	0
21	Tractor Cleaner	1	1	0
22	Truck Cleaner	1	1	0
23	Vanmajur	63	63	0
	Total	345	323	22

9.10.3: Rest Houses: In Pusad forest division there are 2 Forest Rest Houses located at Singad and Marwadi. In addition to these forest rest houses, there are 19 inspection huts and labour sheds. Owing to lack of proper maintenance these buildings are not utilized to fullest extent.

9.10.4: Forest communication: All the range headquarters are very well connected with divisional headquarter at Pusad by all weather roads mostly of tar roads. The beat and round headquarters are connected with range headquarters by metal road or fair weather roads. The area of region is fairly connected with state and district services. Telephone communication and the computers are provided to all ranges. All field staff upto the level of RFOs are provided with Personal Digital Assistant (PDA) for better communication and reporting mechanism.

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CHAPTER – 10

FIVE YEAR PLANS

10.1: Forest was a subject of state list till 42nd amendment to the Constitution of India in 1976. State used to look after the protection, development and management of all the forest resources and generate revenue to its exchequer. Forest was managed even before independence on scientific lines in consonance with the prepared Working Plans. The emphasis before independence was on improvement of forest and exploitation of matured and valuable timber species. The ex-proprietary forest was also brought under the purview of the management after independence. Wildlife was treated as a source of recreation. Till late 70's of last century, no plan funds were allocated to the forest sector. In this area, forest was very dense and was utilized for meeting the demands of the local people for forest produce. In this area, silvicultural operations were given priority and protection and fire protection was very much emphasized. With the introduction of plan, lots of developmental activities have been taken up. Forestry sector remained as revenue generating sector and very little amount through non plan expenditure was incurred on forestry sector.

10.1.1: 1st five year plan (1951-56):

First Five Year Plan aimed at rehabilitation of degraded forests, introduction of economic species, survey and demarcation of the forest area. During this period Pusad forest division was a part of Yavatmal forest division and some of the forests remained as ex-proprietary forests of this area. The impact of the First Five Year Plan is not noticeable, as the flow of funds was never made available to this tract for requisite achievement of management prescribed in the Working Plan. During this period forest was managed as per the Working Plan of Robinson.

10.1.2: 2nd five year plan (1957-60):

The Second Five Year Plan also emphasized rehabilitation of degraded forest, introduction of economic species, survey and demarcation. During Second Five Year Plan Thosre's Plan was in progress. During this period systematic management of the forest

was introduced. Silvicultural operations were given main importance in forest management to rejuvenate the forests. Plan funds were not allotted for the operations of forest management. Some of the forest lands were allotted to local villagers to raise agri-silvi plantations.

10.1.3: 3rd five year plan (1961-66):

Third Five Year Plan emphasized on increasing the productivity of the forest by taking up plantations of fast growing species. Scientific assessment, modern logging methods for extraction of timber were utilised. Forest land was allowed to be given to villagers for cultivation. During this period lots of land have been allocated for agricultural purposes. However, as the population was low there was no major impact of disforestation.

Agri-silvi plantations were continued during this period also. During this period also Thosre's plan was under implementation. Plan funds were not allotted to any operation of forest management. The plantations raised during this period under non plan funds. During this period the old Yavatmal division was bifurcated into East and West Yavatmal division.

10.1.4: Post 3rd five year plan (1966 to 1969):

Thosre's plan was under implementation. In this area, there was severe drought condition and the local people were reeling under deep poverty as agricultural crops had completely failed which resulted in lack of employment to agricultural labourers. The main thrust of the Government was to provide work and civil amenities to the people. Foresters were compelled to follow the policies of the Government to provide employment to the people in forestry operations.

10.1.5: 4th five year plan (1969 - 1974):

This five year plan aimed at increase in productivity of the forest by introducing fast growing species in plantations, assessment of forest on scientific lines and modernizing logging operations. During this period, administration of forest villages was brought under the Revenue department. New approach in the field of forestry sector emerged in the form of timber board to divert revenue for the development of forest.

The Forest Development Board was formed in 1969 and converted into Forest Development Corporation in 1974. Many successful plantations were raised during this period and no direct funding was made available from the plan component.

10.1.6: 5th five year plan (1974 - 1979):

During this period Thosre's plan was continued up to middle of this plan and in the later period Pal's plan was under implementation. The forestry sector in this five year plan aimed at large scale plantation, social forestry and forest conservation. Social forestry wing was established during this period to involve people to raise the plantation on the lands outside forest *i.e.* community lands, Government waste lands, etc. The State Government introduced Employment Guarantee Scheme (EGS) to provide employment to the local people by creating assets to the community. During this period many successful plantations were raised by the department. The scheme of general utility of timber was introduced.

10.1.7: Annual plans (1979 – 1980) and 6th five year plan (1980-1985):

During this period thrust was given to save natural forest by providing alternative sources of forest produce through social forestry activities. The decision for regularizing encroachment on forest land was taken from 1/4/1972 to 31/3/1978. This decision aggravated the problem of encroachment further and many forest dwellers resorted to encroachment keeping in mind that these encroachments would be regularized in future. Pal's working plan was under implementation during this period. Successful teak plantations have been raised in Marwadi block under the plan scheme of GUT (General Utilization of Timber). However, the budget allocation under plan scheme was meagre, not even 1 % of the total plan budget of the district. During this period Forest Conservation Act 1980 was enacted. The reorganization of forest divisions were effected as a result of which Pusad forest division was curved out from East and West Yavatmal divisions.

10.1.8: 7th five year plan (1985-1990):

During this period Pal's working plan was under implementation. The basic aim of 7th five year plan was forest conservation, massive afforestation and waste land

development. Massive afforestation was taken up under EGS scheme and various other plantations were taken up under district plan schemes. The infrastructural facilities like communication, transportations, buildings, etc. were improved. The forest management activities were disrupted as Government of India imposed ban on clear felling of naturally grown forest. The implementation of Forest Conservation Act 1980 gained momentum and the forest dwellers were of the opinion that the forest and the acts for conservation of forest were hindering the process of development in forest areas. Plan funds were allocated for the developmental activities under district plan scheme.

10.1.9: 8th five year plan (1992-1997):

This plan aimed at protection of forest against biotic interference, utilization of waste lands for forestry activities, creation of awareness among the people for forestry through JFM and conservation of biodiversity. World Bank project was implanted which helped in improving infrastructural facilities like communication, transportation, buildings, etc. and introduction of modern technique in forestry like root trainer nursery, clonal nurseries, germ plasm banks, etc. Various G.R.s were issued for implementation of JFM from time to time. During this period the impact of overall development in the forestry sector was noticed. District plan fund allocation was made available for the development of various activities like plantations, roads, buildings, etc. Under EGS lot of funds were made available for taking up plantations, soil and moisture conservation works. In the beginning of the plan no working plan was under implementation and subsequently Gupta's plan came into force during 1996-97.

10.1.10: 9th five year plan (1997-2002):

The aims of 8th five year plan were carried forward to 9th five year plan as far as forest sector is concerned. The State Government initiated different schemes for development of forestry sector in consonance with Central Government schemes. The period of World Bank project was completed during this period. The plantations of both teak and miscellaneous species were taken up under various schemes. The plan fund was received from district plan.

10.1.11: 10th five year plan (2002-2007):

During this period Gupta's plan had been under implementation and this expired during 2005-06. This five year plan gave thrust on implementation of JFM through Forest Development Agency, a Central Government aided project. In Gupta's plan lot of soil and moisture conservation works were prescribed and accordingly some of the works were taken up under various schemes. The flow of plan funds had come down drastically. Therefore, the developmental activities in forestry sector was less.

The national forestry action programme was formulated to establish linkage between national forest policy and national five year plan. In the past there was no comprehensive and constant programme structure for forestry. Every plan had its own programme structure hence it was difficult to get linkages and establish trends. The budget outlay for forestry sector was hardly 0.032 % of total outlay in 5th year plan and increased to 0.94 % in the 8th five year plan. The highest allocation to forestry sector was in 7th five year plan (1.09 %). Forestry sector is one of the most important sectors of the Government which provides tangible and intangible benefits to the community by conserving and maintaining biodiversity. Such an important sector needs sustainable development and this can not be achieved through meagre budget allocation to the forest sector, therefore the budget outlay for forests should be raised 4 to 5 %. Similarly, this forest also, the plan allocation must be in conformity with the national perspective to achieve the objectives of the nation as well as forests.

10.1.12: 11th five year plan (2007-2012):

The monitorable target of the 11th five year plan was to increase the forest cover by 5% of the total geographical area. This would require an additional cover of about 16 million ha. Out of this, 5 million ha could be brought under the tree cover within the recorded forest area while the rest would be added through agro forestry and social forestry. However, the policy target is to have 33% forest and tree cover which will require an additional coverage of about 10–11 million ha. This will have to be done mainly outside the recorded forest area. The target of 33% forest and tree cover reflects the tree component without accounting for other vibrant non-tree natural biomes like grasslands.

The amendment of the target of the 1952 policy, of one-third area under forests, to forest/tree cover resulted in a shift of focus from ecological habitat to tree cover. Further, recognition of biodiversity characteristics and ecological services rendered by habitat like grasslands, natural desert ecosystems, alpine, and riparian habitat suggests that several biomes, even if devoid of tree component, can be recognized as 'green cover' and accounted. Recognizing these facts, the following strategic principles will be adopted for dealing with the green cover. The policy objective of 33% tree/forest cover should be revisited for its definition on ecological considerations. The green cover should include the existing natural ecosystems within which the tree cover constitutes a sub-set. Enabling environment for social and participatory regimes should be the aim of Central efforts, as is being done through JFM mode under the National Afforestation Programme. Implementation of the Central programmes has met with difficulties on fund flow management at the State level. It is advisable to undertake activities in project mode with earmarked funding, as is done in the externally aided projects.

Ministry of Environment and Forests had an approved outlay of Rs. 10,000.00 crores for the 11th five year plan, during 2007-12. Annual plan 2007-08 had an approved outlay of Rs. 1,351.00 crores against which the actual utilization amounted to Rs. 1,349.73 crores. In 2008-09, an outlay of Rs. 1,500.00 crores was allocated, against which the actual utilization amounted to Rs. 1,483.02 crores. Annual plan 2009-10 had an approved outlay of Rs. 1,880.00 crores, reduced at RE stage to Rs. 1,650.00 crores under economy instructions, against which the actual utilization amounted to Rs. 1,630.69 crores. Annual plan 2010-11 had an approved outlay of Rs. 2,200.00 crores, against which the actual utilization amounted to Rs. 2,181.58 crores. In the last year of the 11th plan, the Annual plan 2011-12 had an approved outlay of Rs. 2,300.00 crores, against which the actual expenditure amounted to Rs. 1825.44 crores.

While the gaps are huge, potential for improvement of productivity exists. The status of green cover is an indicator of status of productivity of forests. The following strategies have been evolving in the sector for improving the status of green cover.

Participatory Forest Management or Joint Forest Management (JFM):

Initiated with the circular of the MoEF on 1st June 1990 on people's involvement in forest conservation and management, the JFM regime has evolved gradually and at present 106479 such committees (22 million participants) are functioning in 28 States covering 22.02 million ha of forests. This participatory regime is seen as a potential strength of forest management for the forest fringes. The challenge now is to effectively empower the local communities with appropriate rights and responsibilities, and ensure that substantial benefits from forest conservation accrue to them.

A similar approach has been attempted in wildlife management also. In Project Tiger, India, eco-development project was implemented during 1995-2005 under Global Environment Facility (GEF) with focus on village eco-development through optimum use of local resources and involvement of local people in conservation of protected areas. Integration of this approach to protected area management through shared decision-making and full integration of conservation and livelihoods across the landscape are yet to be realized. Also, the recognition of a large range and diversity of community traditions or new initiatives towards conservation is very weak.

The 1st five year plan, as far back as 1951, indicated the scope for establishment of village plantations. Subsequently, a series of externally aided social forestry projects during the 1980s and allocation of 25% of District Rural Development Agency funds under National Rural Employment Programme, Rural Landless Employment Guarantee Programme, and so on, for social afforestation provided impetus to social forestry. This provision was not pursued since the Eighth Plan. Regeneration of forests and growing of trees being a long-term activity, did not receive due focus in the rural development programmes. Even the Watershed Management Programme aims more at equitable sharing and caring of watershed benefits, and afforestation remains a latent component. The cost norms of these programmes are not able to support substantial afforestation activities requiring strong wage contribution.

Agro and Farm Forestry: The social forestry programmes also include extension and promotion of agro and farm forestry in the farm sector. The farmers of the States like

Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Karnataka, and Tamil Nadu have adopted agro forestry. However, the forward linkages with the user industry and facilitation by the State agencies have not existed. Thus, the sector suffers from problems of unorganized markets driven by middlemen, depriving the farmers of optimum prices for their produce.

Biodiversity: Habitat conversion or land use changes, land degradation, and pollution result in the decline of ecological goods and services needed for human welfare. The Biological Diversity Act, 2002 and Rules, 2004 provide for constitution of State Boards (SBBs) and Management Committees (BMCs) for conservation, documentation and sustainable utilization of biodiversity and for building up capacities of these bodies. Chronicling in the form of People's Biodiversity Registers will be the only way we can identify changes happening due to climate change. There is a need to develop appropriate methodology and models for conducting such an exercise. Documentation of traditional knowledge should also include adaptation of such knowledge in line with the present needs of conservation.

Conservation of natural resources and ecosystems: Inland aquatic systems (excluding paddy fields) cover 5.3% of the country's land area but harbour 15% and 20% of India's floral and faunal diversities, respectively. There are wide gaps in knowledge relating to hydrological parameters, ecosystem processes, and aquatic life forms in these systems. Information on the physico-chemical aspects of water quality in rivers and lakes has become available largely because of the support from the National River Conservation Directorate (NRCD) and the CPCB, but that on aspects such as area, depth, hydrology, and Environment and Climate Change 203 ecosystem processes (functions) is practically non-existent. The existing programmes on conservation accordingly need a revamp.

The Scheme on Conservation and Management of Mangroves, Coral Reefs, and Wetlands has been too small to make an impact on the conservation of these ecosystems. Mangroves and coral reefs are mainly found on government lands. Development of appropriate institutions to motivate people to co-operate in the conservation efforts of

these systems will be a priority area. More protected areas are needed for the conservation of coral reefs. Restoration and plantation programmes for mangroves are necessary to make these eco-systems function as effective barriers against invasion of land by sea. The existing programmes on wetlands, mangroves, and coral reefs will be extended to mountains, grasslands, and alpine ecosystems. Initiatives on conservation need to be more effectively integrated with development and poverty reduction. The principles of Community Reserves under the Wild Life (Protection) Act may be useful in such efforts. Long-term plans for conservation of such habitats will be important. Wetlands will be part of NLCP and the objectives will cover conservation of life forms apart from mitigating pollution and augmenting catchments. An information system will be set up for islands, coral reefs, mangroves, and wetlands by developing a consolidated and easily accessible database of all recorded species. Support activities will include participatory research for inventory and valuation of freshwater ecosystems, measures to tackle serious threats to them and ensure conservation, as also the livelihood security of dependent communities. With regard to linkage between biodiversity and climate change, it should be recognized that biodiversity is an important tool to find solutions for tackling the impact of climate change on rural populations that depend on biomass for their livelihood. There is a need to recognize the potential of biodiversity to provide solutions for adaptation in the form of traditional crop varieties and donors for creating GMOs.

National agro biodiversity hotspot mapping and identification of important agro biodiversity landscapes will be undertaken for conservation with the participation of farmers and pastoralist groups. Regions with high concentration of genetic diversity on major and important crops may be declared as ‘gene sanctuaries’ for conservation and enrichment of diversity, involving communities through diversity based income generation and incentives. The regulatory mechanism for trials and adoption of GMOs will be required to be based on scientific, socio-economic, and EIA in the long as well as short term. The process of a regulatory regime, therefore, should be consultative and transparent, based on the prescribed scientific, logical, and progressive norms, taking into

account factors of human health and environmental health. Awareness generation will be important for ensuring effective outreach of the prescribed process for promotion of appropriately and adequately tested GMOs, mechanisms for enforcement of procedures, and processes for safeguarding ecological and health safety will be established.

10.1.13: 12th five year plan (2012-2017):

The 12th plan has the basic theme of "Faster, Sustainable, and more Inclusive Growth", and lays out major targets, key challenges to meet them, and the broad strategy that may be followed to achieve the stated objectives. Ministry of Environment and Forests has allocated an outlay of Rs. 17,874.00 crores, which works out to 0.41% of the plan allocation across various Ministries/Departments as against a share of 0.42% or Rs. 9231.00 crores in the 11th plan. At current prices, the enhancement in this Ministry's 12th plan outlay over the 11th plan outlay, however, works out to 109%.

12th plan has identified 13 Monitorable Socio-Economic targets for this Ministry, which has been taken up for regular monitoring of progress made by the Ministry. These targets are as follows:

Environment and Climate Change:

- Assess and remediate 12 identified contaminated sites (hazardous chemicals and wastes) with potential for ground water contamination by 2017.
- Clean 80 per cent of critically polluted stretches in rivers by 2017 and 100 per cent by 2020.
- States to meet National Ambient Air Quality Standards (NAAQS) in urban areas by 2017.
- To reduce emission intensity of Gross Domestic Product (GDP) in line with the target of 20 to 25 per cent reduction over 2005 levels by 2020.

Forests and Livelihood:

- Greening 5 million ha under GIM including 1.5 million ha of degraded lands, afforestation and eco-restoration of 0.9 million ha of ecologically sensitive areas.

- Technology-based monitoring of forest cover, biodiversity and growing stock including change-monitoring on periodical basis through dedicated satellite by 2017 and establishment of open web-based National Forestry and Environmental Information system for research and public accessibility by 2015.
- Engagement of Village Green Guards/Community Foresters for every Joint Forest Management (JFM) village by 2016.
- Establish forestry seed bank in forest circles and Model Nursery in every district with information on public portal by 2014.

Wildlife, Ecotourism and Animal Welfare:

- Twenty per cent of veterinary professionals in the country will be trained in treating wildlife.
- Integrated Ecotourism District Plans covering 10 per cent of all potential Protected Areas (PAs) by 2017.
- Promoting participation of private sector, civil societies, NGOs and philanthropists in animal welfare.

Ecosystem and Biodiversity:

- Restore 0.1 mha. of wetlands/inland lakes/water bodies by 2017.
- Mapping and preparation of biodiversity management plans for deserts (both cold and arid), coastal areas, important coral zones, wetlands, mangroves and so on to be completed by 2017.

Besides, 14 Goals have also been identified in the Plan Document, which would receive focus and special attention, *inter alia*, through the Annual Plans of the Ministry. These 14 Goals are set out below:

1. Epidemiological studies to assess improvement in health status due to better management of environment and ecology.
2. Promotion and adoption of cleaner technology, strengthening and initiation of reforms in regulations, policy making and enforcement institutions for environmental governance.

3. Move towards cumulative and strategic Environmental Impact Assessment (EIA).
4. Ensure ecological flows in all rivers by regulating abstractions so as to allow conservation of riverine ecosystems through developing a legal framework and management strategy for conservation of river basins.
5. Promotion of recycling and reuse of treated sewage in urban projects such as sanitation, landscaping, central air conditioning and so on.
6. Improve forest productivity, production and sustainable management of biodiversity (equity in access to benefit sharing with local people).
7. Restore and intensify forest-rangelands/ grazing-land management and establish community grazing land around forest fringe villages.
8. Build capacity of Village Forest Committees/ Joint Forest Management Committees (JFMCs) for management of forest resources including ecotourism.
9. Revive seed orchards and silviculture plots for various forest types of the country, as well as for enlisted species under Minor Forest Produce (MFP)/ Non Timber Forest Produce (NTFP), including genetic improvement, and establishment, of clonal orchards.
10. Reducing and managing human–wildlife conflict.
11. Commercialisation of permissible marine products rich in poly unsaturated fatty acids (PUFAs), vitamins and so on.
12. Promotion of ecotourism and participatory eco-development support livelihood of local population.
13. Develop national targets and indicators related to biodiversity and support actions to strengthen implementation of Biological Diversity Act, 2002 and ensure bio-safety for economic and social development of local communities.
14. Assess coastal biodiversity resources, ensure sustainable management, restoration of mangroves, coral reefs and wetlands and support livelihood.

The progress made under the various schemes implemented by the forest department under the 12th plan is given below.

Table No.10.1: Progress under various schemes in 12th five year plan

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
(2406 Forestry and wildlife) (State)						
1	Strengthening of check nakas	0.00	1.16	6.46	9.98	0.00
2	Strengthening of existing wireless network	0.00	6.8	0.00	3.52	0.00
3	Supply of cooking gas	3.33	3.74	12.31	22.64	34.20
4	Joint Forest management	14.17	14.32	10.00	14.00	16.00
	Total	17.50	26.02	28.77	50.14	50.20

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
Centrally sponsored scheme						
1	Modern Forest fire control and management (IFPC)	23.20	5.49	8.82	0.00	0.00
2	National Afforestation programme	77.07	0.00	0.00	0.00	0.00
	Total	100.27	5.49	8.82	0	0

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
Total (2406 Forestry and wildlife) (State)						
1	Supply of cooking gas	11.77	19.24	6.05	29.10	80.24
2	Vidarbh vikas	15.45	12.32	11.26	11.00	0.00
	Total	27.22	31.56	17.31	40.10	80.24

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
(2406 Forestry and wildlife) (State)						
1	Soil and moisture conservation on forests areas	0.00	28.02	0.00	0.00	11.95
2	Establishment of central nursery	0.00	0.00	0.00	0.00	10.65
3	Forest protection from fire	0.00	0.00	0.00	0.00	0.00
4	Reforestation of degraded forest (RDF)	37.17	68.28	55.30	24.35	48.59
5	Development of Forest Tourism	0.00	0.00	0.00	0.00	14.00
6	Compensation to the formers for losses caused by wildlife	0.00	0.00	0.00	5.00	0.00
	Total	37.17	96.30	55.30	29.35	85.19

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17

(2406 Forestry and wildlife) (State)						
1	Joint forest management	49.71	53.62	22.39	20.00	25.00
2	Plantation of general use	0.00	0.00	0.00	0.00	29.69
	Total	49.71	53.62	22.39	20.00	54.69

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
	(2406 Forestry and wildlife) (State)					
1	Construction of Van Talao	0.00	0.00	0.00	22.34	24.40
2	Massive Afforestation programme	20.05	12.00	8.82	8.54	81.15
3	Afforestation for soil conservation	0.00	0.00	0.00	3.07	0.00
	Total	20.05	12.00	8.82	33.95	105.55

Sr. No.	Name of scheme	Financial (Rs in lakhs)				
		12-13.	13-14	14-15	15-16	16-17
4406 Forestry and wildlife						
1	Forest Building (Repairs)	0.00	0.00	0.00	0.00	7.00
2	Soil and water conservation on forests areas	50.46	0.00	41.10	0.00	0.00
3	Forest roads & bridges (4406-4415)	0.00	0.00	0.00	20.63	26.91
4	Forest Protection from fire	0.00	0.00	0.00	0.00	0.00
5	Wildlife & nature conservation	0.00	0.00	26.42	0.00	0.00
6	Development of Forest Tourism	0.00	0.00	97.03	0.00	0.00
	Total	50.46	0.00	164.55	20.63	33.91

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CHAPTER – 11

PAST SYSTEMS OF MANAGEMENT

11.1: GENERAL HISTORY OF THE FORESTS:

11.1.1: Pusad forest division is a part of old forest of Berar. The information regarding forest of Berar is meagre though the forest of Berar was assigned to British in 1853. During this period the importance and value of the forest was not realised. The forest of Yavatmal district was in a very dilapidated condition as a result shifting cultivation, indiscriminate felling, heavy grazing and repeated fires. The tract of this forest was in under developed stage when it was assigned in 1853. The regular forest administration was initiated since 1865 by the appointment of Assistant Conservator of Forests for entire forest of Berar under the administrative control of Conservator of Forests, Central Provinces. In the first year, few forest blocks were selected and demarcated for reservation. With reservation felling being stopped and for the first time in 1871, forest rules were applied in this area to protect the forest from encroachment, illicit felling and unregularised grazing. In 1873 fire protection was introduced in the forest. In 1880 the whole position of the forest was reconsidered and all the waste lands outside the regular reserved blocks were examined. The elaborate classification and nomenclature was introduced and accordingly, waste lands were divided into A and B Class forest. Subsequently these were transferred to A Class and all these forests under A Class were set aside as prominent forest for the production of timber, fuel and fodder. The type of classification of the forest was as under.

1. A Class: Production of timber and fuel wood and closed for grazing.
2. B Class: Reserved for production of grass and closed for grazing.
3. C Class: Reserved for fire wood and for the production of timber and fuel wood.
4. Class-II: For free grazing lands.

This classification appears to have been completed in 1884 but areas so selected were not notified under the new Berar forest class till 1892. This classification worked very well until the year 1900, when after the famine a boom of lands for agriculture set

in. The cotton prices rose every year resulting in the rise of land prices. With the increase of land under cultivation, grazing area was curtailed while livestock increased until free grazing and class-I land could no longer sustain increasing pressure of grazing. The grazing incidences increased from 1.37 acre per head in 1896-97 to 0.74 acre in 1906-07. These circumstances therefore, compelled to revise the then existing classification. The revision of classification was completed in Pusad taluka by a Commission on whose recommendation, free grazing areas of Class-II was either transferred to A Class or given out for cultivation or formed to E Class (Village free grazing land not under the forest). A new class of forest, "Class D" was also formed and subsequently this was amalgamated in C Class in 1911. In rest of the Yavatmal District there were no free grazing areas *i.e.* Class-II existed and no regular enquiry was held. Land suitable for cultivation was disforested. Some of the waste lands were afforested and new A Class blocks were formed out of C Class on a small scale. However, no definite policy was laid down.

11.1.2: In 1913 the Chief Conservator of Forests inspected bulk of Yavatmal forests and had come to conclusion that A Class forest area of this tract was insufficient to supply the growing demands for timber by increasing and highly prosperous population. The C Class forest, on other hand contains large species of Teak, which could not be harvested safely unless they were transferred to A Class so that the stringent rules regarding felling and grazing could not be applied. Subsequently, a joint enquiry by a Revenue Officer and the Working Plan Officer was held and as a result of which about 1/3rd area of C Class was transferred to A Class. Disforestation and exchange of land have taken place subsequently with the main object of release or exchange the area suitable for cultivation, simplifying the boundary and removing inconvenience to villagers with A Class reserved forests.

11.1.3: For a long time even after assignment of district to the British, the ex-private forests were under the control of private owners, which were subjected to heavy felling and grazing resulting in gradual disappearance of useful tree growth. Out of these ex-proprietary forests some of the areas survived as good forests as these were situated in interior and inaccessible areas. When the Second World War began, demand for Teak, Salai and miscellaneous ballies increased, truck transportation started and heavy

exploitation was carried out without considering regeneration of the forests. Some of the ex-proprietary forests which survived even after heavy exploitation were subsequently examined and taken over by the Forest department for management.

11.2: PAST SYSTEMS OF MANAGEMENT AND THEIR RESULTS:

11.2.1: Pre-Working Plan period (1865 – 1914):

Prior to 1865 there was no regular forest management and administration in this area. The regular forest administration was initiated in Yavatmal District in 1865 when forest reserves were originally formed. The main object of the forest management was to restore the degraded ruined forests by giving them complete rest from felling and by protecting forest against fire and grazing. However, extraction of dead wood for meeting demands of sleepers on a small scale was carried out in Pathrot area and the exploitation was completely limited to dead wood. The areas were completely closed for grazing. The policy continued till 1890 when regular working under improvement felling was introduced in Marwadi block under the Painganga Working Plan. Under this plan working was restricted to extraction of saleable trees at irregular intervals. The harvesting consisted of little more than exploitation of saleable material and this lead to excessive fellings.

11.2.2: From 1900 to 1915:

By the year 1900 it was realized by the administration that A Class blocks were completely closed to felling without carrying any improvement works as a result grazing was run at a loss without improvement. A series of provisional Felling Scheme were drawn up for the blocks having demand for forest produce. The system was improvement felling under 20 years rotation in order to prepare the forest for working under coppice units standard. The working of the forest started in 1901 in Pathrot, and lateron, in Jamb, Umarda, Chausala, Dabhadi, Kharoni, Barad, Pokharni, Fiski, Gari and Lonbehel blocks. The system adopted was to mark trees to be retained and offer the rest of the crop for sale on cost to the public. In 1905 the system was extended to Marwadi block under the name of “coppice with standard”. Silviculture operations like cut back operations were undertaken on a considerable scale in two old felling series for a decade.

11.2.3: From 1905-06 to 1914-15:

By considering revenue and expenditure, the system was in force for 14 years and it was beneficial from the point of revenue and expenditure. During famine in 1919, due to scarcity of fodder some of the A Class forest was allowed to be opened for grazing and since then there has been a general practice of allowing cattle in A Class forest, which was gradually established.

The work was introduced with 3 working circles, one for teak areas, one for other species and one for scrub forests. The system adopted was retention of good teak trees and trees of reserved species and the rest of trees were permitted to be cut by the purchasers. The system is said to have worked very well in pre-plan period till the year 1900 and brought considerable revenue. But the system gradually became unworkable due to transfer of areas from C Class to A Class, made the felling series incomplete and heavy grazing destroyed the coppice in worked coupes. Moreover, there was no intensive supervision (as no Forest Guards then patrolled C Class) which resulted in heavy illicit felling coupled with bad coppicing.

11.2.4: Post Working Plan period (1915 – 2005):

The regular Working Plan to manage forests was started in 1915 based on the requirement of treatment to the forest, needs of the local population and policies, rules laid down by the Government from time to time.

11.2.5: Malcolm's Working Plan (1915-16 to 1937-38):

In 1914 it was decided to replace the previous schemes in order to have effective management by one Working Plan. The preparation of Working Plan was entrusted to Mr. C. A. Malcolm, IFS and his plan was introduced in 1915-16. These forests were managed as per the prescriptions of Malcolm Working Plan for 23 years. In this plan grazing was recognized for the most important demand on the forest and every effort was made to fulfill the grazing demand of the local cattle population. In this plan main emphasis was to divide the workable forest into 49 felling series and dividing each felling series into approximately 30 annual coupes. Several small under stocked areas were not

included in coupes but were left open for grazing in entire plan period in order to provide large area for grazing of excess cattle population. The cycle of closing to grazing and the sections of coupes were determined in time with a view to provide maximum grazing facilities to the local cattle. At the same time some of the blocks, where heavy grazing was noticed were closed for 5 to 6 years. In some blocks large under stocked areas were developed into additional coupes, generally large in size than the workable coupes and brought under periodical closures as in case of workable coupes. Cut back operations after main felling was prescribed. Cleaning and thinning were also recommended in the Working Plan but no regular system was prescribed. The method of exploitation to mark the trees for retention and then the coupes were open to purchasers and allowed them to fell any unmarked tree within the coupe. Cut back operations were carried out in the area. As the system had inherent disadvantages, it was gradually replaced by departmental felling which eventually included cut back operations. Under the previous system some coupes were marked, felled by the purchasers, coupled with poor and lack of supervision of the department lead to deterioration of the crop. Practically some of the areas were not worked by the purchasers. The progress of cultivation became rapid, resulting in increased demand. Heavy exploitation was organized after the 1st World War until 1929. In every felling series the demand was full and made it possible to carry out the thinning and cleaning especially in better teak areas. These fellings resulted in replacing all over matured and malformed crop with a new well grown even aged forest in well-stocked areas. However, in poorly stocked open grassy areas, they caused lots of damage which resulted in slow recovery. Moreover, as a result of these heavy fellings, forests were over exploited and crop in most of the better quality areas turned young to middle age.

11.2.6: Robinson's Working Plan (1938-39 to 1955-56):

Shri Malcolm's Plan was revised by Shri Robinson which came into force in 1938-39. Shri Robinson prescribed management of the forests keeping in view firstly the interest of local population and secondly the interest of general living. The general objects of management proposed by Shri Robinson are as under.

(1) To obtain maximum possible, sustainable annual out turn of forest produce mostly in demand by the local people, mostly timber, fuel wood, grass, bamboo and other minor forest produce.

(2) To meet the demand for grazing for local cattle population.

(3) To maximize the revenue in consideration with the above aims.

All A Class forests have been worked according to its prescription under this plan. A Class forests were categorized into 3 main types namely (1) Good quality teak forests, (2) Medium quality teak forests, (3) Poor quality teak and mixed forests and these were allotted to 3 Working Circles namely, Painganga High Forest Working Circle, General High Forest Working Circle and Coppice Working Circle respectively. The fourth Working Circle namely Miscellaneous Working Circle in which mostly under stocked areas were included, out of which 12.4 Sq. mile area was allowed for pasture improvement, 8.5 Sq. miles for fodder reserves and 7.6 Sq. miles of Tiwsala reserve which was kept for Agro Silviculture Plantations. The remaining 13.4 Sq. mile area consisted of small blocks. Besides these categories 3 overlapping working circles were also formed (1) Bamboo Overlapping Working Circle, (2) Teak Plantation Overlapping Working Circle, (3) Bamboo Plantation Overlapping Working Circle. The brief prescription of the plan and the results of working are given below.

(1) Painganga High Forest Working Circle:

This working circle constituted the best quality teak forests of the division found along the river Painganga. The site quality is mostly of III with some patches of site quality II and also site quality IVa and IVb which occur in the patches. One felling series was found in the entire working circle. The main object of management was to convert the area into even aged crop in 80 years. The method of treatment prescribed was clear felling or concentrated and regeneration felling, supplemented by artificial regeneration in under stocked areas. Periodic block-I comprised of high proportion of matured trees. The area was divided into 20 annual coupes referred as equi-productive annual coupes. The regenerated coupe was to be worked annually.

The inspection reports of coupe No. I to coupe No.XVII worked under these prescriptions revealed that the areas have failed to regenerate satisfactorily either artificially or naturally but most of the regeneration was from coppice origin. The crop in the coupe No. I to IV, attained a height of 40 feet and it has started seeding profusely, from those the new crop would not have the original quality. Planting done over small areas in Comptt. No. 603 and 606 before introduction of the plan gave good results in artificial generation but after introduction of the plan the worked areas lacked inadequate seeding regeneration of advance growth. The teak plantations raised in the past were now taken in coupe No.XVII, which indicates that successful plantations cannot be raised in these areas with ploughing.

Results: The areas failed to regenerate by natural regeneration and most of the forest crop was found to be of coppice origin. The prescription to some extent was that, no regard was paid to future yield. Prescription of heavy thinning and selection felling in all the remaining areas including the areas fit for PB-II lead to over exploitation and depletion of higher girth classes especially during the war years.

(2) General High Forest Working Circle:

Medium quality teak forest of sufficient extent with coupe group together were conveniently brought under this working circle. General site quality was of IVa and IVb. The crop present in the forest area was young to middle aged. The percentage of teak was generally high, sometimes upto 100% and seldom below 40%. Regeneration of teak was generally, satisfactory and in many areas with little or no regeneration also occurred. Mostly teak as principal species in the crop associated with its natural associates was found. The method of treatment adopted was found in high forest system but forest was very irregular and the silvicultural system prescribed was conversion uniform. The conversion period prescribed was 60 years by clear felling or regeneration fellings supplemented by artificial regeneration over refractory areas. The compartments which were silviculturally most suitable for conversion have been placed in the periodic block-I. Periodic block-I included roughly 1/3rd of the workable area and it was divided into approximately 20 equi-productive annual coupes. Rest of the areas *i.e.* areas under

period block-II and period block-III were unallotted and work to be done over on a 20 year cycle, wherein heavy thinning and selection fellings were to be carried out. The tending operations in regenerated areas of the periodic block-I were to be carried out annually as long as those operations were necessary. The areas allotted to this working circle were more or less similar or slightly better than the areas allotted to coppice origin working circle. The prescriptions in periodic block-I areas were as under.

1. All teak areas which were coupled with regeneration coupes will be clear felled and all teak advance growth in such areas cut back unless the advance growth attains to fit growth found in groups which will appear suitable to form crop. In such patches no cut back operations on account of malformed species was permitted and the retention of patches of regeneration could be considered for main felling.
2. There were small patches of Tiwas forest, which were prescribed for clear felling, but if they were young and promising, thinning and tending works were prescribed.
3. Some patches of teak forest before regeneration in which general thinning and tending for the prescribed area, the Conservator of Forests may order for clear felling in such areas. The well stocked mixed forests were allowed to be worked when there was sufficient demand. 25 trees were allowed to be retained as standard along with all young poles with girth up to 9 inches.
4. Dead and dying trees were allowed to be felled in under stocked areas. Moha and other fruit trees were to be retained for local people.
5. Unallotted area: Thinning in selection fellings was prescribed on a 20 year cycle after the inspection of the area. No regeneration operations or cut back operations were allowed in such unallotted area. Climber cutting was also prescribed. Selection felling among teak trees over 3 ft. girth was prescribed if the trees were available silviculturally.

Results: Heavy thinning in some areas and selection felling in other areas without any regard to yield resulted in disappearance higher girth classes. As a result of over

exploitation, under Malcolm's plan the area allotted to this working circle had very low percentage of higher girth classes. Areas coming under periodic block-I after coupe No.XV had young and middle aged crop. The prescription of the working circle almost reflected the working of CWR since artificial regeneration was not taken up as prescribed.

(3) Coppice Working Circle:

Major portion of workable forest areas of the division was allotted to this working circle. The areas included in this working circle were divided into 48 complete series and 8 half felling series, with each felling series having 20 coupes respectively. The silvicultural system followed was coppice with the reserve system. The main prescription were (1) No felling except removal of dead, dying trees under stocked areas, (2) The vegetation of the forests prominently of teak of site quality IVb and V with the small patches of site quality IVa and III. Some of the under stocked area in unworkable areas also occurred. Under reserve system differential treatment for different areas adopted as per the requirement of treatment to the crop.

(A) General:

(1) No fellings were allowed to be carried out except dead and dying trees in under stocked areas.

(2) Areas with steep slopes which may be subject to landslide were excluded from working.

(3) Strips of trees retained along the banks of important streams and exploited for teak, were allowed to be felled.

(4) Healthy Semal, Kulu and fruit tree such as Moha were to be reserved.

(5) Felling of Salai was not obligatory and wherever the interference of the Salai with other species was to be felled.

(B) Mixed forests:

(1) The treatment adopted in mixed forest about 25 of the best available trees per acre, appropriately distributed, were to be reserved as standard and also all the crop of upto 9 inches in girth were to be retained.

(2) In well stocked mixed forest the working was allowed if there was sufficient demand. Retention of 25 best available trees was also prescribed in such areas and number would change or vary if the climber intensity is more and the retention of the trees could be increased.

(3) In well stocked patches of young Tiwas and Dhawda thinning was prescribed.

(C) Teak forests:

(1) In better quality teak forest, crops of promising even aged poles of 2 feet in girth of teak and other viable species were to be reserved after thinning to form part of future crop.

(2) In other workable areas, around 20 well grown vigorous stems of Teak, Ain, Sivan, Behara, Tiwas and Dhawda of not more than 2 feet in girth could be retained per acre wherever available. Wherever the proportion of teak is very high, other species were given preference.

(3) Subsequent silvicultural operations like cut back, thinning for achieving proper girth wherever required were prescribed.

Results: The system proved to be very suitable to the forest included in this working circle except thinning which at times were quite heavy.

(4) Miscellaneous Working Circle:

In this working circle all under stocked areas were included. The areas included 15.5 sq. miles of pasture series, 8.5 sq. miles of Ramnas or fodder reserves and 7.6 sq. miles of Tiwsala reserved for agri-silvi plantation.

(1) Fodder Reserves or Ramnas: 8 blocks were permanently kept closed for grazing in order to meet demand of grass. They were very useful in meeting the demand of grass in Yavatmal town.

(2) 22 pasture series have been earmarked in the entire area. Each series was divided into groups of 4, 5 or 6 coupes which would be closed for grazing under rotation.

Results: Prescriptions had improved the quantity and quality of pasture to a great extent, however long periodic closure provided for improvement of pasture led to the deterioration of the tree growth in certain lightly grassed blocks due to repeated fires.

Tiwsala Reserves: This was a small reserve of 4807 acres in the then Kelapur range, which mainly consisted of unworkable, open mixed forest. At some places patches of workable mixed forest occurred but natural teak was totally absent. In this area agri-silvicultural operations were prescribed. Accordingly 1815 acres of land has been planted and these proved to be successful plantations. As there was a great demand for grass and moderate demand for grazing, the working in these reserves was completely in the hands of Divisional Forest Officer subjected approval of the Conservator of Forests if accepted the following restrictions.

(1) Not more than half of the area would be closed for grazing at one time.

(2) Thinning in areas under the orders of Conservator of Forests.

(5) Bamboo (Overlapping) Working Circle:

The working plan prescriptions were found to be suitable. All important bamboo bearing compartments were included in this working circle. 8 Felling Series were formed and each one further divided into 4 annual coupes. Harvesting of bamboo was carried out under standard prescriptions.

Results: The prescriptions were found to be suitable.

(6) Teak Plantation (Overlapping) Working Circle:

The areas from Painganga High Forest Working Circle and areas adjoining to it which were suitable for raising teak plantation, were allotted to this working circle. Around 40 acres were to be planted by every year after clear felling. The silviculture system followed in this working circle was clear felling followed by artificial regeneration of the teak. Cotton crops were also to be taken up in the first 2 years after taking up teak plantation, which covered the cost of teak plantation.

Results: The plantations proved to be quite successful.

(7) Bamboo Plantation (Overlapping) Working Circle:

The areas that were permanently closed for grazing were included in this working circle. *Dendrocalamus strictus* was the main species.

C Class Forest: These areas were not dealt in Malcolm's Plan. Robinson prescribed thinning to the congested crops wherever available. Accordingly, thinning operations were carried out.

Results: Heavy thinning was carried out in certain areas for supply of teak ballies during Second World War. Besides, absence of forest protection in C Class areas resulted in greater deterioration of these areas. Special works of improvement were undertaken.

Fire Protection: In these forests fire conservancy began in 1873 till 1911. A Class reserves were protected by means of exterior and interior fire lines with special fire patrolling during dry season. As the system was not exactly effective, in 1912 the method and principles of fire protection were modified.

(1) Abolition of fire patrols and rigid protection of all those coupes closed grazing after main felling.
(2) Early burning of grassy areas.
(3) Isolation of valuable forests for fire protection along with Painganga river.
(4) Permission to graze heavily along the fire lines.

In 1922 the provincial of rules for fire protection given M.P. Forest Manual were introduced.

Results: The system of modified fire protection methods worked very well except in Painganga strip and in the grassy areas. Extensive closures proved more harmful when compared to benefits in remote areas with the line grazing because the areas could not be successfully protected from fire due to their scattered occurrences, scarcity of labour and water supply.

Roads: During this period a fire system of certain roads have been constructed in larger reserves of the forests areas and in smaller reserves short length of road net work to connect the main district road system either directly or by village track.

Results: There was an extensive improvement in road communication within the forest areas to help the management of forest and extraction of forest produce.

Buildings: Suitable buildings or suitable quarters were provided to all the Range Officers at their respective headquarters, good forest rest houses were constructed at Singad, Marwadi, Bittergaon, Sondabhi, Kharabi, Korata, Chikhali, Hiwari, Pathrot.

Tanks and wells: Wells were constructed as per the need at few places.

Agri-silvicultural operations: The idea of raising forest species along with agricultural crop was first conceived in the year of 1900 and attempts were made in the year 1909. Accordingly, the seeds of forest species like Khair, Babul, Ain, Tiwas were sown alongwith the agricultural crops and these operations proved to be failure due to lack of supervision. Subsequently, raising of plantation has been attempted with species of Babul, Khair, Dhawda, Neem, Bija, Sisham, Sievan, Chandan, Semal. Some of these plantations were well established and became successful.

11.2.7: Thosre's Working Plan (1955-56 to 1970-71):

Robinson's Working Plan was revised by Shri Thosre which came into existence in the year 1955-56 from 1st July, 1956 and was in force upto 30th June, 1971 and the period was further extended upto 1975-76. The forests were managed as per the prescriptions of Thosre's Working Plan under the following working circles.

(1) Painganga Selection-cum-Improvement Working Circle.
(2) Coppice with Reserve Working Circle.
(3) Improvement Working Circle.
(4) Plantation Working Circle.
(5) Pasture Improvement Working Circle.
(6) Bamboo Overlapping Working Circle.
(7) Miscellaneous Working Circle.

A brief description and the results of working in each of the working circle of Thosre's Working Plan is given below.

(1) Painganga Selection-cum-Improvement Working Circle:

In this working circle the best quality teak forests occurring along the bank of Painganga river were included. Only one felling series with 2 cutting sections A and B were constituted. The cutting section A included 9875 acres of forests not worked under

Robinson's Plan. The crop included in this working circle was with site quality III, Painganga type forests, which is confined into narrow, elongated mainly as narrow strip along the Painganga river. Results of stock mapping indicated most of the teak forests are capable of growing sound teak trees upto 5' girth. The principal associates of teak are Ain, Dhawda, Kalam, Bel, Semal etc. Cutting section A divided was into 20 coupes on a 20 year felling cycle. The harvestable girth of teak was 135 cms at breast height over bark and the yield was regulated by area. The forests included in cutting section B was completely young crop and divided into 10 coupes and thinning on a 10 year cycle was prescribed. An area of 16.187 ha of teak plantation mixed with Semal and Siwan was prescribed on agro-silvi basis starting from coupe no.I of the cutting section B every year. Mechanical thinnings were prescribed in 5^{th} and 10^{th} year and subsequently light crown thinning was also prescribed on a 10 year cycle. In cutting section A regular thinning and tending operations were prescribed on the basis of 10 year cycle.

Results: Since the treatment adopted for the area included in this working circle was Selection-cum-Improvement, the question of sacrificing younger crop in section B did not arise. It was prescribed to remove 140 teak trees of above exploitable girth per year but due to improper execution of prescriptions it resulted in over exploitation at times. In the name of improvement marking the pre selection girth class trees were also marked for felling to a considerable extent. Teak plantations of 16.187 ha in each coupe were not taken up systematically which indicates that the prescriptions of the treatment were not followed scrupulously. It was also observed that timely thinning was not carried out resulting in the congestion of plantation.

(2) Coppice with Reserved Working Circle:

Major portion of workable forest area of the division was placed in this working circle, including the forests previously managed under General Teak High Forest Working Circle. The rotation period was fixed at 40 years. Under this working circle 68 felling series were formed and each felling series was divided into 40 equi-productive coupes. The coupes were worked through the contractor system except for coupes of ex Izara and C Class transferred to A Class, which were worked departmentally to meet the demand of

small timber and fuel wood for the surrounding population. Thinnings have been prescribed at 10th and 20th year after main felling. The system of treatment adopted was aimed trees that have attained maturity and the retention of which was no longer necessary on silvicultural grounds.

Results: The results proved to be quite successful because of the treatment of the crop included in this working circle. However, the under mentioned defects were noticed. The contention that these forests were capable of producing sound teak trees up to 60 cm in girth at 40 year rotation and then becoming unsound did not prove to be correct. The forest that was included in Kharabi, Korat, Chikhali, Sondabhi, Morchandi, Masalga, Bhansara felling series of this working circle were capable of producing sound teak trees up to 105 cm girth. The thinning carried out was defective as it was more of revenue oriented thinning rather than silvicultural thinning which resulted in over exploitation of the forests. In the prescriptions of subsequently silviculture operations, no cleaning was prescribed which led to heavy competition of coppice shoots and consequently congestion in the crop was noticed. The working plan prescribed that marking of the main felling coupes in Bhansara, Satara, Anjankhed, Kharabi should be done by the gazetted officer but this was never followed. The result was that the prescriptions had not been scrupulously followed.

(3) Improvement Working Circle:

In this working circle crooked, stunted, malformed and open teak forests situated in remote area were included. Low density, poor quality forests devoid of any regeneration due to heavy growth of thick grass especially in Kharabi and Jaorala plateaus with scattered patches of better density crop occurred along main nalas included in this working circle. The forests included in this area were largely uneven age of unsound and malformed stems with high percentage of teak. The felling cycle was fixed at 20 years.

Results: It was observed that, the prescriptions were not rigidly followed as a result of which over exploitation took place in the crop. Moreover, the size of annual coupe was approximately 400 ha which was very large to control and supervise by the staff.

(4) Plantation Working Circle:

This working circle includes old teak plantations in Tiwsala and Kinwat series and other suitable areas for raising teak, fuel and fodder plantations. The main aim behind the formation of the working circle was to plant under stocked and mixed forest areas situated in compact blocks of more than 100 acres and capable of growing quality III to IVa teak, by agri-silvi plantation and also growing better plantations of fuel and fodder as per the suitability of the site.

Results: The prescriptions in teak and mixed plantations raised during the period of the plan had shown wide variations in success. The factors, which were responsible for this, are soil conditions and lack of tending the crop after plantation. Only 135.415 ha of plantations had been taken up out of the proposed 530.500 ha area of plantation in this working circle.

(5) Pasture Improvement Working Circle:

In this working circle open or scrub forests classified as pasture lands according to classification made on functional basis have been included. These areas were not capable of producing either valuable timber or fuel and were subjected to intensive grazing. The main object of management of the forests included in this working circle was to provide grazing to the maximum, possible extent in consistence with the preservation and improvement of the pasture. Each pasture series was divided into 4 or multiples of 4 coupes and 1 out of every 4 coupes was to undergo 3 years monsoon closure continuously and then remain open to continuous grazing for 9 years. Operations aiming at improvement of pasture were to be carried out one year before closure. In these areas planting of better fodder species like Sheda, Paunya, Marvel was prescribed. Similarly, planting of fodder trees like Anjan, Kachnar, Bija etc. were prescribed in these coupes one year before closure.

Results: Effective implementation of the prescriptions made in the working circle could not be achieved as these pasture series were surrounded by cultivations, villages and closure became a difficult task. All these areas had been subjected to indiscriminate grazing and the object of forming the working circle was not achieved. Teak plantations

raised in Deulgaon and Rui pasture series had miserably failed as the prescriptions of raising teak plantations in pasture series as prescribed was not correct.

(6) Bamboo (Overlapping) Working Circle:

All important bamboo areas were included in this Bamboo Overlapping Working Circle. The entire area was divided into 11 felling series worked under 3 year cutting circle. Bamboo covered only a small area and they are generally of poor quality but of great local importance. Bamboo distribution generally confine to banks of nalas.

Results: The prescriptions were not systematically followed which resulted in malformed and congested crops. Out of prescribed area of 118.210 ha of bamboo plantation in this working circle only 122.33 ha had been taken up. It has been observed that almost all the bamboo plantations have been failed.

(7) Miscellaneous Working Circle:

All the grass birs, forest villages and few compartments, which have not been included in any working circle, were allotted to this working circle.

(a) Grass birs: There were 13 grass birs ramnas in the division and some of the grass birs had been fenced. Prescription of the working plan for the improvement of grass birs had been followed to some extent in Gahuli ramna. The other grass birs were located in Darwha range where there was no sufficient demand for grass.

(b) Forest villages: 25 forest villages were in the division. They were managed as per the instructions contained in para no.68 and 69 of the C.P. and Berar manual vide Government notification no.FLD-3269-221239-WI, dt.20.12.69. These forest villages had been deforested and they were under the management of the forest department as per the provisions of Maharashtra Land Revenue Code, 1966.

(c) Unallotted area: 6 compartments left unallotted in Thosre's plan. Stock position proved these areas have comparatively improved and the presence of matured and over matured trees is noticed.

11.2.8: Pal's Working Plan (1976-77 to 1991-92):

Thosre's working plan was revised by Shri B. C. Pal. As per the prescriptions of Pal's working plan, the forest area of Pusad forest division was divided into 8 working circles including 2 overlapping working circles.

(1) Coppice with Reserve (CWR) Working Circle.
(2) Selection-cum-Improvement (SCI) Working Circle.
(3) Teak Plantation Working Circle.
(4) Pasture Improvement Working Circle.
(5) Fodder Reserved Working Circle.
(6) Miscellaneous Working Circle.
(7) Bamboo (overlapping) Working Circle.

(1) Coppice with Reserve (CWR) Working Circle:

Major portion of forest areas of the region included in this working circle which is capable of producing small to medium size timber, poles and firewood. The site quality of the teak forest included in this working circle is poor *i.e.* IVa and IVb. The crop constitutes mostly teak as principal species, which represents young to middle age. The forest is mostly open, the entire area was divided into 25 felling series with 40 annual coupes of each felling series. The rotation for teak was fixed at 40 years and corresponding girth expected by this time was 85 cm. The treatment adopted in this working circle was reservation of 150 trees/ha along with sound fruit bearing trees and well grown advanced growth of teak and other species upto 40 cms. Clear felling to the tune of 10% of the coupe area or a minimum of 5 ha in well stocked with good site quality area for raising teak plantation was also prescribed. The prescriptions further emphasized that working in blank areas, nala banks, eroded and very steep slope areas of the forests was excluded from felling. Yield was regulated by area. For the purpose of treatment the area was divided into 4 categories *i.e.* (a) Protection area, (b) Young crop, (c) Areas fit for plantation and (d) Other areas. Under the system the regeneration cut back operations, after main felling and cleaning in the 6^{th} year of main felling were also prescribed. As per the working plan prescriptions, 1^{st} and 2^{nd} mechanical thinnings were to be carried out at

8th and 15th year of plantation respectively. Thereafter, silvicultural thinning (3rd and 4th thinnings) based on the rate of growth of the crop were to be carried out at 25th and 35th year of the plantation. Thinnings in other crop was also prescribed in the 21st year of main felling which were to be in the favour of teak.

Results: Since most of the area had been regularly managed under CWR system right from beginning of 1938-39 the prescriptions of Robinson's working plan resulted in reduction of coppice vigour. The stocking of teak had increased in the forests over the years owing to poor coppicing power of miscellaneous species. In addition, the soil had became highly compact due to adverse biotic factors, heavy grazing pressure, illicit felling, frequent fires due to which young natural regeneration of teak and its associates did not come up and died before getting established. The reduction of coppice shoots to 1 to 2 per stool as prescribed in the working plan had not been followed scrupulously resulting in a number of shoots getting established from the same stool. The resultant coppice crop was stunted, malformed and pollarded to a great extent, constituting high proportion of teak, up to 60% of the total stocking.

(2) Selection-cum-Improvement (SCI) Working Circle:

In this working circle best quality teak forests belonging to site quality III along the banks of river Painganga, managed under Painganga Selection-cum-Improvement Working Circle during the previous plan were included. These forests were also managed under Painganga High Forest Working Circle prior to Thosre's plan. At the beginning of the plan, the crop was uneven aged with inadequate regeneration. The principal species in this area was teak of site quality III and the area was mostly inaccessible and undulating and at places it was represented by ravines. The selection girth was fixed at 130 cm over bark and felling cycle was fixed at 20 years. Two felling series namely Painganga-I and Painganga-II were formed. The yield was to be regulated by area. 1/3rd of the total teak trees above selection girth were to be marked for felling and all miscellaneous trees above 135 cms girth except certain reserved species were to be marked for felling if those trees were available silviculturally. In the remaining crop light thinning was prescribed to

remove congestion in the crop. It was prescribed with the preparation of treatment map showing the following categories in the coupe -

(a) Protection area.

(b) Workable area.

(c) Areas for diffused plantation.

Diffused plantations were prescribed in patches not less than 0.5 ha as per the suitable crop site. Cut back operations in the next year of the main felling and cleaning in the 6th year were prescribed. Mechanical thinning was to be carried out in the teak plantation and thinning schedule was also prescribed in old teak plantation. The thinnings were suggested in favour of teak.

Results: Considerable changes in the crop were not noticed as the condition of crop remained more or less the same. The density of the crop varied from 0.5 to 0.8 and teak constituted main species of the crop. The crop was middle aged to mature and the regeneration of teak and other species was inadequate. Presently the area falls in Painganga Wildlife Sanctuary.

(3) Teak Plantation Working Circle:

The old teak plantations taken up in the past and the areas suitable for growing the plantations of teak and other miscellaneous species in future were included in this working circle. The basic object of management was to convert the existing inferior quality and less valuable mixed of good site quality into valuable and superior teak forests. The treatment prescribed in this working circle was clear felling followed by artificial regeneration. The site quality of the forests included in this working circle belonged to III and IV. The teak plantations raised in Robinson's plan had attained site quality III and were fully stocked whereas teak plantations raised during Thosre's plan showed variable success. The crop was young, miscellaneous species such as Sissoo, Semal, Siwan, Sisham and Eucalyptus found in strip teak plantation but the miscellaneous species had failed. The area included in this working circle for raising new plantations, had been divided into 2 felling series with 40 annual coupes whereas the area under old plantations was divided into 10 annual coupes. For effective treatment of this area, it was

divided into 2 categories as unworkable areas and workable areas. In this working circle subsidiary silvicultural operations like weedings, cleanings, casualty replacements were prescribed. Thinning cycle was prescribed as 8^{th} to 15^{th}, 25^{th}, 35^{th} and 45^{th} year of the plantation. First two thinnings were mechanical, whereas the thinnings at 25^{th}, 35^{th} and 45^{th} year of planting were silviculture thinnings.

Results: The prescriptions regarding thinning in old teak plantation areas were found to be satisfactory. The new plantations as per the prescriptions could not be raised with desired success as most of the new sites proposed for plantation were in riparian zones or in valley depression. Proper rab burning and stump uprooting had not been carried out at the time of planting, resulting in the formation of multiple coppice shoots and because of this the teak seedlings planted did not achieve desirable growth. Adequate number of miscellaneous species was also not maintained.

(4) Pasture Improvement Working Circle:

Pasture lands as per classification made on functional basis were included in this working circle. These forests were basically open stocked or scrub lands not viable to yield even small timber but conveniently situated for providing grazing lands to the cattle of adjoining villages. Most of the forest area managed under Pasture Improvement Working Circle of Thosre's plan was included in this area. Special objects of the management of the working circle was (1) to check soil erosion, (2) to maintain and improve the existing vegetative cover, (3) providing grazing to maximum possible extent in consistence with the above 2 objects. The forests were in general open and under stocked containing stunted and scattered trees of Salai, Palas, Dhawda, Hiwar, Ain, Lendia and usually thorny species like Khair, Acacia, Ber, Chilati, Barhati. Common grasses found in this area were Bhurbhushi, Kusal, Sheda etc. Method of treatment adopted for a management was controlled grazing, improvement of pastures by closing certain areas for grazing and allowing other areas open for grazing. Cattle unit prescribed was 0.40 ha. The total area was divided into 15 pasture series with 4 or multiples of 4 annual coupes in each series. One out of 4 coupes was to be closed for grazing for 3 years continuously and thereafter the coupe was to remain open for 9 years. No grass cutting was allowed in closed coupes

and the areas were to be protected from fires. Pasture watchers were recommended to protect the area. Introduction of superior fodder grasses, tree species, contour trenches along with soil and water conservation measures were also prescribed.

Results: The working plan prescriptions were not followed regularly. The practice of rotational grazing as prescribed could not be effected successfully in the field. In other areas heavy grazing without any improvement works coupled with the heavy biotic pressure resulted in further deterioration of the pasture areas.

(5) Fodder Reserved Working Circle:

It included the areas situated in the midst of the cultivations and which were capable of producing good fodder grasses locally called as Ramnas. Majority of the areas were managed under the same system of the previous working plan. These areas were situated in close proximity of towns and big villages where there was demand for fodder grasses. The basic objects of management prescribed were to improve the quality and quantity of fodder grasses by introducing better variety of grass species. The areas of this working circle were mostly devoid of tree growth and were scarcely wooded. The grasses situated in this area had comparatively less fodder value. The common grasses of this area were Kusal, Aristidia, Funuculenta and grasses like Sheada, Paunya were scarcely present. Treatments were prescribed to protect the areas from illicit grazing and frequent fires. All the Ramnas were to be fenced with wire fence or cattle proof trenches around these Kurans. They were to be permanently closed to grazing and the grasses were to be sold only on cutting basis after October, 31st. Gradually enumeration of unpalatable grasses were prescribed. All the areas were to be fire traced annually.

Results: Most of the Ramnas were worked and maintained as per the working plan prescriptions. The areas could not be closed effectively to cattle grazing since the majority of them were not wire fenced. The situation resulted in further deterioration of the soil. Local people did not respond properly towards the system of cutting and purchasing fodder to stall feed their cattle mainly due to availability of grasses in the forests adjoining to the villages. It had been observed few Ramnas were wire fenced and properly maintained like Belgaon Ramna near Singad had luxuriant growth of fodder

grasses. In most of the Ramnas plantations under different schemes had been taken up but most of these plantations were not successful.

(6) Miscellaneous Working Circe:

Poor and under stocked forests out of the Coppice With Reserve Working Circle, forests areas managed under Improvement Working Circle which did not show any sign of improvement of Thosre's plan and the areas cleared of vegetation growth handed over to other department had been included in this working circle. In general the areas were open with teak and its common associates such as Ain, Dhawda, Lendia, Tendu, Salai, Beheda. The method of treatment prescribed to manage these forests was to give complete rest to the forests for natural rejuvenation and otherwise were to be opened to grazing. Fire protection was to be carried out regularly.

Results: Heavy grazing resulted in compactness of soil with no sub soil moisture and natural regeneration could not establish due to these factors. The general improvement of the area was not possible without soil and moisture conservation methods. The areas were found to deteriorate further due to heavy biotic pressure and frequent fires.

(7) Bamboo (Overlapping) Working Circle:

It included forest areas having established bamboo in the areas of Kharabi, Bitergaon and Arni ranges. It overlapped Selection-cum-Improvement (SCI) Working Circle, Coppice with Reserved Working and Teak Plantation Working Circle. Patches of management were to meet local demand of bamboo to introduce scientific exploitation of bamboo in order to get maximum yield to increase bamboo area by raising bamboo plantations. *Dendrocalamous strictus* as main species in this area, which occurs as middle story confined to hilly slopes, shelter valleys and along banks of water sources. Method of treatment prescribed was a 3 year cutting cycle *i.e.* A, B and C. Three cutting series were formed with each series divided into 3 annual coupes. Bamboo plantations were prescribed in suitable areas along the nala banks. Strict grazing control and fire protections were also prescribed.

Results: The bamboo plantations undertaken in the past had not shown any desired success and almost failed to establish. They were affected by wild boar at many places

and no bamboo was harvested in the past few years. Stocking of natural bamboo in the forests is negligible.

(8) Wildlife (Overlapping) Working Circle:

It covers entire forest division. The special objects of the management were to ensure and maintain viable population of wildlife, to preserve for all times areas of such valuable importance as natural heritage for the benefit of wildlife and enjoyment of the people. The treatment prescribed for wildlife was to be supplement to the forest practices. Strict implementation of Wildlife Protection Act, 1972 was prescribed and natural habitats and restricted wildlife places were to be left undisturbed. Prescriptions emphasized digging of water holes, no felling in a radius of 100 mtrs from the perennial water holes, construction of nala bunds, arrangement of salt licks at suitable places and strict protection by way of continuous patrolling and by erecting watchtowers etc.

Results: All the prescriptions were hardly followed hence no significant improvement in wildlife management was noticed.

11.2.9: Gupta's working Plan (1996-97 to 2005-06):

Pal's Working Plan replaced by Gupta's Working Plan:

In this working plan the forest area of Pusad forest division divided into seven working circles with a view of the following general objects of management.

1. To improve the vegetal cover in both quality and quantity in degraded as well as under stocked areas of the forest besides suitable soil and moisture conservation measures.
2. Conversion of coppice forest with the reduced coppice vigor to high forest. To conserve and improve forest cover on steep slopes and catchments areas of various irrigation projects in order to check soil erosion and degradation of these areas and for retarding of siltation of reservoirs thereby mitigating soil erosion.
3. To meet the demands of local people for small timber, bamboo, fuel wood, fodder and the various non wood forest produce by increasing the stock of respective species.

4. To have the participation of the local people and the voluntary agencies in various forestry activities such as protection, development and other management aspects, etc. and to create awareness among them about the importance of forests. The various working circles in Gupta's Plans are as under.

    1. Conversion to High Forest Working Circle.
    2. Improvement Working Circle.
    3. Afforest ration Working Circle.
    4. Catchment Area Treatment Working Circle.
    5. Fodder Reserve Working Circle.
    6. Non Wood Forest Produce Overlapping Working Circle.
    7. Miscellaneous Working Circle.

In Gupta's plan major area of the forest (around 37%) was allotted to the Catchment Area Treatment Working Circle. It was followed by Improvement Working Circle (21.78%), Afforestation Working Circle (18.17%), Conversion to High Forest Working Circle (18.11%), Fodder Reserve Working Circle (2.45%) and Miscellaneous Working Circle (2.11%).

Conversion to high forest working circle:

The crop included in this working circle was young to middle aged with crop density varying from 0.4 to 0.7. The crop was mainly of coppice origin stunted and malformed to a large extent with a high proportion of teak which constituted above 60% of the stocking. The site quality was IVB to IVA as teak was principal species with its common associates like Dhawda, Ain, Lendia, Bhira, Char, etc. The majority of this area previously worked under CWR system. The status of natural regeneration was inadequate and the crop had stunted growth due to loss of coppice vigour over a period of time. This working circle was divided into 8 felling series with 20 annual coupes in each. The felling circle prescribed was for 20 years and the exploitable girth was 75 cms at breast height. The yield was regulated by area. The silvicultural system adopted was conversion to high forest.

The method of treatment prescribed was improvement of soil as the soil had become compact due to heavy grazing, trampling of cattle, resulting in loss of porosity which did not allow the surface water to percolate down which resulted in a condition of little or no subsoil moisture. As a result the younger recruits of teak and its associates, which came up naturally, died before they got established. In order to mitigate this problem extensive soil works including tractor ploughing, in coupes or CCT, gully plugging, nala bunding, were prescribed.

Reduction of number of coppice shoots to one per stool in the coppice crop. Teak trees of above exploitable girth were prescribed for felling. No marking was prescribed for removal of sound miscellaneous and edible fruit species except dead, dying and diseased. Thinning and tending operations were prescribed in plantation and natural regeneration was given preference over coppice shoots. Artificial regeneration (50 % teak and 50% miscellaneous) was prescribed in the areas wherever necessary keeping 625 seedling for ha (Natural Regeneration and Artificial Regeneration). For implementation of treatment prescribed the coupe area was divided into a) Protection area, b) Under stock area, c) Young crop and old plantation area, d) Well stocked areas. Subsidiary silvicultural operations like CBO, cleaning and thinning were also prescribed in teak and miscellaneous plantations. First and second thinning was mechanical in 11^{th} and 18^{th} year of plantation. Subsequent thinnings prescribed were silvicultural thinning in 25^{th} and 35^{th} year of plantation. Thinning was also prescribed in other crop areas at 21^{st} year of main felling.

Results: As per the prescription, 8 coupes became due for felling every year and majority of these due coupes had not been worked in the targeted years. Therefore, the prescriptions suggested had not been implemented *in toto*.

The soil and moisture conservation measures were taken up at few places without following regular prescriptions. The subsidiary silvicultural operations like CBO, cleaning were not carried out as per prescriptions of working plan. Thinnings in teak and miscellaneous plantations and other crop areas were not carried out as per the prescriptions. Therefore, there is no visible change or improvement in quality and composition of the crop as per the stock map report. Teak was dominant species with

approximately 43 % of the total stocking. The results of 2004 enumeration indicate that there was a marginal improvement in the stocking of the forest specially in the lower girth classes of 15/30, 30/45 cms.

Improvement working circle:

The areas included in this working circle were managed under CWR working circle, some of the areas of miscellaneous working circle and part of improvement working circle of the previous working plan. Most of the forest crop represented site quality IV B with some patches of IV A. The crop was young to middle aged with stunted growth and malformed trees. Dominant species in this forest was teak which constituted 62 % of the total stock with its natural associates like Dhawda, Ain, Hirda, Salai, Kalam, etc. The density of the crop was between 0.4 to 0.6 with some patches of lower and higher crop density. The areas that were included in this working circle were subjected to large scale felling especially teak trees. This working circle was constituted with a view of improving the stocking, composition and condition of growing stock to increase the proportion of valuable miscellaneous species. To check soil erosion and to conserve the soil and moisture in the area, this working circle was divided into 11 felling series. The treatment adopted was improvement felling of malformed crop and thinnings wherever necessary. Implementation of treatment prescribed, the coupe area was to be divided into -

Area A: Protection areas

Area B: Understocked areas

Area C: Pole crop and old plantation areas

Area D: Well stocked areas

Soil and moisture conservation and plantation of teak and other suitable miscellaneous species like bamboo under planting in the fourth year of plantation were prescribed as per the need of treatment of the particular category of the area. Greater emphasis was given for soil and moisture conservation of this working circle as soil had become compact over the years due to heavy grazing pressure, frequent fires resulting in poor drainage as well as poor aeration of the soil. As a result of this condition young recruit of teak and miscellaneous which come up naturally did not get established.

Improvement of the crop was prescribed within a span of 10 years by enhancing natural regeneration supplemented by artificial regeneration and intensive soil and moisture conservation. Calculation of yield was not carried out as no yield was expected.

Results: Out of 11 coupes due every year, majority of coupes had not been worked probably due to shortage of funds. Therefore, the treatment to the crop as per the prescriptions had not been implemented completely. There was no remarkable change of crop quality and vegetation cover.

Afforestation working circle:

The area included in this working circle was 'C' class reserve forest falling outside catchments of various irrigation projects, part areas allotted to miscellaneous working circle, part areas of CWR working circle, plantation working circle and fodder working circle of previous plans. The area in general was under stocked, open with crop density less than 0.4 with some patches of better-stocked areas in some of the compartments. The 'C' class reserve forest allotted to this working circle was highly degraded without any significant tree crop. Most of the area represented site quality IV B. The crop had teak as principal species along with miscellaneous species like Dhawda, Ain, Sal, Tendu, etc. The area was subjected to heavy grazing pressure resulting in compaction of soil with little or no subsoil moisture. Natural regeneration of teak and its associates was negligible and died back without getting established.

The objects behind the constitution this working circle were -

- To increase vegetative cover.
- To check loss of top soil through suitable soil and moisture conservation measures.
- To increase water holding capacity of the soil and to increase the productivity of land. 11 felling series with 20 annual coupes in each series had been constituted. To implement the prescriptions, the coupe area was divided into area A (Protection area), area B (Under stocked area), area C (pole crop and old plantations), area D (Well stocked areas).

- Intensive soil and moisture conservation works were prescribed. Afforestation of suitable areas in category A and B types was prescribed on the basis of ecological index and planting of 1000 seedlings per ha. Subsidiary silvicultural operations like CBO and cleaning were prescribed. Thinnings of 1st and 2nd mechanical thinnings at 11th and 18th year of plantation and subsequently, silvicultural thinnings at 25th and 35th year of plantation was also prescribed.

Results: Out of 11 coupes due for working, no coupe was worked in the initial two years and subsequently majority of the due coupes were not worked. The subsidiary silvicultural operations were not done as per the prescriptions. The soil moisture conservation works were not implemented as per the prescriptions. The field visits indicated that most of the plantations in the division did not come up to the desired level mostly because of grazing, fire and wrong selection of sites and species. Afforestation carried out in last 10 years resulted into increase in vegetation cover on some sites whereas afforestation also led to control on soil erosion, development of grasses on some sites.

Catchment area treatment working circle:

The forest area under this working circle constituted of various irrigation projects. The site quality of the crop varied from IV A to IV B and the forest was well stocked with patches of under stocked and open areas. The 'C' class reserve forest included was with a little vegetation and the nature of forest was of local subtype "poor quality forest" and degraded scrub forest. The special objects of management in this working circle were -

- To check soil erosion.
- To arrest the runoff water by taking up intensive soil and moisture conservation measures in the catchment area of the forests.
- To preserve and increase vegetative cover to prevent the siltation of reservoirs by checking up of soil erosion in the forest catchment areas.
- To increase the ground water table.

In this working circle 22 felling series with 20 annual coupes of each felling series had been constituted. The method of treatment adopted were soil and moisture conservation works along with the afforestation in order to prevent soil erosion, siltation

of reservoir and to enhance ground water table. The forest area falling in the catchment of each irrigation project included in this working circle had been treated as a complete unit. For implementation of the treatments prescribed, the area of the coupe had been divided into area A (Protection area), area B (Understocked area), area C (pole crop and old plantations), area D (Well stocked areas). In D areas 50% teak trees above harvestable girth were to be felled. No felling was prescribed in the areas which directly drained into catchment. Intensive soil and moisture conservation works along with afforestation were prescribed besides encouragement through natural regeneration and gap plantings. Subsidiary silvicultural operations like CBO, cleaning, thinning were prescribed.

Results: As per prescriptions 22 coupes were due every year and most of these coupes due for treatment could not be worked as prescribed. It was noticed during the visits to the field, a number of coupes were declared as unworkable as there was no yield. It was also observed that the other prescriptions given were also left out, though harvesting was one of the prescriptions.

Fodder reserve working circle:

The areas included in this working circle represented site quality IV B and were mostly without any appreciable tree growth with species such as Hiwar, Palas, Teak, Bhor, Khair. Most of these areas generally had grasses of less fodder value Kus (*Andropogon contartus*), Bhurbhussi (*Eragrostis tennela*). However, good fodder grasses such as sheda, paunya, marvel etc. were scarcely present. The forest included in the working circle belonged to local subtype “degraded scrub forest”. Special objects of management were to improve quality and quantity of fodder by introducing better verities of fodder grasses, fodder tree species and to meet the local demands for fodder. The treatments prescribed were extensive soil and moisture conservation works, removal of weeds, thorny, shrubs and bushes and eradication of unpalatable grasses like Kushal, Burbushi, etc. at pre flowering stage. Sowing of seeds of superior fodder grasses Sheda, Paunya, Marvel, etc. on the lower side of contour trenches and retention of existing trees except dead trees.

Introduction of fodder tree species such as Subhabul, Anjan, Kusum, Acacia, etc. by way of pit planting in between CCT, erection of wire fencing around the area under treatment, intensive fire protection and permanent closing of the area to grazing, two felling series were formed with 10 annual coupes each for implementation of the

prescriptions. The coupe area was divided into A, B, C and D categories. Existing natural regeneration was to be taken into consideration while taking up new plantations.

Results: The prescriptions were not implemented in due coupes. Stall feeding of the cattle *i.e.* cut and carry away practice to feed the cattle had not been followed, as stall feeding was not common in this area. As these areas were situated nearby villages and were subjected to unregulated grazing, frequent fires and other biotic pressure it resulted in further degradation of these areas.

Non wood forest produce (overlapping) working circle:

The main species in this forest is teak and its common associates are Ain, Salai, etc. The non wood forest species produce such as Tendu, Mahua, Char, Dhawda, Hirda, Behada, etc. were distributed in scattered patches all over the area along with other species. Special objects of management were to improve non wood forest produce species in the forest thereby enhancing the yield and collection of various non wood forest produce and to enhance employment to local people those who depend upon non wood forest produce. In this area Tendu leaves, Dhawda gum, Charoli, Mahua flowers, Mahua seeds and seeds of Behada, Hirda and Rosha grass had good market value. For the collection of non wood forest produce, the entire division was divided into various units.

Identification of compartments with promising regeneration of non wood forest produce species, removal of congestion and soil working was prescribed. Soil working in case of Tendu and Mahua by taking one feet deep trench and circling with a diameter around the tree to activate root suckers on plantation, introduction of 10 to 15 % of non wood forest produce species was prescribed. No non wood forest produce species were not to be marked for felling except dead and dying trees.

Results: The prescriptions made in this working circle were not implemented, hence no change in composition of the crop with respect to non wood forest produce.

Miscellaneous working circle:

In this working circle the areas handed over to other departments in the past but not disforested were included. “C” class reserved forest areas, which were not given compartment numbers, were also included.

Results: In this working circle the situation remained more or less same, out of due coupes only 15% coupes worked so far. Therefore, visible change in the crop quality and composition was not noticed in this working circle. The enumeration data of 2004 by the SOFR indicated that, there was a marginal increase in the stocking of the forest especially in the lower girth classes.

11.2.10: Dinesh Kumar Tyagi and G. Rama Krishna Rao's Plan (1996-97 to 2005-06):

Gupta's Working Plan was replaced by Dinesh Kumar Tyagi and G. Rama Krishna Rao's Working Plan. In this working plan, the forest area of Pusad forest division was allotted into seven working circles.

1. Selection-cum-Improvement Working Circle.
2. Afforestation Working Circle.
3. Catchment Area Treatment Working Circle.
4. Fodder Management Working Circle.
5. Miscellaneous Working Circle.
6. Non Wood Forest Produce (Overlapping) Working Circle.
7. Joint Forest Protection (Overlapping) Working Circle.
8. Wildlife Conservation (Overlapping) Working Circle.
9. Forest Protection (Overlapping) Working Circle.

Selection-cum-Improvement working circle:

Majority of these areas were managed under Coppice with Reserve Working Circle (CWR), SCI Working Circle, Miscellaneous Working Circle, Plantation Working Circle, Fodder Reserve Working Circle and Pasture Working Circle in the previous management plan. These forests were characterized by both good quality as well as degraded forests mixed together. These forests were capable of yielding good quality of timber, small timber and fuel wood. The basic aim of management was to improve the condition of the crop by tending natural regeneration and supplemented it by artificial regeneration where ever necessary. In good quality patches, matured trees were to be harvested (above exploitable girth) if the trees were available silviculturally. Therefore, the harvestable girth was kept at 75 cm gbh in the teak trees for site quality IV. Subsidiary

silvicultural operations like CBO, cleaning and thinning were also prescribed. Suitable soil and moisture conservation works were advocated to improve the site quality and crop condition.

A total of 114 compartments were allotted to this working circle and these compartments were divided into 23 felling series having 20 coupes in each one of them. The average coupe area was around 84 ha. It was prescribed that, the preparation of treatment map would show the following categories in the coupe.

1. Category “A”- Protection area.
2. Category “B”- Under stocked area.
3. Category “C”- Areas of old plantations and pole crop of NR.
4. Category “D”- Well stocked areas.

Catchment Area Treatment working circle:

The forest areas falling in the catchment areas of irrigation, drinking water projects and directly draining into water bodies or reservoirs were included in this working circle. These areas were previously managed under Coppice with Reserve, Miscellaneous, Plantation, Fodder and Pasture Improvement Working Circles. The idea of creating this working circle was to prolong the life of irrigation as well as drinking water projects by controlling soil erosion and siltation in the reservoirs. Treatment of catchments included soil and moisture conservation measures, drainage treatment and improving vegetation cover to prevent soil erosion and to check run off in the catchment areas. The density of the forest varied from 0.1 to 0.6 and the crop mostly young to middle aged. The site quality in general confirmed to IV B. The special objects of management were -

1. Intensive soil and moisture conservation works to check the soil erosion and to arrest the runoff in the forest catchment areas.
2. Effective drainage treatment to check the silt flow into the water reservoirs. To preserve and increase vegetal cover through appropriate treatment to enhance the ground water table. A total of 76 compartments were allotted to this working circle and these compartments were divided into 13 felling series.

Afforestation working circle:

This working circle consisted of major portion of 'C' class reserve forests which were previously managed under various working circles, CWR, Miscellaneous, Pasture and Plantation working circles. In Gupta's plan these areas were under the treatment afforestation working circle. The governing aim was to improve the vegetation cover both in quality and quantity and to meet local demands of small timber, fuel wood, fodder and other forest produces by undertaking plantations in degraded under stocked and blank areas.

Fodder Improvement working circle:

This working circle included open and sparsely stocked areas not capable of yielding timber. These areas were managed under Miscellaneous, Plantation, Pasture Improvement, in the previous plans. In Gupta's plan these areas were allotted to fodder reserve working circle. The extent of area allotted to this working circle was 1680.90 ha. The basic aim to constitute this working circle was to raise good fodder species to meet the fodder demand for cattle population of local people.

Non-Wood Forest Produce (overlapping) working circle:

This working circle covered the entire area of the division as it is termed as over lapping working circle. Non wood forest produce like Tendu leaves, Dhawda and Karai gum, Moha flowers and seeds, myrabolons (Behada, Hirda, Aaola) and Rosha grass were available on limited scale in selected patches. There was a fair demand for non wood forest produce in the market. The aim was to improve the yield of existing non wood forest produce species and introduce the concept of sustainable yield and encourage the growth and development of non wood forest produce species by means of protection and scientific management and by way of plantation.

Joint Forest Management (overlapping) working circle:

This working circle encompasses the entire area of Pusad forest division. Forest protection and management aimed at involving local people with mutual understanding. The benefits obtained out of effective protection and management by

the local people could be shared between Government and members of Joint Forest Management committees as per the prevailing Government orders.

Wild Life Conservation (overlapping) working circle:

This was constituted mainly to protect the existing wildlife specially rare and endangered species and to take up measures to improve habitat conditions in terms of food, shelter and habitat management.

Forest Protection (overlapping) working circle:

The protection of the forest was ensured utmost importance. Rapid dwindling of forests and forest lands coupled with increasing human and cattle population created a huge gap between demand and supply of forest produce. The inclination and greed of the people towards tangible benefits and individual short time gains dominated over realizing intangible benefits and social long term gains alarmed forest protection leading to rapid degradation of forest and forest areas. Considering the huge problem of forest protection, the Government of India made it mandatory to have forest protection over lapping working circle in all working plans. Forest protection is a major and complex problem which needed multipronged approach. The strategy suggested to tackle huge problem of forest protection was an integrated approach and it shall be applied through various measures. It was directly related to field actions in participatory manner to manage the forest through active participation of local people *i.e.* through Joint Forest Management approach. Some of the measures proposed were -

- Enhancement of productivity of forest by taking up extensive soil and moisture conservation works, natural and artificial regeneration and other cultural operations.
- Strict control of fires and regulation of grazing.
- Active participation of local people in all operations of forest management.
- Meeting the demands of local people for forest produce.
- Creation of employment even during lien period.
- Strengthening of available infrastructure.
- To tackle forest offences, by introducing rewards and informers system.

Miscellaneous working circle:

The area already transferred to other departments for non forestry purposes and the area yet to be deforested were allotted to this working circle. It was prescribed to initiate disforestation in these areas as early as possible and these areas were required to be deleted from form no.1. Total area included in this working circle was 1667.79 ha.

Results: The results obtained during the plan period are summarized below.

Selection-cum-Improvement working circle:

During the plan period there a total of 230 coupes were due to be worked. Out of this 90 coupes have been worked which works out to around 39%. Nearly 68 coupes were within 10 kms of protected area and hence not worked. The total yield in all the worked coupes is 4182.249 cum. The average yield was 4.64 cum/ha. It was also observed that subsidiary silvicultural operations like CBO, cleaning and thinning were not carried out. Soil moisture conservation works were carried out in some of the coupes.

Afforestation working circle:

The area allotted to this working circle was understocked with crop density less than 0.4. Site quality was Iva to IVb. No yield was prescribed in this working circle. A total of 12297.03 ha was included in this working circle. A total of 120 coupes were due during the plan period. Out of which only four coupes were worked. There is no significant change in the composition of the crop.

Catchment area treatment working circle:

The areas allotted to this working circle the catchments of major and medium irrigation projects in the division. A total of 17015 ha was included in this working circle. In this working circle a total of 130 coupes were due during the plan period, out of which only 3 coupes were worked. A total of 14 coupes were not worked as they fall within 10 kms from the boundary of protected area. Soil and moisture conservation measures were carried out. Most of the coupes remained unworked.

Fodder Improvement working circle:

A total of 3 coupes were not worked as they fall within 10 kms from the boundary of protected area. A total of 1680.90 ha was included in this working circle. The prescriptions of this working circle were not implemented.

Miscellaneous working circle:

In this working circle the areas handed over to other departments in the past but not disforested were included. "C" class reserved forest areas, which were not given any compartment numbers, were also included. None of the areas in this working circle have been disforested till date. There has been no change in these compartments.

11.3: SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN:

Some special works of improvement in the management of forests have been taken in the last few years. Notable among these are GR No.FDM2011/C.No.100/F2, dt.05/10/2011 implicating the Tendu Contractor in case of a fire happening in his jurisdiction which has resulted in the dramatic decrease in incidences of fire.

11.3.1: Information technology: Maharashtra Forest department has been deploying information and communication technologies for better forestry management. The main objective is to systematically organize planning, implementation and monitoring of forestry and other related operations by systematic collection, storage and retrieval of MIS and Geospatial data through a computer based communication network. This will not only bring transparency, responsibility and accountability but will also enhance efficiency. These initiatives plans to achieve its objective by using ICT to set up e-Governance framework for information availability and tracking of forestry related activities across the supply chain while involving citizens, villagers and other stakeholders in the entire process. Maharashtra Government has taken decision of computerisation of state's Forest department vide Resolution dated 05.10.2011. Accordingly, infrastructure was developed to connect all offices from beat guard to head quarter of Maharashtra Forest department, Nagpur and Mantralaya, Mumbai by LAN and internet connectivity. IT cell has been developed at head quarters in Nagpur equipped with computers and independent server farms. A consultant has been appointed to bridge the technical

component and IT savvy personnel have been appointed to develop various applications required for forestry activity and services.

11.3.2: PDA (Personal Digital Assistant): In Pusad forest division a total of 189 PDAs were distributed to the staff of the division pre-loaded with applications on offence reporting, fire incidences, beat checking, etc. in which incidences of fire and other illicit activities can be tracked more accurately with geo-tagged photos and Lat-Long details. This helps in capturing real time data and monitoring forestry activities. The application enables registration of offence, taking photograph of seized material and also of offender, if any.

11.3.3: Plantation using PMIS/NMIS: Plantation Management Information System (PMIS) captures district-wise, taluka-wise and village-wise data for registration of plantation sites. Most of these sites are geo-tagged. These sites are tagged with the department's existing Nursery Management Information System (NMIS) to support adequate seedling stock. The application has also been integrated with the department's existing plantation management application system to address future monitoring of plantation activity.

11.3.4: Greening of Maharashtra (50 crore plantation programme): Maharashtra Government has started the 50 crore plantation programme from 2015-16 to 2019-20. During the implementation of this programme, lot of emphasis has been given for involving the public across all walks of life and also other line departments have been involved in addition to Forest department. This programme has created a big people movement for Greening of Maharashtra. Lot of enthusiasm is seen among all stake holders in this mission.

11.3.5: Green Army Maharashtra: To supplement the insufficient manpower with the Forest department, the initiative of Green Army was conceptualised. This initiative has a vision to raise 10 million volunteers to help achieve the nationally mandated forest cover of 33% is in place. To facilitate this vision green army website (www.greenarmy.mahaforest.gov.in) was launched where interested citizens could get themselves registered to volunteer for this mission.

11.3.6: Centralised call centre "Hello Forest-1926": Maharashtra Forest department has started call centre "Hello Forest" which will handle citizen grievances, suggestions and

complaints. This involves participation of public to reduce forest fires, encroachment, poaching and illicit felling as well as to make enquiries regarding citizen services, ecotourism and matters related to forestry.

11.3.7: Soil and moisture conservation works: Maharashtra Government also started the Jalyukta shivar programme for taking up intensive soil and moisture conservation works. Under this programme, lot of SMC works have been taken in this forest division. The details is given in **Appendix-XIX**. These works will definitely help in improving the soil-moisture regime of the area in long run.

11.4: PAST YIELD AND REVENUE:

The details of yield and revenue realized during the past ten years are given in the table below.

Table No.11.1: Past yield and revenue realized

Sr. No.	Year	Timber		Firewood	
		Quantity (m^3)	Revenue (Rs.)	Quantity (m^3)	Revenue (Rs.)
1	2008-2009	418.752	5025818	0	0
2	2009-2010	1125.182	14951075	307.614	262930
3	2010-2011	844.52	14450100	478.876	172881
4	2011-2012	422.39	8079620	95	172800
5	2012-2013	510.52	9953370	159.5	201910
6	2013-2014	261.171	5001700	123.483	200660
7	2014-2015	455.674	12571400	112.32	24670
8	2015-2016	523.259	13618000	63.6	42600
9	2016-2017	694.132	19617100	71.28	149000
10	2017-2018	1032.164	22534770	46	56850
Total		6287.764	125802953	1457.673	1284301

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CHAPTER – 12
STATISTICS OF GROWTH AND YIELD

12.1: STOCK MAPPING:

Forest stock maps are defined as the maps which naturally contain detailed spatial information on forest type, density, encroachments, cultivation, human habitats, and regeneration status which typically provide a fundamental idea about available resources. The status of forest vegetation includes categorization of the forest into density classes, species distribution, assessment of growing stock, growth data for various species and age distribution.

The reserve forest of the division were stock mapped for the first time in the year 1915-16 to 1937-38 at the time of revision of working plan by Shri. Malcolm. The stock maps were updated from time to time with each revision of the working plan. During the present revision stock maps have been updated in 2018 by the territorial staff of Pusad forest division. With help of GIS software entire data pertaining to beat, round, range, division, village, taluka, stock maps, forest cover, drainage and contour have been digitized in the GIS cell of Working Plan office Yavatmal and maintained in the form of various layers. The results of stock mapping are given in table below.

Table No. 12.1: Results of stock mapping

Quality	Area (ha)	Area wrt to WP area (%)
Teak IV A	8040.12	11.65
Teak IV B	24636.71	35.69
Miscellaneous IV A	3623.27	5.25
Miscellaneous IV B	9529.02	13.80
Plantation	3218.08	4.66
Understock	12347.83	17.89
Blank	3771.18	5.46
Eroded and Scrub	222.76	0.32
Encroachment/ Cultivation	3308.47	4.79
Water Bodies	338.50	0.49
Total	69035.94	100.00

12.2: TREE ENUMERATION:

SOFR unit, Amravati, has completed the enumeration of forest resources in Pusad forest division during September 2015 to September 2016. The entire area of forest division was considered for sampling enumeration plan. The trees are enumerated in girth classes from 30 cm and above. The girth was scientifically measured at breast height (gbh). This data was correlated with stock maps prepared by field units and also compared with satellite imagery before the compartments were allotted to various working circles.

The statistical sampling method namely "Systematic Line Plot Sampling with Random Start" was used wisely for tree enumeration. The plot size is of 50"x50" (50 seconds x 50 seconds) *i.e.* 225 ha. In each plot, 0.1 ha plot was enumerated. The complete enumeration of trees, natural regeneration, grass and medicinal species were carried out in these plots. In the same way, qualitative measurements were also carried out. The enumeration data was analysed by Forest statistician in the O/O PCCF (ITP).

The total growing stock as per analysis of enumeration data is 434.45 out of which 317.70 is teak and 116.75 is of miscellaneous species. The results of enumeration data is given in the table below.

Table No. 12.2: Results of enumeration

Species	Teak	Non Teak	Grand total
15-30	55.25	24.00	79.25
30-45	91.63	21.30	112.93
45-60	72.84	30.60	103.44
60-75	46.29	15.51	61.80
75-90	30.17	10.25	40.42
90-105	12.32	6.38	18.70
105-120	6.89	4.48	11.37
120-135	1.37	1.56	2.93
135-150	0.51	1.55	2.06
>150	0.43	1.12	1.55
Total	317.70	116.75	434.45

The comparison of growing stock reveals that the total growing stock has increased from 327.05 trees/ha (year 2004) to 434.45 trees/ha (year 2016). Out of the total number of trees, teak constituted 317.70 trees/ha while miscellaneous constituted

116.75 trees/ha which amounts to around 73% of teak. The number of teak trees has increased (from 143.27 to 317.70 trees/ha) while the number of miscellaneous trees has decreased (from 183.78 to 116.75 trees/ha) when compared to 2016 enumeration. The increase in the number of teak trees is substantial. In teak there is an increase in the lower girth classes *i.e.* 15-30, 30-45 and 45-60 cm. In miscellaneous species, there is decrease in the lower girth classes *i.e.* 15-30 and 30-45 cm. The comparison of number of trees/ha in 2004 and 2016 enumeration is given in the table below.

Table No. 12.3: Number of trees/ha

Girth Class	Number of trees/ha				Total trees/ha	
	Teak		Miscellaneous			
	2004	2016	2004	2016	2004	2016
15-30	38.44	55.25	85.90	24.00	124.34	79.25
30-45	36.59	91.63	41.14	21.30	77.73	112.93
45-60	28.24	72.84	20.87	30.60	49.11	103.44
60-75	19.05	46.29	12.38	15.51	31.43	61.80
75-90	11.72	30.17	8.86	10.25	20.58	40.42
90-105	5.51	12.32	5.76	6.38	11.27	18.70
105-120	2.44	6.89	3.69	4.48	6.13	11.37
120-135	1.28	1.37	5.18	1.56	6.46	2.93
135-150	0	0.51	0	1.55	0.00	2.06
>150	0	0.43	0	1.12	0.00	1.55
Total	143.27	317.70	183.78	116.75	327.05	434.45

12.3: STEM ANALYSIS:

During the revision of this working plan stem analysis was done by Working plan office Yavatmal during 2018. The stem analysis of teak coppice and seed origin was carried out by selecting representative teak trees of site quality IV from Pusad, Mahagaon and Marwadi range. The results obtained have been computed and the following curves were drawn.

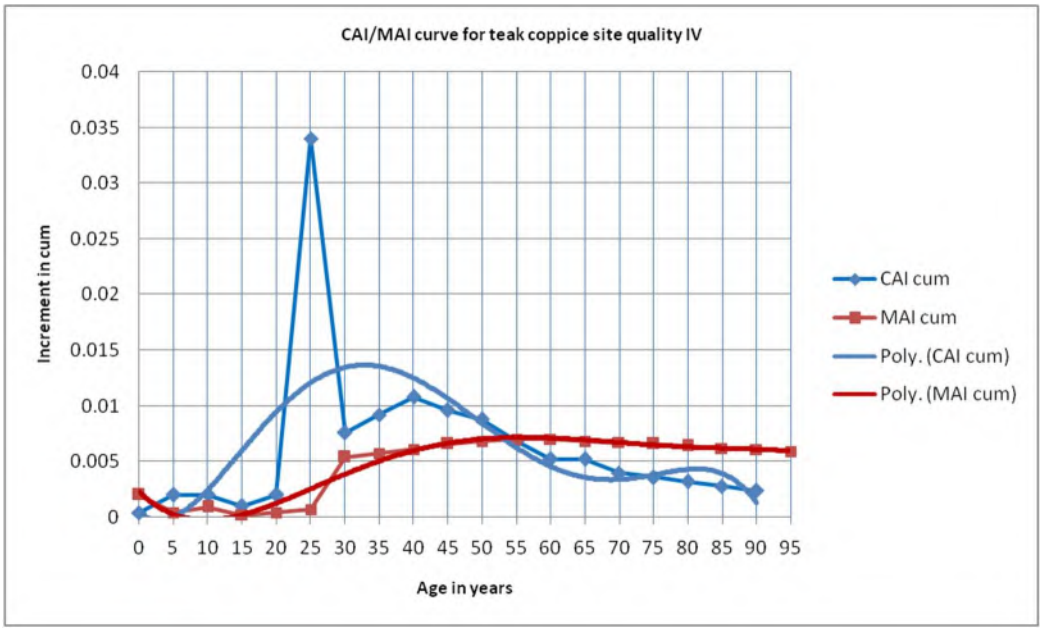
1. Age/diameter curve
2. Height/age curve and
3. Age/volume curve

Stem analysis was carried out in compartment no. 429 of Beldari-1 beat (Mahagaon range), compartment no. 391 of Marwadi beat (Marwadi range), and compartment no. 366 of Mokhad beat (Pusad range). The data obtained during stem analysis has been utilized to determine harvestable girth, felling cycle and expected yield.

The data of stem analysis with respect to girth, height, volume etc. are given in the following tables.

Table No. 12.4: Stem analysis for Teak coppice (Site quality IV)

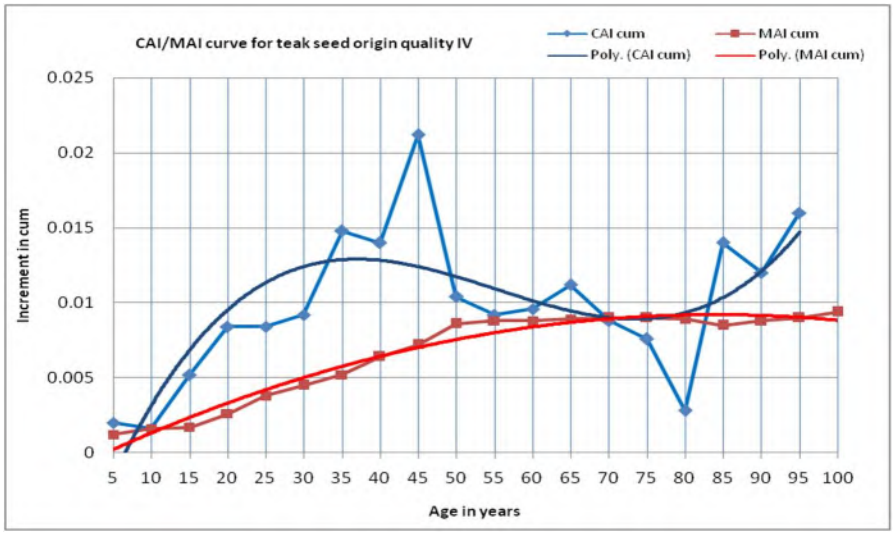
Sr. No.	Age	Height (m)	DBH ob (cm)	GBH ob (cm)	Volume (m^3)	CAI(m^3)	MAI(m^3)
1	5	1.90	2.80	8.80	0.002	0	0.002
2	10	3.20	5.70	17.90	0.004	0.0004	0.0004
3	15	5.20	8.70	27.31	0.014	0.002	0.0009
4	20	6.80	11.70	36.73	0.005	0.002	0.0002
5	25	8.0	14.70	46.16	0.010	0.001	0.0004
6	30	9.70	17.40	54.63	0.022	0.002	0.0007
7	35	11.10	19.50	61.23	0.192	0.034	0.0054
8	40	13.0	21.40	67.19	0.230	0.0076	0.0057
9	45	13.90	22.90	71.90	0.276	0.0092	0.0061
10	50	15.40	24.30	76.30	0.330	0.0108	0.0066
11	55	16.80	25.60	80.38	0.378	0.0096	0.0068
12	60	18.20	26.80	84.15	0.422	0.0088	0.0070
13	65	19.60	27.90	87.60	0.456	0.0068	0.0070
14	70	20.70	28.80	90.43	0.482	0.0052	0.0068
15	75	21.70	29.60	92.94	0.508	0.0052	0.0067
16	80	22.70	30.40	95.45	0.528	0.0040	0.0066
17	85	23.50	31.10	97.65	0.546	0.0036	0.0064
18	90	24.60	31.80	99.85	0.562	0.0032	0.0062
19	95	25.10	32.40	101.73	0.576	0.0028	0.0061
20	100	25.80	33.0	103.62	0.588	0.0024	0.0059



The periodic CAI and MAI curves intersect at 55th year. The girth (OB) corresponding to this exploitable age is 79 cms. The exploitable girth is hence fixed at 75 cms for teak coppice.

Table No. 12.5: Stem analysis for seed origin Teak (Site quality IV)

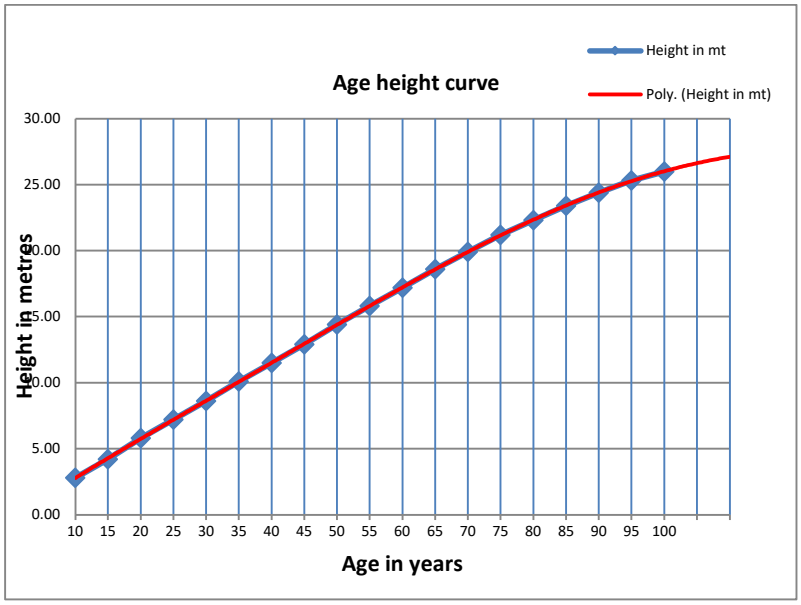
Sr. No.	Age	Height (m)	DBH (OB)	GBH (OB)	Volume (m^3)	CAI (m^3)	MAI (m^3)
1	5	1.50	2.3	7.22	0.006	0	0.0012
2	10	2.80	5.6	17.60	0.016	0.002	0.0016
3	15	4.20	8.9	27.94	0.026	0.0016	0.0017
4	20	5.80	12.7	39.90	0.052	0.0052	0.0026
5	25	7.20	15.9	49.90	0.094	0.0084	0.0038
6	30	8.60	18.3	57.46	0.136	0.0084	0.0045
7	35	10.10	20.4	64.0	0.182	0.0092	0.0052
8	40	11.50	23.1	72.53	0.256	0.0148	0.0064
9	45	12.90	24.9	78.18	0.326	0.014	0.0072
10	50	14.40	26.4	82.90	0.432	0.0212	0.0086
11	55	15.80	27.8	87.29	0.484	0.0104	0.0088
12	60	17.20	29.3	92.0	0.530	0.0092	0.0088
13	65	18.60	30.7	96.39	0.578	0.0096	0.0089
14	70	19.90	32.0	100.48	0.634	0.0112	0.0090
15	75	21.20	33.3	104.56	0.678	0.0088	0.0090
16	80	22.30	34.6	108.64	0.716	0.0076	0.0089
17	85	23.40	35.8	112.41	0.730	0.0028	0.0085
18	90	24.40	36.0	113.04	0.800	0.014	0.0089
19	95	25.30	38.2	119.94	0.860	0.012	0.0090
20	100	26.00	39.3	123.40	0.940	0.016	0.0094



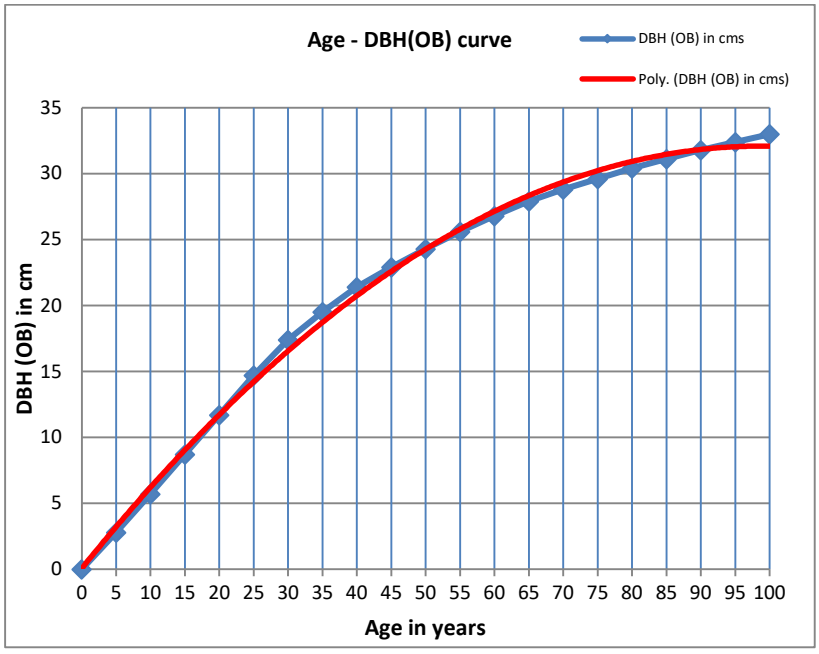
The periodic CAI and MAI curves intersect at 71st year. The girth (OB) corresponding to this exploitable age is 105 cms. The exploitable girth is hence fixed at 120 cms for teak of seed origin.

The data of stem analysis (coppice origin teak) with respect to girth, height, volume etc. are given in the following table.

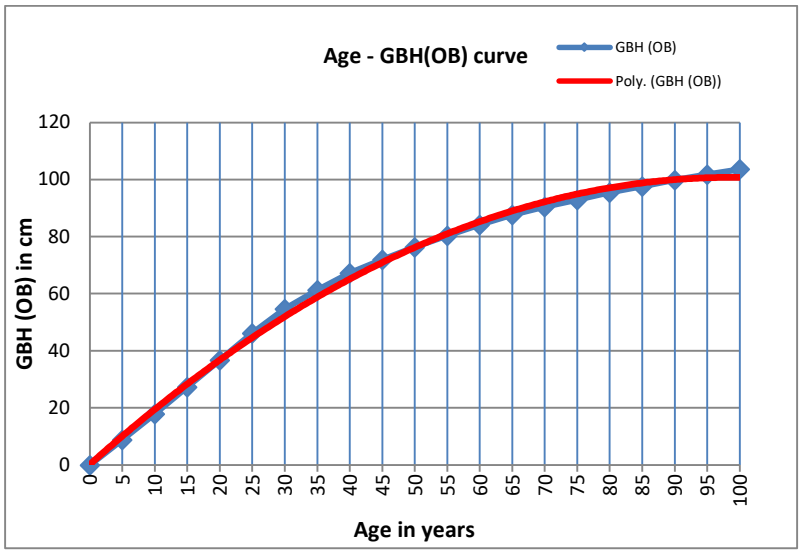
Sr. No.	Age	Height (m)
1	5	1.90
2	10	3.20
3	15	5.20
4	20	6.80
5	25	8.0
6	30	9.70
7	35	11.10
8	40	13.0
9	45	13.90
10	50	15.40
11	55	16.80
12	60	18.20
13	65	19.60
14	70	20.70
15	75	21.70
16	80	22.70
17	85	23.50
18	90	24.60
19	95	25.10
20	100	25.80



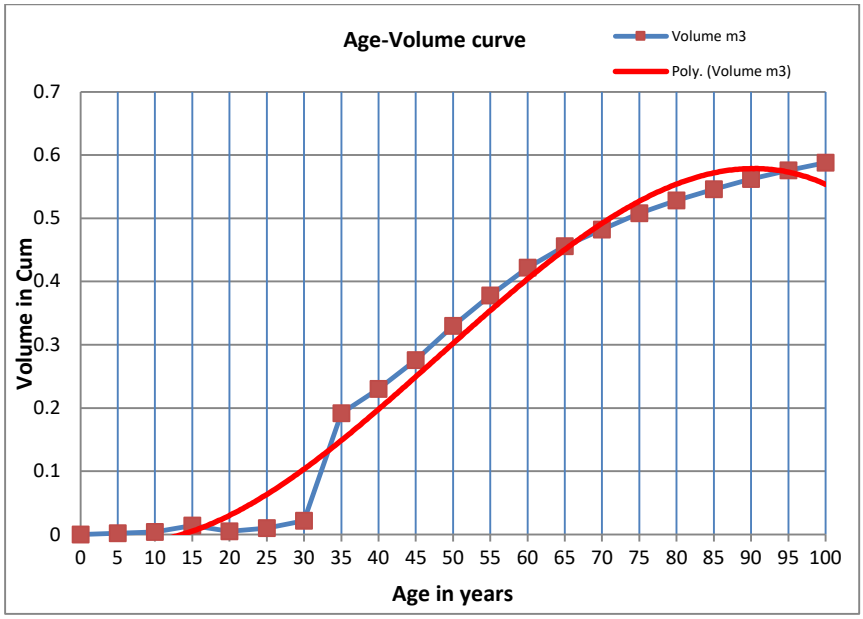
Sr. No.	Age	DBH ob (cm)
1	5	2.80
2	10	5.70
3	15	8.70
4	20	11.70
5	25	14.70
6	30	17.40
7	35	19.50
8	40	21.40
9	45	22.90
10	50	24.30
11	55	25.60
12	60	26.80
13	65	27.90
14	70	28.80
15	75	29.60
16	80	30.40
17	85	31.10
18	90	31.80
19	95	32.40
20	100	33.0



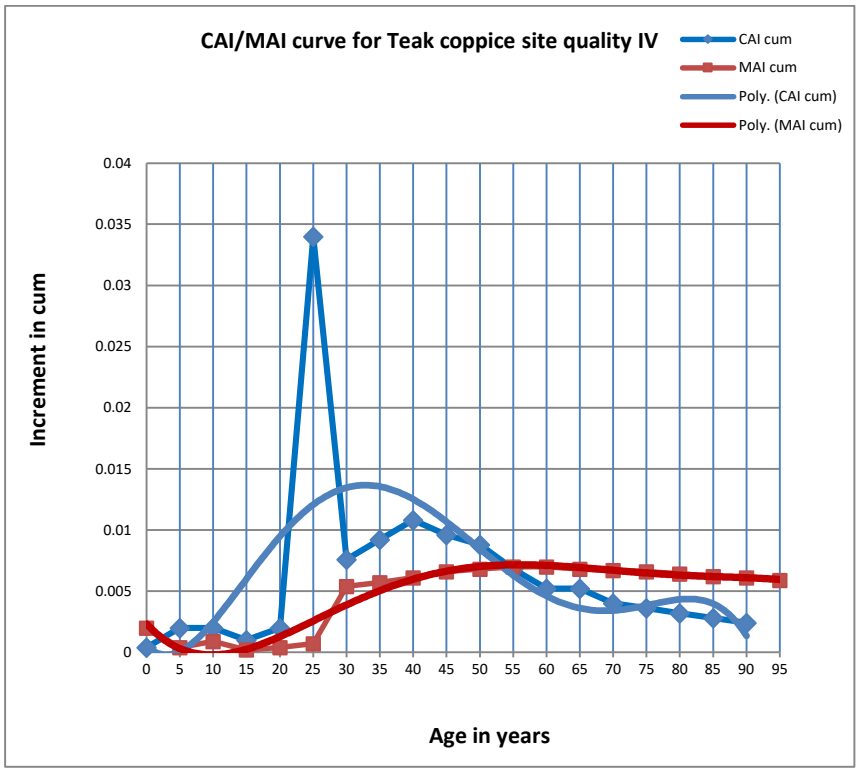
Sr. No.	Age	GBH ob (cm)
1	5	8.80
2	10	17.90
3	15	27.31
4	20	36.73
5	25	46.16
6	30	54.63
7	35	61.23
8	40	67.19
9	45	71.90
10	50	76.30
11	55	80.38
12	60	84.15
13	65	87.60
14	70	90.43
15	75	92.94
16	80	95.45
17	85	97.65
18	90	99.85
19	95	101.73
20	100	103.62



Sr. No.	Age	Volume (m^3)
1	5	0.002
2	10	0.004
3	15	0.014
4	20	0.005
5	25	0.010
6	30	0.022
7	35	0.192
8	40	0.230
9	45	0.276
10	50	0.330
11	55	0.378
12	60	0.422
13	65	0.456
14	70	0.482
15	75	0.508
16	80	0.528
17	85	0.546
18	90	0.562
19	95	0.576
20	100	0.588

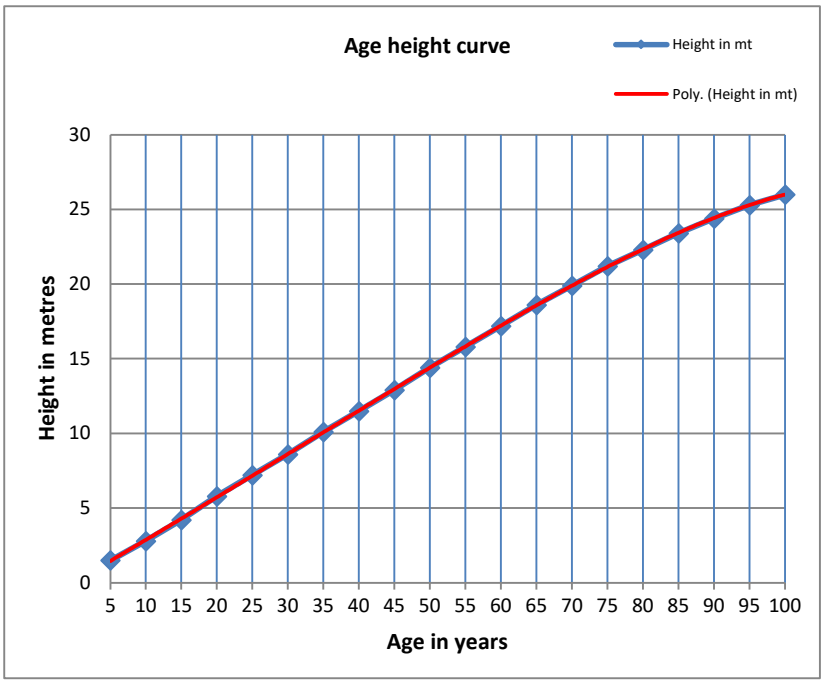


Age	CAI(m^3)	MAI(m^3)
5	0	0.002
10	0.0004	0.0004
15	0.002	0.0009
20	0.002	0.0002
25	0.001	0.0004
30	0.002	0.0007
35	0.034	0.0054
40	0.0076	0.0057
45	0.0092	0.0061
50	0.0108	0.0066
55	0.0096	0.0068
60	0.0088	0.0070
65	0.0068	0.0070
70	0.0052	0.0068
75	0.0052	0.0067
80	0.0040	0.0066
85	0.0036	0.0064
90	0.0032	0.0062
95	0.0028	0.0061
100	0.0024	0.0059

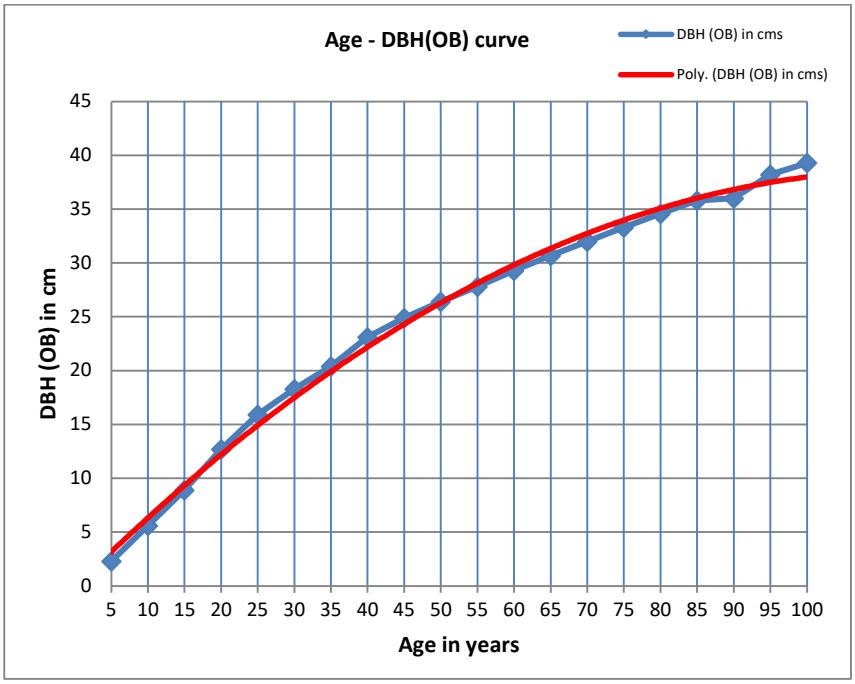


The data of stem analysis (seed origin teak) with respect to girth, height, volume etc. are given in the table below.

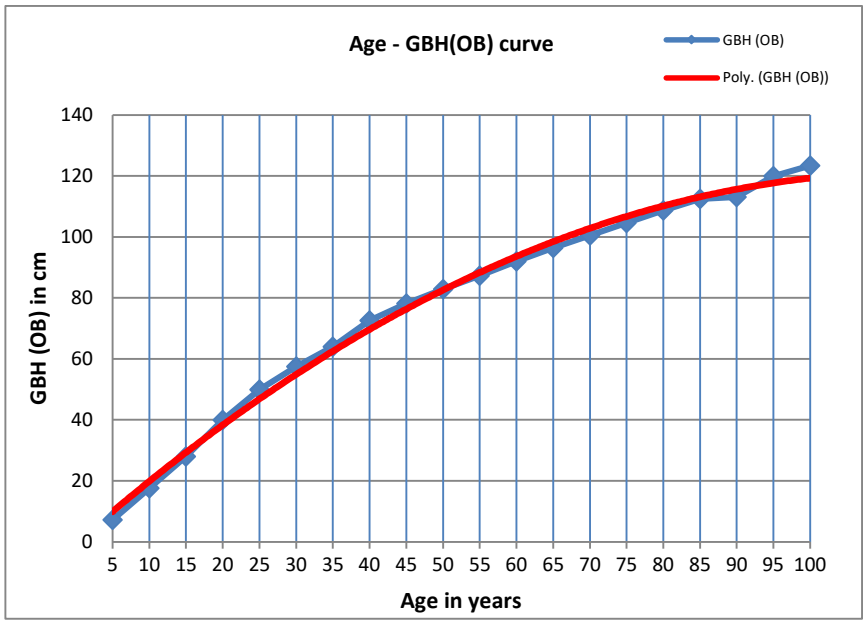
Sr. No.	Age	Height (m)
1	5	1.50
2	10	2.80
3	15	4.20
4	20	5.80
5	25	7.20
6	30	8.60
7	35	10.10
8	40	11.50
9	45	12.90
10	50	14.40
11	55	15.80
12	60	17.20
13	65	18.60
14	70	19.90
15	75	21.20
16	80	22.30
17	85	23.40
18	90	24.40
19	95	25.30
20	100	26.00



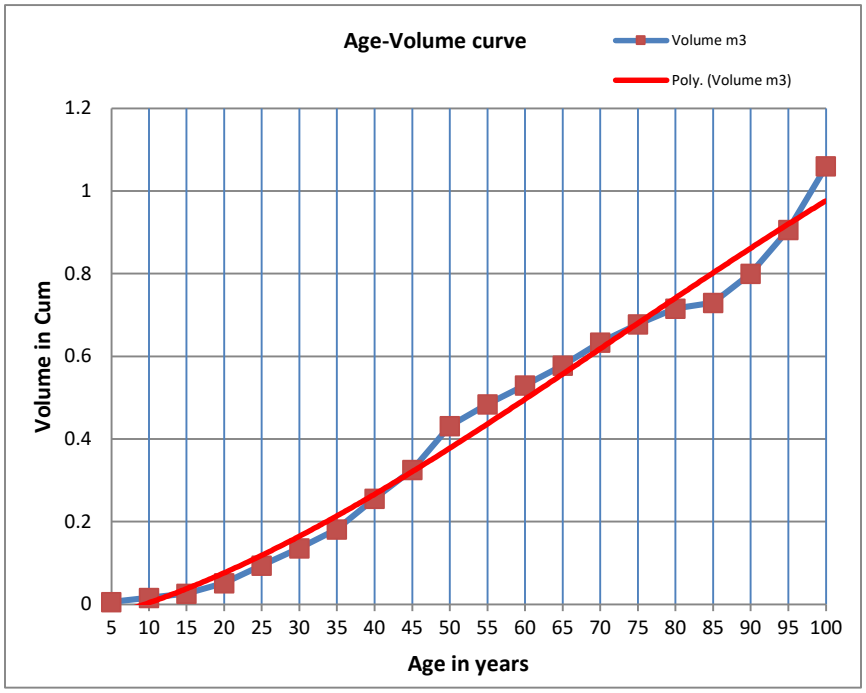
Sr. No.	Age	DBH ob (cm)
1	5	2.30
2	10	5.60
3	15	8.90
4	20	12.70
5	25	15.90
6	30	18.30
7	35	20.40
8	40	23.10
9	45	24.90
10	50	26.40
11	55	27.80
12	60	29.30
13	65	30.70
14	70	32.0
15	75	33.30
16	80	34.60
17	85	35.80
18	90	36.0
19	95	38.20
20	100	39.30



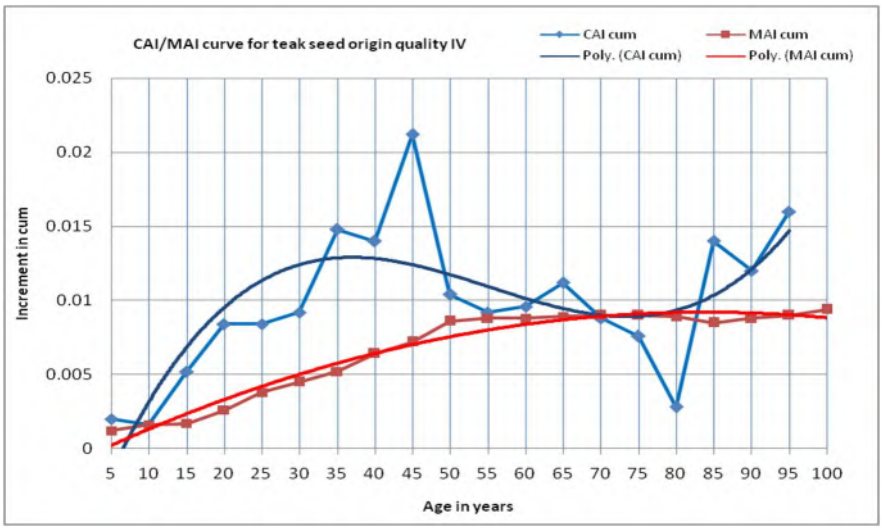
Sr. No.	Age	GBH ob (cm)
1	5	7.22
2	10	17.60
3	15	27.94
4	20	39.90
5	25	49.90
6	30	57.46
7	35	64.0
8	40	72.53
9	45	78.18
10	50	82.90
11	55	87.29
12	60	92.0
13	65	96.39
14	70	100.48
15	75	104.56
16	80	108.64
17	85	112.41
18	90	113.04
19	95	119.94
20	100	123.40



Sr. No.	Age	Volume(m^3)
1	5	0.006
2	10	0.016
3	15	0.026
4	20	0.052
5	25	0.094
6	30	0.136
7	35	0.182
8	40	0.256
9	45	0.326
10	50	0.432
11	55	0.484
12	60	0.530
13	65	0.578
14	70	0.634
15	75	0.678
16	80	0.716
17	85	0.730
18	90	0.800
19	95	0.860
20	100	0.940



Age	CAI(m^3)	MAI(m^3)
5	0	0.0012
10	0.002	0.0016
15	0.0016	0.0017
20	0.0052	0.0026
25	0.0084	0.0038
30	0.0084	0.0045
35	0.0092	0.0052
40	0.0148	0.0064
45	0.014	0.0072
50	0.0212	0.0086
55	0.0104	0.0088
60	0.0092	0.0088
65	0.0096	0.0089
70	0.0112	0.009
75	0.0088	0.009
80	0.0076	0.0089
85	0.0028	0.0085
90	0.014	0.0089
95	0.012	0.0090
100	0.016	0.0094



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PART – II

FUTURE MANAGEMENT

PUSAD FOREST DIVISION
WORKING CIRCLES

N
W E
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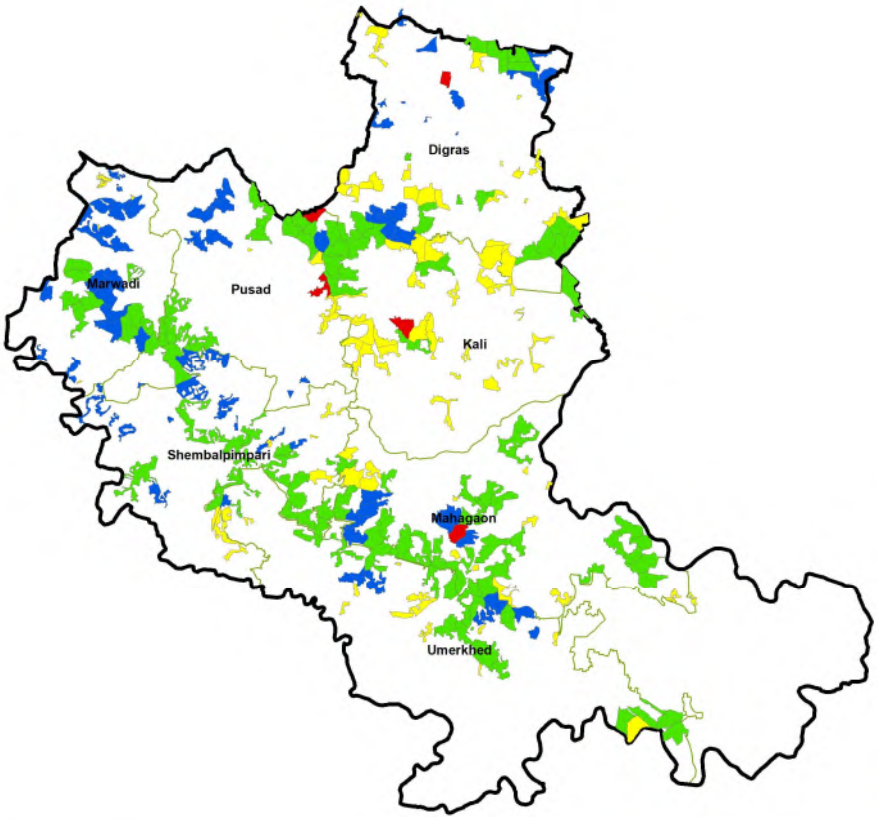
1:150,000



Legend

- Division boundary
- Range boundary
- SCI WC
- Afforestation WC
- Catchment Area Treatment WC
- Fodder Improvement WC

0 2.5 5 10 15 20 25
Kilometers

CHAPTER-1

BASIS OF PROPOSALS

1.1: NATIONAL FOREST POLICY:

National forest policy for India was first enacted in 1894. This policy considered public benefit as the main objective of public forest management. It suggested the maintenance of forests in hilly areas for preservation of climatic conditions and protection of agriculture from hill torrents. The objectives of the forest policy 1894 were-

A. To preserve climatic and physical conditions of the country.
B. To preserve minimum amount of forest necessary for general well being of the country.

The other priorities of 1894 forest policy were -

1. Priority to cultivation over forestry.
2. To meet the public demands for forest produce at concessional rates on priority in comparison to revenue consideration.
3. Realization of maximum revenue after meeting the demands of local people.

1.2: NATIONAL FOREST POLICY 1952:

Indian republic formulated its first National Forest Policy in 1952. The factors that influenced the policy makers were -

Detoriating environmental conditions, world wars, dependency of defence on forest produce and reconstruction schemes on forestry.

The following needs were identified while making forest policy.

1. The need for evolving a system of balanced and complimentary land use.
2. Need for checking of denudation of mountainous regions, erosion along the tree less banks of great rivers and on vast undulating waste lands.
3. Need for establishing tree lands, to ameliorate physical and climatic conditions for general well being of the people.
4. The need for progressively increasing demands for grazing, fire wood, and small timber for agriculture implements.

5. The need for realization of revenue in continuity.

The National Forest Policy 1952 stated that the State Government can regulate, frame the policies for forest administration and legislation for conservation and utilization of forest resources, provided those policies do not adversely affect the general economy and physical balance of adjoining States and in general the Forest Policy of the Central Government.

1.3: NATIONAL FOREST POLICY 1988:

The forests have been brought to the concurrent list from the state list with the effect of 42nd amendment to the constitution of India which enables the Central Government to exercise more authority in forestry matters. This was clearly reflected in the National Forest Policy 1988. The reasons for such changes were, inadequacy of protection measures, diversion of forest lands to non forestry uses, tendency to maximum revenue realization, growing demands for timber, wood and fodder. The Forest Policy of 1988 clearly states that the forests are to be managed mainly for preservation, maintenance, sustainable utilization, restoration and enhancement of natural environments. The governing objects of National Forest Policy are as follows.

1. Maintenance of environmental equilibrium through preservation and restoration of ecological balance.
2. Conserving national heritage by preserving the remaining natural forests with the great variety of flora and fauna which represents commendable biodiversity and genetic resources of the country.
3. Checking soil erosion and desiltation in the catchment areas of rivers, lakes, reservoirs through soil and water conservation measures in order to mitigate floods, droughts and siltation of reservoirs.
4. Substantial improvement in the forests and tree cover in the country through massive afforestation, social forestry programmes specially on denuded, degraded and unproductive lands.
5. Meeting the demands for fuel wood, minor forest produce, fodder and small timber of the rural and tribal populations.

6. Increase the productivity of forest to meet essential needs of the nation.
7. Efficient utilization of forest produce by introducing modern techniques and maximum substitution of wood.
8. Ensuring massive peoples movement by creating awareness and involvement of women for achieving these objects and to minimize the dependency on existing forests.
9. The basic emphasis of the policy is on the management of existing forests and forest lands by protecting and increasing their productivity and conservation of total biological diversity by strengthening and improving network of national parks, sanctuaries, biosphere reserves and other protected areas.

The objectives of Forest Policy 1988 are as follows:

1. Restrictions on schemes and projects which interfere with the forest that cover steep slopes, catchment of rivers, lakes and reservoirs.
2. No working of forests without approval of management plans by the Central Government.
3. Exotic species are not to be introduced without long term scientific trails.
4. The rights and concessions including grazing be regulated by carrying capacity of the forests.
5. The rights and concessions for forest produce of the tribal should be protected and their domestic needs for fuel, fodder, non wood forest produce and small timber for construction should be provided on priority.
6. Forest management plans to take special care about wildlife conservation.
7. Effective action to prevent encroachment on forest land the existing encroachments should not be regularised.
8. Forest based industries should raise their raw material needed by them, making arrangement from private cultivators without depending on forests.
9. Survey of forest resources shall be completed on scientific lines for updating information.

1.4: NATIONAL FORESTRY ACTION PROGRAMME:

The Government of India has formulated National Forestry Action Plan in order to reverse the process of degradation of forests and for sustainable development of forests. It is a compressive strategic plan to address major problems of the forestry sector. The major thrust of National Forestry Action Programme is to enhance the contribution of forestry and tree resources for ecological stability and people centered development through qualitative and quantitative improvement in forest resources.

The identified issues in forestry sector:

The aim of the National Forestry Action Programme is to evolve issue based programme on the lines of provisions of National Forestry Policy 1988. It is to integrate forestry development programme in the country within the frame work of National five years plans. Under National Forestry Action Programme five inter related basic issues have been identified and these are the basis of the following programme structure.

The programme targets the rehabilitation and increase in productivity of the degraded forests and enhance in the areas of forest and tree cover to the extent of 33% of the total area of the country within 20 years. The five inter related issues identified and to be addressed in the programme are -

i. Protect existing forest resources.
ii. Improve forest productivity.
iii. Reduce total demand.
iv. Strengthen policy and institutional frame work.
v. Expand forest area.

Programme:

i. Protect existing forest resources: It has three mains of sub programmes.

1. Forest Protection
2. Soil and water conservation
3. Protected areas and biodiversity conservation.

These sub programmes include the works of forest survey, demarcation mapping, inventory, bio-diversity conservation, protected area management, stringent protection against encroachment, fires, poaching, etc.

ii. Improve forest productivity : The main sub programmes identified are -

1. Rehabilitation of degraded forests.
2. Research and technology development.
3. Development of NWFP.
4. Assisting private individuals with community participation.

These sub programmes involve main aspects of research and enrichment of planting stock, soil and water conservation, technology improvement, regeneration, rehabilitation and afforestation mainly in existing forests.

iii. Reduce total demand: The main sub programmes for the efficient usage of fuel wood, fodder, timber and NWFP.

The main aspects in this programme are technology improvement in preservation, seasoning, substitutions and other measures or efficient utilization of forest products, reduction in wastage of forest produce and also through extensive bio mass plantations.

iv. Strengthen policy and institutional frame work: The sub programmes are-

1. Central forests administration, 2. Central forestry institutions, 3. State forestry administration and institutions.

These sub programmes include development of infrastructure facilities like buildings, communication etc. and strengthen of skills of staff including Human Resources Development. These issues cover all the aspects of capacity building forest policy and litigation, public forest administration and organizational structure, research, planning and budgeting etc.

v. Expand the forest area: The two sub programmes are 1.Tree plantation on forest and outside forest lands, 2.Peoples' participation in plantation and its protection.

The aspects of extensive forestry programme in all kinds of waste lands and marginal farm lands through creation of plantation forest by taking up waste land reclamation, afforestation, promotion of agro forestry.

The basic objective of National Forestry Action Programme:

The objectives of National Forest Action Programme are as follows -

1. To achieve sustainability of the forest, productivity of forest plantations to be enhanced at least 3 to 5 cubic meter per ha, per annum, by regeneration and enrichment plantations.
2. Improvement of hygiene of the forest through perpetual silviculture practices.
3. Efforts are to be made to bring 1/3rd geographical area of the country under forests and tree cover by plantations on all category of waste lands on farm lands (Agro-forestry).
4. Expansion of protected area network and maintenance of biodiversity conservation.
5. Non forest waste lands to be planted with mostly fuel wood species as 70% of wood produced from the forest is used as fuel wood. The species of industrial wood and pulp wood may be increased in farm forestry.
6. Peoples' participation in protection and development of degraded forests and fringe forests to be strengthened.
7. Non-wood forest species to be developed and value addition may be promoted at village level.
8. Regulation of grazing in forest as per the carrying capacity and silvicultural needs.
9. Infrastructure for forest inventory, research and development to be strengthened. Human resource development should also be improved.
10. Investment for sustainable development of forest should be rational and in proportionate to the total production.
11. Supreme Court rulings and other rules of the land should scrupulously be followed.

1.5: NATIONAL WILD LIFE ACTION PLAN (2002-2016):

National Wildlife Action Plan was first adopted in 1983 and it had outlined the strategies and directions for action for wildlife conservation in the country. The action plan 1983 has been in force for a long time. In the changing scenario of the country some problems have become more acute and the new concerns have become apparent which forced a change in priorities. Increase in commercial use of natural resources growth of human population and live stock population and changes in consumption patterns are carrying greater demographic impacts. Therefore, biodiversity conservation has attained a focus of interest. The National Forest Policy was also formulated in 1988 in which priority was given to conservation hence this new national wildlife action plan was adopted.

Overview:

1. Wild Life includes all uncultivated flora and wild fauna of the nature. Every species has right to live and every species must be protected to prevent its extension.
2. Water, wilderness and wildlife are inseparably inter-linked owing to demographic, agriculture and industrial pressures. The wilderness areas which are richest repositories of wildlife and biodiversity have either shrunk or disappeared.
3. Effective ecosystem conservation is the fundamental for long term ecological and economic stability. The natural process, forest and wildlife habitats recharge aquifers, maintain water regimes and moderate impact of floods and cyclones, thereby they ensure food security and regulate climate change. They are also ensure a source of food, fodder, fuel and other products supplement the sustenance of local communities.
4. India represents 6^{th} position among 12 major biodiversity countries of the world. Conservation of biodiversity is directly linked with conservation ecosystems and thus with water and food security.

5. Planning commission has not considered the adverse ecological consequences of shrinkage and degradation of wildlife from the pressure of both human and animal population and commercialization of the forests. The situation has resulted in alarming degradation of nations' natural heritage which consists of rivers, aquifers, forests, grass lands, mountains, waste lands, coastal and marine habitats, arid lands and deserts. This has adversely effected natural phenomenon such as breeding, ranging and migration of wildlife and geo morphological features.
6. The frequency and intensity of natural disasters, plummeting fertility rate of our soils and accelerated degradation of our fresh water resources have further crippled the financial position of the nation. This situation has compelled to realign development priorities to take into account ecological imperatives including the protection of wildlife which sustain and enhance natural habitats for their survival.
7. The rural development schemes for forest dwellers and other wilderness regions have suffered both from inadequate recourses as well as in-appropriate measures. It has failed to address their very dependence upon natural biomass resources as well as shrinking and degrading resources base. The productivity in agriculture has also declined due to lack of proper support, causing impoverishment and enhanced pressure on natural resources, which resulted in greater pressure on the biomass of our forest inturn leading to wide spread alienation of people from the goals of nature conservation efforts.
8. The developmental projects such as hydroelectric dams, mines, etc. compounded the problems of wildlife conservation.
9. The habitat loss has been compounded by illegal trade which further aggravated by raising demands of wildlife products and then lucrative prices in the international market.

POLICY IMPERATIVES:

Ecological Security:

In order to maintain and protect the long term ecological security of India, the national development agenda must identify the impact of natural ecosystems from over exploitation, contamination and degradation. Moreover, to maintain long term ecological security short term economic gains must not be permitted to undermine the ecological security.

Priority to Conservation:

Priority must be assigned both at the central and the state level for conservation. The integration of conservation must be ensured in all developmental programmes evolving proper funding mechanism, enhancement of financial allocation and provision of adequate personnel with requisite experts in order to arrest further degradation and restore wildlife and its habitats.

National land use policy:

The Non Wood Forest Produce can not be implemented in isolation restricted to protected area as the wildlife is not restricted to National Park and Sanctuaries. Areas out side protected area network are often formed vital ecological corridor and these must be protected to prevent isolation of fragments of bio diversity. The policy of Land and Water use will lead to accept the imperative of strictly protecting ecologically feigned habitats as well as regulating use elsewhere.

Primacy for water and sustenance:

The water resource must be recognized as prime product of our forests and these forests must be managed to protect and optimize the hydrological systems. The National Forest Policy 1988 clearly emphasis conservation of our natural heritage in the form of natural forest, flora and fauna. A critical imperative also to recognize forest, water, land and other natural habitats as a source of survival of millions of people.

***In Situ* Conservation:**

Emphasis must be accorded to *in situ* conservation, the sheer anchor of wildlife conservation.

Ex situ measures in zoological parks and gene banks may supplement these objectives without depleting scarce wild resources.

Peoples' support for wildlife:

The local communities traditionally depend upon natural bio mass and they have first lien on such resources. These benefits are subjected to assumption of basic responsibility to protect and conserve these resources. The conservation programmes must attain to reconcile livelihood security with wildlife protection through creative zonation and by adding new protected areas in consultation with the local people such as an inviolative core, conservation buffer, community buffer and multiple use area.

Man - animal conflict:

This is the outcome of shrinkage, fragmentation and degradation of habitats which has caused destruction of wildlife and generated animosity against wild animals and protected areas which is a crucial management issue that needs to be addressed by innovative approaches.

Strategy for action:

Adopting and implementing strategies and the needs out lined above will require action for covering the following parameters.

1. Strengthen and enhancing the protected area network.
2. Effective management of protected area.
3. Conservation of wild and endangered species and their habitats.
4. Restoration of degraded habitats outside protected areas.
5. Control over poaching, taxidermy and illegal trade in wild animal and plant species.
6. Research and monitoring.
7. Human Resource Development and personnel planning.
8. Encouragement of people participation in wildlife conservation.
9. Conservation awareness and education.
10. Wildlife tourism.
11. Domestic legislation and international convention.

12. Enhancing financial allocation for ensuring fund flow to the wildlife sector.
13. Integration of national wildlife action plan with other sectoral programmes.

1.6: FACTORS INFLUENCING THE GENERAL OBJECTS OF MANAGEMENT:

The major factors influencing the objects of management are given below.

1. Forests of Pusad forest division have density of 0.1 to 0.7 which includes scrub, open forest and medium dense forests. These forests were repeatedly managed under Coppice with reserve system in the previous working plans which have resulted in degradation of forests. The status of regeneration is not satisfactory. These forests can be restored if they are restocked under different afforestation schemes coupled with soil and moisture conservation works ad strict protection from fire, grazing, illicit felling and encroachment.
2. Natural regeneration is unsatisfactory due to low site quality, excessive biotic pressure, and repeated fire incidences. Provisions for improving natural regeneration will have to be made in the plan for natural regeneration and root stock management. Artificial regeneration will be used to supplement natural regeneration in places which lack or are inadequate.
3. Teak constitutes more than 70% of crop composition; hence there is a need to improve miscellaneous species in the forests.
4. Forests capable of producing medium to large sized timber will be harvested under Selection cum Improvement management system.
5. The forest tracts constituting various catchments of various irrigation projects are subjected to soil erosion which requires intensive soil and moisture conservation works.
6. Management of forests close to villages will be given priority for meeting demands of local people for small timber, firewood, poles, fodder, NTFP etc. local people will be actively involved in forest management. JFM committees have to be given priority.

7. Patches of forests are rich in wildlife with over all distribution of wildlife in the division. Wildlife needs to be protected and conserved through habitat improvement measures and effective protection.
8. NTFP species form a substantial portion of the forest crop that contributes to a large extent to the livelihood of local people. NTFP has great potential for sustainable economic development of local communities with conservation of forest resources.
9. In this division medicinal plant diversity and its abundance needs to be documented and protected in the places of occurrence.
10. Reducing biotic pressure on forests particularly illicit felling, grazing, fire and encroachment need to be given utmost priority.
11. Boundary demarcation of forest areas will have to be done in a time bound manner with special focus on forest land under the Forest Rights Act 2006.

1.7: GENERAL OBJECTS OF MANAGEMENT:

1. To preserve and enrich the growing stock in natural forests and to restore all under stocked and degraded areas of the forest with better stocking by taking up soil and moisture conservation measures, and afforestation.
2. To preserve forest cover on hill slopes, along streams, water courses and water bodies to prevent soil erosion, check siltation and preserve catchment areas through treatment of catchment and drainage areas.
3. Suitable tending and rootstock management to stimulate growth of naturally regenerated seedlings and rootstock.
4. Preservation and improvement of forests by harvesting silviculturally available medium to large sized timber on sustainable basis and to meet the demands of local people.
5. Habitat management and protection activities for wildlife in these forests.
6. To effectively protect forests from illicit felling, uncontrolled grazing, fire, poaching and encroachment with the help of local people.

7. To document, increase the availability, production and harvest of NTFP species especially medicinal plants through sustainable means.
8. To meet the biodiversity conservation values and maintain gene pool in natural forests while providing ecological services with the active involvement of people.
9. Site specific ecodevelopment initiatives based on participatory village level microplans to improve ecological status of the area and livelihood of the local communities.

1.8: ANALYSIS AND VALUATION OF THE CROP:

SOFR unit, Amravati, has completed the enumeration of forest resources in Pusad forest division during the year 2016. The entire area of forest division was considered for sampling enumeration plan. The trees are enumerated in girth classes from 30 cm and above. The girth was scientifically measured at breast height (gbh). This data was correlated with stock maps prepared by field units and also compared with satellite imagery before the compartments were allotted to various working circles.

The statistical sampling method namely "Systematic Line Plot Sampling with Random Start" was used wisely for tree enumeration. The plot size is of 50"x50" (50 seconds x 50 seconds) *i.e.* 225 ha. In each plot, 0.1 ha plot was enumerated. The complete enumeration of trees, natural regeneration, grass and medicinal species were carried out in these plots. In the same way, qualitative measurements were also carried out. The enumeration data was analysed.

The total growing stock as per analysis of enumeration data is 434.45 out of which 317.70 is teak and 116.75 is of miscellaneous species. The results of enumeration data is given in the table below.

The comparison of growing stock reveals that the total growing stock has increased from 327.05 trees/ha (year 2004) to 434.45 trees/ha (year 2016). Out of the total number of trees, teak constituted 317.70 trees/ha while miscellaneous constituted 116.75 trees/ha which amounts to around 73% of teak. The number of teak trees has

increased (from 143.27 to 317.70 trees/ha) while the number of miscellaneous trees has decreased (from 183.78 to 116.75 trees/ha) when compared to 2016 enumeration. The increase in the number of teak trees is substantial. In teak there is an increase in the lower girth classes *i.e.* 15-30, 30-45 and 45-60 cm. In miscellaneous species, there is decrease in the lower girth classes *i.e.* 15-30 and 30-45 cm. Forest cover classes as per Status of Forest Report, 2017 (SFR,2017) is given in below table.

Table No.1.1: Forest cover classes (SFR, 2017)

Density	Area in ha.
VDF	803.39
MDF	13487.45
OF	26902.46
NF	26926.2
Scrub	569.62
Water	346.82
Total	69035.94

Details of classes of forests in different compartments are given in **Appendix-XX.**

1.9: FUNCTIONAL CLASSIFICATION OF FOREST:

The Government of Maharashtra vide G.R.No. MEP-1365/132211-Y, Dt. December 6, 1968 classified the state forest into following category.

Protection Forests:

This category consist of forest on very strip slopes, 25° and above and the forest situated along river banks, the forest that have depleted on account of maltreatment and heavy biotic pressure and further harvesting will accelerate soil erosion and affect the agriculture productivity in the lower plains adversely.

The management will aim at improvement of the forest both in quality and quantity and soil and moisture conservation measures.

Tree Forests:

This includes the forest situated in remote areas where the biotic pressure is negligible and this forest shall be capable of producing large size and commercially valuable timber and other products of economic value.

Minor Forests:

These forests are situated adjoining to cultivated lands and are subjected to heavy biotic pressure. These forests are capable of producing minor timber, fuel wood, fodder and other forest produce to fulfill the needs of local population.

Pasture Lands:

The nature of this forest is generally, highly degraded, open sparcely stocked or mostly scrub lands. These lands are unable to produce small timber but provide grazing land to local cattle population.

Miscellaneous Forests:

This category includes 1. Grass reserves, 2. Remaining areas. The grass reserves are small patches of forest situated adjoining to cultivated lands or habitats. These forests have scrub vegetation capable of producing good quality of fodder. The remaining areas in this category are needed for other works, with regard to wild life habitat most of the forest track in this division is potential habitat for many kind of wild life. Some of the areas rich in wild flora specially medicinal plants.

1.10: METHOD OF TREATMENT:

The method of treatment to be adopted is influenced by the situation and condition of forest, status of regeneration of the crop, needs of local people, availability of labour force, staff and resources. Encouragement of natural regeneration where ever present, shall be properly tended for planting operations Local tree species shall preferred and participation of local villagers in forestry operations like afforestation, protection shall be encourage. Extensive soil and moisture conservation measures shall be taken up. These forests will be effectively protected from illicit felling, encroachment, unregulated grazing and repeated forest fires.

Protection Forests:

This type of forest occurs in small and scattered patches throughout the division. These are treated under type of area ‘A’ category of the respective working circle. The patches of protection forest in Pusad, Shembalpimpri, Mahagaon, Umarkhed and Digras Ranges falling in catchment of irrigation projects proposed are to be treated under

catchment working circle. In these areas the method of treatment is extensive soil and moisture conservation works along with gap plantation wherever needed. No felling is prescribed in these areas.

Tree Forests:

This type of forests includes the better quality forests, especially of good site quality, capable of producing medium to large sized timber. These areas shall also be treated under Selection cum Improvement Working Circle. Tending of natural regeneration wherever it is adequate and areas having inadequate natural regeneration will be planted with suitable valuable species. Steep slopes will be excluded from harvesting operations but soil and moisture conservation will be taken up.

Minor Forests:

Major area of Pusad Forest division fall in this category of the forests. These forests represent mostly site quality 'IVB' and to a limited extent site quality 'IVA' dominated by teak. This type of forest generally situated in Umarkhed, Mahagaon, Shembalpimpri and Digras ranges. The well stocked forest of this category or proposed to be treated under Selection cum Improvement. These forests are capable of producing small timber and fuel wood. In this area extensive soil and moisture conservation works along with gap plantation is prescribed. Areas having sparse tree crops, open areas without tree growth and isolated small forest patches are included in the Afforestation Working Circle (AWC). In such areas the focus would be upon tending of existing natural regeneration and rootstock; in natural regeneration management, the seedlings of seed origin of desirable species will be given preference over the coppice. If natural regeneration is insufficient then it will be supplemented by seedling plantations, wherever necessary. Involvement of the local community is considered focal for management of such areas as well as afforestation of open areas and isolated patches.

Pasture Forests:

The compartments and areas close to the habitations which are unsuitable for raising timber crops due to their refractory nature, heavy biotic pressure and grass birs have been proposed to be managed under Fodder Improvement working circle.

Miscellaneous Forests:

These areas are transferred to other department in the past and yet to be denotified are proposed to be kept under miscellaneous working circle.

1.11: FORMATION OF WORKING CIRCLES:

The following working circles have been proposed based on the objects of management and methods of treatment.

1. Selection-cum-Improvement Working Circle.
2. Afforestation Working Circle.
3. Catchment Area Treatment Working Circle
4. Fodder Improvement Working Circle.
5. Miscellaneous Working Circle.

A separate chapter for each of the following has been included in the plan.

1. Non Timber Forest Produce
2. Joint Forest Management
3. Wildlife Management
4. Maintenance and enhancement of forest health and vitality.
5. Management of spiritual, cultural aspects of forests and eco-tourism.

1.12: DISTRIBUTION OF AREAS TO VARIOUS WORKING CIRCLES: The allocation of forest areas under various working circles of the current working plan has been given in the table below.

Table No.1.2: Working circles and area assigned

Sr.No.	Working Circle	Area (In ha.)	Percentage
1	Selection-cum-Improvement WC	35984.18	52.12%
2	Afforestation WC	13679.82	19.82%
3	Catchment Area Treatment WC	16414.79	23.78%
4	Fodder Management WC	1307.27	1.89%
5	Miscellaneous WC	1649.88	2.39%
	Total	**69035.94**	**100%**

Table No. 1.3: Table of comparison between previous and present plan

Sr. No.	Previous plan	Area(ha)	Proposed plan	Area(ha)
1	Selection-cum-Improvement WC	36774.54	Selection-cum-Improvement WC	35984.18
2	Afforestation WC	12297.03	Afforestation WC	13679.82
3	Catchment Area Treatment WC	17015.00	Catchment Area Treatment WC	16414.79
4	Fodder Improvement WC	1680.90	Fodder Improvement WC	1307.27
5	Miscellaneous WC	1,667.79	Miscellaneous WC	1649.88
	Total	**69435.26**		**69035.94**

1.13: PERIOD OF PLAN:

The period of plan is declaimed for 10 years from 2019-20 to 2028-29. The midterm review can be undertaken after 5 years if the situation demands and proposal moves by concerned Chief Conservator of Forests (Territorial).

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PUSAD FOREST DIVISION
SCI Working Circle

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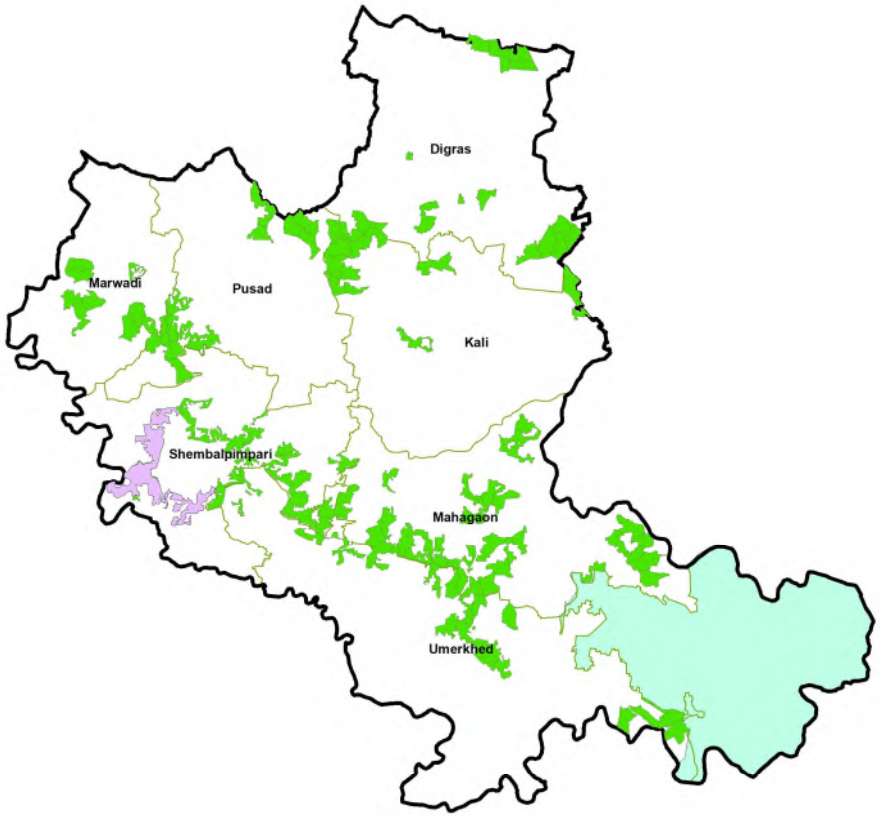

Legend

- Division boundary
- Range boundary
- Painganga WLS
- Isapur WLS
- SCI WC

CHAPTER-2

SELECTION-CUM-IMPROVEMENT WORKING CIRCLE

2.1: SELECTION-CUM-IMPROVEMENT WORKING: The area of this working circle has been marked on GIS based map of 1:150000 which is appended in the plan and a copy of the same is given in A4 size here.

2.2: GENERAL CONSTITUTION OF THE WORKING CIRCLE:

This working circle consists of areas which were earlier assigned to Coppice With Reserve, SCI, Miscellaneous, Plantation and Pasture Improvement Working Circles. The crop is uneven aged. These forests were treated under Coppice With Reserve system prior to Dinesh Kumar Tyagi and G. R. K. Rao's plan. In Dinesh Kumar Tyagi and G. R. K. Rao's plan majority of these areas were treated under Selection-cum-Improvement Working Circle. The forests are predominantly teak forests. Teak constitutes around 70% with 262 trees/ha while miscellaneous species constitute 30% with 108 trees/ha. The total forest area included in this working circle is 35984.18 ha. It constitutes 52.12% of the total forest area of the division.

2.2.1: Area allocation:

The information from enumeration data stock mapping, forest density classes from FSI and compartment wise density classes in digital format were utilized for allotment of this working circle. Forest areas with density of 0.4 and above, which can produce medium to large size timber and poles are included in this working circle. Most of the crop is of site quality IV with a few patches of site quality III. As per the enumeration data 19.46% of teak trees fall in the girth class above 75 cms.

2.2.2: Area statement: Range-wise allocation of compartments and area is shown in the table below.

Table No. 2.1: Distribution of area in SCI working circle

Sr. No.	Range	Area (ha)	No. of Compt.	Area allotted (ha)		% to the area of Range	% to the area of WC
				RF.	Total area		
1	Digras	12864.43	14	4432.14	4432.14	35.45	12.33
2	Pusad	7798.06	16	4825.61	4825.61	61.88	13.41
3	Shembalpimpri	7533.15	16	4089.14	4089.14	54.28	11.36
4	Umarkhed	10240.54	23	6543.57	6543.57	63.90	18.18
5	Mahagaon	14100.49	30	9698.20	9698.20	68.78	26.95
6	Kali D.	8934.78	10	3642.51	3642.51	40.77	10.12
7	Marwadi	7564.49	9	2753.01	2753.01	36.40	7.65
	Total	69035.94	118	35984.18	35984.18	52.12	100%

2.3: GENERAL CHARACTERISTICS OF VEGETATION:

The forests included in this working circle represent mostly teak with natural associates of miscellaneous species. As per SOFR Amravati data of 2016, the number of teak and miscellaneous trees per hectare was 262 and 108 respectively. The total number of trees per hectare was 370. The site quality conforms to IVb and IVa with some patches of site quality III. The principal species of the crop is teak with its natural associates like Dhawda, Moha, Ain, Lendia, Salai, Bhirra, Kalam, Char, etc. The distribution of Salai is common in dry locations. The crop is young to middle aged and open at some places. Teak is mostly of coppice origin and the growth is stunted and malformed which constitute about 70% of the total stock. The established regeneration is meager in number though young recruits are seen in some places. The density of the crop is between 0.4 and 0.7.

2.4: FELLING SERIES, CUTTING SECTIONS AND JFM AREAS:

Felling Series and Annual Coupes: The entire area of this working circle has been divided into 22 felling Series with an average area of 1636 ha and each felling series is further divided into 20 coupes with an average area of 82 ha. Felling cycle is fixed at 20 years. The details of annual coupes is given in **Appendix-XXI and XXII.**

2.5: BLOCKS, COMPARTMENTS AND JFM AREA (MARKED ON GIS BASED MAPS): A total of 118 compartments is allotted to this working circle. The details of compartment wise area distribution are given in the table below.

Table No.2.2: Compartments allotted to SCI working circle

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha.)
1	Digras	Arambhi	739	330.23	1400.66	4432.14
2	Digras	Arambhi	740	450.84		
3	Digras	Arambhi	741	319.71		
4	Digras	Arambhi	742	299.88		
5	Digras	Singad	344	362.21	1509.05	
6	Digras	Singad	345	315.67		
7	Digras	Singad	789	307.58		
8	Digras	Singad	798	471.72		
9	Digras	Singad	803	51.87		
10	Digras	Dolamba	328	433.03	1522.43	
11	Digras	Dolamba	329	341.57		
12	Digras	Dolamba	325	192.91		
13	Digras	Dolamba	326	257.52		
14	Digras	Dolamba	327	297.40		
15	Pusad	Jamni	360	280.86	1892.75	4825.61
16	Pusad	Jamni	361	263.43		
17	Pusad	Jamni	406	366.66		
18	Pusad	Jamni	354	316.48		
19	Pusad	Jamni	358	396.20		
20	Pusad	Jamni	362	269.12		
21	Pusad	Khandala	397	271.96	1235.55	
22	Pusad	Khandala	398	238.37		
23	Pusad	Khandala	352	315.67		
24	Pusad	Khandala	355	173.21		
25	Pusad	Khandala	357	236.34		
26	Pusad	Yeldari	399	368.68	1697.31	
27	Pusad	Yeldari	400	311.62		
28	Pusad	Yeldari	401	250.10		
29	Pusad	Yeldari	402	439.10		
30	Pusad	Yeldari	405	327.81		

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha.)
31	Marwadi	Pandhurna	390	354.92	1317.70	2753.01
32	Marwadi	Pandhurna	395	200.73		
33	Marwadi	Pandhurna	394	369.90		
34	Marwadi	Pandhurna	393	392.15		
35	Marwadi	Panhala	383	341.97	1435.31	
36	Marwadi	Panhala	384	316.47		
37	Marwadi	Panhala	388	341.97		
38	Marwadi	Panhala	824	151.61		
39	Marwadi	Panhala	389	283.29		
40	Mahagaon	Dagadthar	483	374.75	1746.25	9698.20
41	Mahagaon	Dagadthar	452	339.54		
42	Mahagaon	Dagadthar	453	367.06		
43	Mahagaon	Dagadthar	753	274.39		
44	Mahagaon	Dagadthar	754	186.97		
45	Mahagaon	Dagadthar	863	203.54		
46	Mahagaon	Ghanmukh	436	300.29	1862.84	
47	Mahagaon	Ghanmukh	437	271.96		
48	Mahagaon	Ghanmukh	438	350.47		
49	Mahagaon	Ghanmukh	441	357.35		
50	Mahagaon	Ghanmukh	442	204.78		
51	Mahagaon	Ghanmukh	448	356.14		
52	Mahagaon	Ghanmukh	752	21.85		
53	Mahagaon	Karanjkhed	760	271.15	1660.49	
54	Mahagaon	Karanjkhed	761	311.62		
55	Mahagaon	Karanjkhed	762	344.40		
56	Mahagaon	Karanjkhed	481	257.39		
57	Mahagaon	Karanjkhed	482	475.93		
58	Mahagaon	Pimpri	446	361.80	1681.52	
59	Mahagaon	Pimpri	447	340.75		
60	Mahagaon	Pimpri	451	486.85		
61	Mahagaon	Pimpri	423	492.12		
62	Mahagaon	Shirmal	478	239.99	1245.93	
63	Mahagaon	Shirmal	479	336.31		
64	Mahagaon	Shirmal	480	428.58		
65	Mahagaon	Shirmal	821	241.05		

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha.)
66	Mahagaon	Taroda	429	412.39	1501.17	
67	Mahagaon	Taroda	435	437.48		
68	Mahagaon	Taroda	428	338.41		
69	Mahagaon	Taroda	445	312.89		
70	Umarkhed	Baldi	456	213.68	1764.08	6543.57
71	Umarkhed	Baldi	457	357.35		
72	Umarkhed	Baldi	458	295.03		
73	Umarkhed	Baldi	459	254.15		
74	Umarkhed	Baldi	460	374.34		
75	Umarkhed	Baldi	461	269.53		
76	Umarkhed	Botha	496	346.83	1955.50	
77	Umarkhed	Botha	499	391.34		
78	Umarkhed	Botha	454	290.17		
79	Umarkhed	Botha	439	293.41		
80	Umarkhed	Botha	440	288.95		
81	Umarkhed	Botha	464	344.80		
82	Umarkhed	Beldari	430	285.31	1302.43	
83	Umarkhed	Beldari	431	403.49		
84	Umarkhed	Beldari	434	162.69		
85	Umarkhed	Beldari	857	69.31		
86	Umarkhed	Beldari	495	381.63		
87	Umarkhed	Pimpalgaon	519	404.29	1521.56	
88	Umarkhed	Pimpalgaon	859	82.42		
89	Umarkhed	Pimpalgaon	422	279.65		
90	Umarkhed	Pimpalgaon	455	247.70		
91	Umarkhed	Pimpalgaon	417	263.06		
92	Umarkhed	Pimpalgaon	420	244.44		
93	Shembalpimpri	Khed	764	168.60	1976.87	4089.14
94	Shembalpimpri	Khed	765	354.27		
95	Shembalpimpri	Khed	766	181.65		
96	Shembalpimpri	Khed	833	288.52		
97	Shembalpimpri	Khed	835	167.73		
98	Shembalpimpri	Khed	838	339.35		
99	Shembalpimpri	Khed	840 A	53.30		
100	Shembalpimpri	Khed	841	141.56		
101	Shembalpimpri	Khed	844	281.89		
102	Shembalpimpri	Shilona	414	19.45	2112.27	
103	Shembalpimpri	Shilona	763	234.84		

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha.)
104	Shembalpimpri	Shilona	845	242.71		
105	Shembalpimpri	Shilona	418	605.43		
106	Shembalpimpri	Shilona	419	492.52		
107	Shembalpimpri	Shilona	421	295.83		
108	Shembalpimpri	Shilona	851	221.49		
109	Kali	Kaubgaon	337	495.35	1590.85	3642.51
110	Kali	Kaubgaon	334	308.77		
111	Kali	Kaubgaon	348	465.40		
112	Kali	Kaubgaon	745	321.33		
113	Kali	Wadad	346	381.23	2051.66	
114	Kali	Wadad	347	280.05		
115	Kali	Wadad	350	418.46		
116	Kali	Wadad	351	377.59		
117	Kali	Wadad	13	479.16		
118	Kali	Wadad	50	115.17		
	Grand Total	**F.S. - 22**	**Compt. - 118**	**35984.18**	**35984.18**	**35984.18**

2.6: SPECIAL OBJECTIVES OF MANAGEMENT:

The special objects of management are:

1. To gradually replace coppice teak crop with high forest of seed origin by encouraging establishment of natural regeneration.
2. To increase the stocking of the miscellaneous species.
3. To obtain medium to large sized timber by utilizing the full potential of the site.
4. Encouraging natural regeneration assisted by artificial regeneration by introducing selected germ plasm.
5. To maintain and improve adequate soil cover in the forest areas by taking up intensive soil and moisture conservation measures on watershed basis.

2.6.1: Analysis of the crop:

Stock mapping of the area was carried out by territorial division of Pusad and was verified with the extensive enumeration data. The density map of State of the Forest Report 2016 obtained from Forest Survey of India, Dehradun has been utilized. The density of the forest in these areas was analysed and used for allotment of compartments

to this working circle. The density of the crop ranges from 0.4 to 0.7 the dominant site quality is IVa. Enumeration carried out by SOFR unit is given in the table below.

Table No.2.3: Enumeration data (girth classwise) in SCI working circle

Sr. No.	Girth Class	Teak			Others			Total	
		No.	% wrt Total teak spp.	% wrt Total stock	No.	% wrt Total Misc. spp.	% wrt Total stock.	No.	% wrt Total stock
1	15-30	48	18.32	12.97	15	13.88	4.05	63	17.02
2	31-45	44	16.79	11.89	21	19.49	5.67	65	17.56
3	46-60	73	27.86	19.72	31	28.70	8.37	104	28.09
4	61-75	46	17.55	12.43	16	14.81	4.38	62	16.81
5	76-90	30	11.47	8.1	10	9.25	2.7	40	10.8
6	91-105	12	4.58	3.24	6	5.55	1.62	18	4.86
7	106-120	7	2.67	1.89	4	3.70	1.08	11	2.97
8	121-135	1	0.38	0.27	2	1.85	0.54	3	0.81
9	136-150	1	0.38	0.27	2	1.85	0.54	3	0.81
10	>151	0	0.00	0.00	1	0.92	0.27	1	0.27
Total		262	100	70.78	108	100	29.22	370	100

Regeneration: Data on regeneration status was collected along with enumeration of the crop. The seedlings were enumerated in the following three categories as R1 upto 1 m height, R2 with 1 to 3 m height and R3 above 3 m height. The data is analysed and used to devise prescriptions for natural and artificial regeneration of forest areas. The status of natural regeneration in SCI areas as in other areas of the division is extremely poor. The total number of seedlings is 66/ha. The table of regeneration is given below.

Table No.2.4: Categories of seedlings in SCI working circle

Sr. No.	Range	No. of sample	No of seedlings/ha			Total
			R1	R2	R3	
1	Umarkhed	41	4.02	3.43	1.67	50.11
2	Digras	76	2.46	3.31	1.88	83.65
3	Shembalpimpri	56	3.31	3.71	1.92	64.95
4	Pusad	38	3.99	3.45	2.22	47.66
5	Marwadi	33	4.64	4.40	2.87	44.90
6	Mahagaon	67	3.39	2.78	3.37	76.54
7	Kali (D.)	52	3.34	2.98	3.15	61.47
	Total	363	25.15	24.07	17.08	66.29

2.6.2: Silvicultural system:

The silvicultural system is aimed at harvesting matured trees and carrying out improvement felling for removal of malformed trees. The percentage of teak improved over the years which constitute approximately 70% of the growing stock. However, miscellaneous species have not shown substantial increase in composition of the crop. Teak trees of coppice origin would be felled on priority to replace age old coppice trees with teak trees of seed origin. There would be no felling of non teak species. Silvicultural operations like CBO, thinning, cleaning are included in this system. Thinning would also be carried out to decongest natural regeneration pole crop. Natural regeneration will be given suitable treatments to regenerate the area. Areas poor in natural regeneration will be supplemented by artificial regeneration to increase productivity and density of the crop. Soil and moisture conservation works would also be taken up on watershed basis to protect and improve soil and water regime.

The SCI being the most conservative system has been applied to preserve and improve the ecological status of the forest in general. So the silvicultural system adopted is aimed at protecting and tending the seedling regeneration while creating desirable gaps to increase natural regeneration by harvesting mature trees as per silvicultural principles.

2.6.3: Rotation period : Rotation period has been fixed for 80 years.

2.6.4: Harvestable diameters:

As felling is restricted to only teak trees, harvestable girth is prescribed for teak alone. Stem analysis of teak trees of seed and coppice origin was carried out in 2018 in four compartments of Pusad forest division for determining the harvestable girth. Harvestable girth has been determined at maximum volume production as per the CAI and MAI curves in stem analysis exercises for site quality IV forests. Harvestable girth for teak trees of coppice origin is fixed at 75 cm (GBH over bark) and for teak trees of seed origin at 105 cm (GBH over bark). As the site quality III is very limited, separate

harvestable girth for site quality III is not prescribed. The harvestable girth prescribed above would be applicable to site quality III also.

2.6.5: Reducing factors and reduced areas: Not applicable.

2.6.6: Felling cycle: Felling cycle has been fixed at 20 years.

2.6.7: Division into periods and allotment to periodic block (PB): Not applicable.

2.6.8: Calculation of the yield:

Annual yield shall be regulated by area and the efforts are made for making annual coupes as equi-productive as possible. For yield calculation in Selection-cum-Improvement Working Circle was Sagreiya's modification of Brandis' formula is used. Mathematical analysis for K.P. Sagreiya`s modification of Brandis' Method of determining the maximum sustained cut of trees of exploitable size from all-aged forest is given as below:

If-

(i) The number of trees in Class I (Exploitable Girth Class) is S_1;

(ii) The number of trees in classes II, III … are $s_2, s_3, \ldots$;

(iii) The fraction of the trees of classes II, III, … that survive and are eventually available for harvesting as class trees are $x_2, x_3, \ldots$, so that $x_2\, s_2 = S_2$; $x_3\, s_3 = S_3; \ldots$

(iv) The trees take $Y_2, Y_3, \ldots$ $year_s$ in classes II, III, …, so that the average annual recruitments in the class periods are-

$S_2 / Y_2 = R_2$

$S_3 / Y_3 = R_3, \ldots$

(v) The overall average annual recruitment for the entire enumeration period, *i.e.*, $(S_2 + S_3 + \ldots.) / (Y2 + Y_3 + \ldots) = S / Y$ is say R.

(vi) The felling cycle adopted is f years and

(vii) The accruing average annual recruitment during the 1st , 2nd , …. Cycles is R', R", … , so that the recruitments, accruing in successive cycles, *i.e.* f R', f R", … are given by as follows:

$$f R' = a R_x + (f - a) R_{x+1}$$

$$f R'' = b R_y + (f - b) R_{y+1}, \ldots.$$

Then the realizable recruitments R_{r1}, R_{r2}, … in cycles I, II, …. will be

$$R_{r1} = \tfrac{1}{2} [f R' - a (R' - R_x)],$$

$$R_{r1} = \tfrac{1}{2} [f R'' - a (f R'' - R_y)], \ldots.$$

Therefore, the prescribed yield should be –

$$I/f [S_1 + f R'/2 - a (R' - R_x)/2],$$

$$I/2f [S_2 + f (R' + R''/2) - b (R'' - R_y)/2], \ldots.$$

According as the stock in hand has to be liquidated in 1, 2, … cycles , to obtain the maximum sustained yield, while the actual recruitment is still less than R.

From this it follows that if the overall annual recruitment R is to be realized on a sustained basis even while the realizable recruitment in a cycle is less than fR, there must be a stock in hand of –

$$S_I = f [R - R'/2] + a (R' - R_x)/2],$$

$$S_{II} = f [2 R - (R' + R''/2)] + b (R'' - R_y)/2], \ldots.$$

According as the deficiency continues for I, 2, 3, … felling cycles.

Regulation of yield of teak coppice trees:

The area in Selection-cum-Improvement Working Circle consists of crop of all age. The girth wise distribution of trees, years to cross the class according to stem analysis of teak tree of Site Quality – IV and selection girth fixed is 75 cm. The prescriptions for regulation of yield for teak coppice trees are narrated below.

Table No.2.5: Details of number of trees/ha in area under SCI working circle

Girth Class	Total teak trees	Non-teak trees	No. of trees of coppice origin (65%)	No. of trees of Seed origin (35%)
16-30	48	15	31. 20	16. 80
31-45	44	21	28. 60	15. 40
46-60	73	31	47.45	25. 55
61-75	46	16	29. 90	16. 10
76-90	30	10	19. 50	10. 50
91-105	12	6	7. 80	4. 20
106-120	7	4	4. 55	2. 45
>121	2	5	1. 30	0. 70
Total	262	108	170. 30	91. 70

In the table above, details of teak and non teak tress per hectare are given based on enumeration data (2016). As the forests were repeatedly worked under CWR system previously, the crop has a considerable stock of coppice origin. For the purpose of calculating yield of coppice trees, it is assumed that 65% of the teak stock consists of coppice origin.

Class	Girth Class (cm)	Years in class	Symbol
A	**B**	**C**	**D**
	>91		
I	76-90		
II	61-75	14	Y_2
III	46-60	12	Y_3
IV	31-45	10	Y_4
V	16-30	9	Y_5
Total enumeration period		45	Y

The number of years required by teak trees (of coppice origin) to switch over to next higher girth class is worked out based on stem analysis and graphical curves of age and diameter. For example teak trees of 16 cm girth at breast height (diameter 5.1 cm) will take 9 years to attain that diameter. Teak trees of 30 cm girth (diameter 9.6 cm) will take 18 years for attaining that diameter. Therefore, the number of years teak trees remain in 16-30 girth is 9 years (18-9=9). The same principal can be applied to all girth classes to know the period (years) taken by teak trees to switch over to next higher girth class. In the above table column A, class-I symbol is given for the teak trees in girth class of harvestable girth and above, which is based on enumeration data. Next lower girth is named as class-II and next girth class-III and so on.

The percentage of trees of different girth classes that will attain harvestable girth and silviculturally available for removal will be as below:

Class	Girth Class	Trees/ ha	% of trees available as Class I	Symbol	Trees available as Class I	Symbol
A	B	C	D	E	F	G
	>91	13.65	-	-	-	-
I	76-90	19. 50	-	-	-	-
II	61-75	29. 90	65. 21%	X_2	19. 49	S_2
III	46-60	47. 45	41. 03%	X_3	19. 49	S_3
IV	31-45	28. 60	68. 19%	X_4	19. 49	S_4

V	15-30	31. 20	62 50%	X_5	19. 50	S_5
	Total	170.30			77. 97	S

In the table above, in column C the number of trees present in a girth class is given based on enumeration data. The trees in class-I of 76-90 and above girth class are not considered here because the trees in this girth class are above harvestable girth and it is the stock in hand for harvesting. In column D percentage of trees available as a class-I in future are given based on the number of trees to be available in column C and F. As the total number of class-II trees above harvestable girth are 19.49 (61-75 girth class) which means that out of 29.90 trees in class-II, 19.49 trees will switch over to above harvestable girth and the percentage 65.21% in column E the symbol X_2, X_3 etc. is given for the percentage of trees available as class-I in future corresponding D. In column G, symbol S_2, S_3 etc. is given for number of trees available as class-I in future from each girth class (class-III, class-IV, class-V) as given in column F. In column G at the bottom S indicates the total number of trees available as class-I in future from all girth classes.

For the period Y (45 years) the total recruitment is S, the mean yearly recruitment R is S/Y

R = 77.97/45

=1.73 per ha

The average annual recruitment per ha during each girth class period namely, $S_2/Y_2=R_2$, $S_3/Y_3=R_3$ will be as given in table below.

Class	Girth Class in cm	No of trees / ha	Years in class	Symbol	Annual recruitment to next class	Symbol
A	B	C	D	E	F	G
	>91	13. 65	-	-	-	-
I	76-90	19. 50	-	-	-	-
II	61-75	29. 90	14	Y_2	1.39	R_2
III	46-60	47. 45	12	Y_3	1. 62	R_3
IV	31-45	28. 60	10	Y_4	1. 62	R_4
V	15-30	31. 20	9	Y_5	2.16	R_5
Total		170. 30	45	Y	1.73	R

In the table above the column F is obtained by the formula S_2/Y_2, S_3/Y_3, S_4/Y_4, S/Y which gives annual recruitment to the next class. In column G, R_2, R_3 etc. indicate annual

recruitment to next girth class corresponding to figures in column F and R indicates average recruitment to next girth class.

There is stock in hand 33.15 trees /ha (class-I) and there will be recruitment of 77.97 trees/ha in 45 years and thus, theoretically annual yield is : 77.97 + 33.15/45 = 2.46 trees / ha, assuming that the existing stock is to be distributed uniformly, that total class-I trees available at the end of the first year will be only (S_1+ R_2) per ha.

Of these, all the S_1 (existing class-I trees) will be available for removal, but when felling proceed from one end of the annual area to the other, only half of the recruitment of $R_2/2$ trees that will come into class-I in one year over the whole coupe will be realizable. Remaining trees will be passing into class-I thereafter. In other words the total realizable yield from the coupe (No. of trees per ha) will be (S_1 + $R_2/2$). Similarly for 2nd coupe, before felling commences it will have S_1 trees and also one year's recruitment namely R_2 trees, all of which will be available for removal. Besides this, in coupe I half of the year's recruitment $R_2/2$ will also be available. Thus, in 2nd coupe trees available per ha would be (S_1+R_2+$R_2/2$) and so on.

Thus, for one hectare area of each coupe, realizable and accumulating class-I trees for entire felling cycle would be as given in table below.

Sr. No.	Coupe No.	For coupe area in ha	nth year of operation	Class-I at hand= S_I	Realizable Recruitment = (n-½) R_2	Accruing Recruitment=
1	I	1	1	33.15	½R_2 = 0.69	19R_2 + ½ R_2 = 27.22
2	II	1	2	33.15	R_2 + ½ R_2 = 2.08	18R_2 + ½ R_2 = 25.71
3	III	1	3	33.15	2R_2 + ½ R_2 = 3.47	17R_2 + ½ R_2 = 24.32
4	IV	1	4	33.15	3R_2 + ½ R_2 = 4.86	16R_2 + ½ R_2 = 22.93
5	V	1	5	33.15	4R_2 + ½ R_2 = 6.25	15R_2 + ½ R_2 = 21.54
6	VI	1	6	33.15	5R_2 + ½ R_2 =7.64	14R_2 + ½ R_2 =20.15
7	VII	1	7	33.15	6R_2 + ½ R_2 = 9.03	13R_2+ ½ R_2 = 18.76
8	VIII	1	8	33.15	7R_2 + ½ R_2 =10.42	12R_2 + ½ R_2= 17.37
9	IX	1	9	33.15	8R_2 + ½ R_2 = 11.81	11R_2+ ½ R_2 =15.98
10	X	1	10	33.15	9R_2 + ½ R_2 =13.20	10R_2+ ½ R_2 =14.59
11	XI	1	11	33.15	10R_2+ ½ R_2 =14.59	9R_2 + ½ R_2 =13.20
12	XII	1	12	33.15	11R_2+ ½ R_2 =15.98	8R_2 + ½ R_2 = 11.81
13	XIII	1	13	33.15	12R_2 + ½ R_2= 17.37	7R_2 + ½ R_2 =10.42
14	XIV	1	14	33.15	13R_2+ ½ R_2 = 18.76	6R_2 + ½ R_2 = 9.03

15	XV	1	15	33.15	$14R_2 + ½ R_2 = 20.15$	$5R_2 + ½ R_2 = 7.64$
16	XVI	1	16	33.15	$15R_2 + ½ R_2 = 21.54$	$4R_2 + ½ R_2 = 6.25$
17	XVII	1	17	33.15	$16R2 + ½ R_2 = 22.93$	$3R_2 + ½ R_2 = 4.86$
18	XVIII	1	18	33.15	$17R_2 + ½ R_2 = 24.32$	$2R_2 + ½ R_2 = 3.47$
19	XIX	1	19	33.15	$18R_2 + ½ R_2 = 25.71$	$R_2 + ½ R_2 = 2.08$
20	XX	1	20	33.15	$19R_2 + ½ R_3 = 27.22$	$½R_2 = 0.69$
	Total	20	20	33.15	278.02	278.02
			Average	33.15	13.90	13.90

Thus overall average number of trees per ha above selection girth will be 33.15+13.90+13.90=60.95. Out of which available for selection felling would be 33.15+13.90=47.05. Percentage removal would be 47.05/60.95x100=77.19. Following the guidelines of Government of India regarding the removal of 50% of normal available yield can be harvested. Accordingly number of trees for felling on average per hectare annually (40% of 47.05) = 18.82 say 19 tees per hectare. Volume conversion factor of teak in girth class 76-90 for timber=0.179m^3. Average annual yield per hectare (19x0.179) = 3.401m^3. Total average annual yield (21590 ha x 3.401)/20=3671.37 say 3671m^3.

Regulation of yield of teak trees of seed origin:

The harvestable girth is fixed at 120 cm at breast height over bark. As the forests were repeatedly worked under CWR system previously, the crop has a considerable stock of coppice origin. For the purpose of calculating yield of seed origin teak trees, it is assumed that 35% of the teak stock is of seed origin. The details of teak trees in various girth classes are given below.

Table No.2.6: Details of teak stock, period required by trees to switchover to next girth class per ha

Class	Girth Class	Total no.of trees per ha, as per enumeration data	Total no.of trees of seed origin per ha out of trees in col.3	years required to shift to next girth class (seed origin)	corresponding symbol for figures in col.5
I	>121	2	0.76	0	Y_2
II	106-120	7	2.67	35	Y_3
III	91-105	12	4.58	33	Y_4
IV	76-90	30	11.45	30	Y_5
V	61-75	46	17.55	15	Y_6
VI	46-60	73	27.86	10	Y_7
VII	31-45	44	16.79	9	Y_8
VIII	16-30	48	18.32	8	Y_9

	Total	262	99.8	140	Y

Table No.2.7: Details of trees available in different girth classes for harvesting per ha

Class	Girth Class	Trees/ ha	% of trees available as class I in future	symbol corresponding figures in col.4	Trees available as class I in future	Symbol for corresponding figures in col.6
I	>120	0.76	0	X_2	0	0
II	106-120	2.67	28.46%	X_3	0.76	S_2
III	91-105	4.58	16.59%	X_4	0.76	S_3
IV	76-90	11.45	6.63%	X_5	0.76	S_4
V	61-75	17.55	4.33%	X_6	0.76	S_5
VI	46-60	27.86	2.72%	X_7	0.76	S_6
VII	31-45	16.79	4.52%	X_8	0.76	S_7
VIII	15-30	18.32	4.14%	X_9	0.76	S_8
	Total	99.8		X	5.32	S

Table No.2.8: Details of teak trees- annual recruitment to next girth class per ha

Class	Girth Class in cm	No of trees / ha	Years in class	Symbol	Annual recruitment to next class	Symbol
I	>121	0.76	0			
II	106-120	2.67	35	Y_2	0.022	R_2
III	91-105	4.58	33	Y_3	0.023	R_3
IV	76-90	11.45	30	Y_4	0.025	R_4
V	61-75	17.55	15	Y_5	0.051	R_5
VI	46-60	27.86	10	Y_6	0. 076	R_6
VII	31-45	16.79	9	Y_7	0.084	R_7
VIII	15-30	18.32	8	Y_8	0.095	R_8
	Total	99.8	140	Y	0.038	R

Table No.2.9: Calculation of yield number of trees per ha for 20 year felling cycle

Sr. No.	Coupe No.	For coupe area in ha	Nth year of operation	Class I at hand= S_I	Realizable Recruitment = (n-½) R_2	Accruing Recruitment=
1	I	1	1	0.76	½R_2 = 0.011	19R_2 + ½ R_2 =0.429
2	II	1	2	0.76	R_2 + ½ R_2 = 0.033	18R_2 + ½ R_2 =0.407
3	III	1	3	0.76	2R_2 + ½ R_2 = 0.055	17R_2 + ½ R_2 = 0.385
4	IV	1	4	0.76	3R_2 + ½ R_2 = 0.077	16R_2 + ½ R_2 =0.363
5	V	1	5	0.76	4R_2 + ½ R_2 = 0.099	15R_2 + ½ R_2 = 0.341
6	VI	1	6	0.76	5R_2 + ½ R_2 =0.121	14R_2 + ½ R_2 =0.319
7	VII	1	7	0.76	6R_2 + ½ R_2 = 0.143	13R_2+ ½ R_2 = 0.297
8	VIII	1	8	0.76	7R_2 + ½ R_2 =0.165	12R_2 + ½ R_2= 0.275
9	IX	1	9	0.76	8R_2 + ½ R_2 = 0.187	11R_2+ ½ R_2 =0.253
10	X	1	10	0.76	9R_2 + ½ R_2 =0.209	10R_2+ ½ R_2 =0.231

11	XI	1	11	0.76	$10R_2$+ ½ R_2 =0.231	$9R_2$ + ½ R_2 =0.209
12	XII	1	12	0.76	$11R_2$+ ½ R_2 =0.253	$8R_2$ + ½ R_2 = 0.187
13	XIII	1	13	0.76	$12R_2$ + ½ R_2= 0.275	$7R_2$ + ½ R_2 =0.165
14	XIV	1	14	0.76	$13R_2$+ ½ R_2 = 0.297	$6R_2$ + ½ R_2 = 0.143
15	XV	1	15	0.76	$14R_2$ + ½ R_2 =0.319	$5R_2$ + ½ R_2 =0.121
16	XVI	1	16	0.76	$15R_2$+½ R_2 =0.341	$4R_2$ + ½ R_2 =0.099
17	XVII	1	17	0.76	16R2+ ½ R_2 =0.363	$3R_2$ + ½ R_2 = 0.077
18	XVIII	1	18	0.76	$17R_2$+ ½ R_2= 0.385	$2R_2$ + ½ R_2 =0.055
19	XIX	1	19	0.76	$18R_2$ + ½ R_2= 0.407	R_2 + ½ R_2 =0.033
20	XX	1	20	0.76	$19R_2$+ ½ R_3 = 0.429	½R_2 = 0.011S
	Total	20	20	0.76	4.40	4.40
			Average	0.76	0.22	0.22

Average no. of trees per ha above harvestable girth of 120 cm --0.76+0.22+0.22 =1.20

Average no. of trees available for selection felling per ha = 0.76+0.22 = 0.98

Percentage removal = 0.98x100 /1.20 = 81.66%

Following the guidelines of GOI for removal of 50% of normal yield, the average annual yield (number of trees) per ha = 40.83% of 0.98 = 0.40 trees per ha

Volume conversion factor of teak for girth class 121-135 (Umarkhed range) = 0.451

Average annual yield (volume) per ha = 0.40x0.451=0.180 m^3

Total average annual yield for area under SCI WC= (21590 ha x 0.180/20) = 194.31 say 194 m^3.

2.6.9 : Table of Felling : The abstract of the table of felling is shown in **Appendix No.XXII**

2.6.10: Method of executing the felling:

2.6.10.1: Agency of harvesting: Demarcation of coupes and marking of trees for felling will be carried out by the department to meet silvicultural and technical requirements. Felling of trees, logging and haulage of the felled material will be carried out either by department or by Forest Labour Co-operative Society (FLCS) as per the existing Government directives. Silvicultural operations like cut-back operation, cleaning, thinning etc. and other regeneration activities after main felling of the coupes will be carried out by the Forest department.

2.6.10.2: Demarcation: The main annual coupes due for felling will be demarcated one year in advance except coupe number one due for working in which demarcation and

marking will be carried out in the same year of working. Demarcation and marking will be carried out as per the prescriptions in miscellaneous regulations. The coupes will be divided into sections for effective control over various operations like felling, extraction and other treatments. Each section shall not exceed more than 20 ha.

2.6.10.3: Preparation of treatment map: After demarcation of the coupes, a treatment map will be prepared by the RFO and it will be verified by the ACF emphasizing for the areas of promising natural regeneration, site suitable for plantation and the area which need soil and moisture conservation works. The treatment map shall be approved by the DCF after having detailed discussion with concerned RFO and ACF and field inspection. The treatment map shall be prepared with proper care and all the features must be shown on the treatment map.

The treatment map shall indicate the following details:

1. Category "A"- Protection areas: It shall include the following areas:

i. Areas with steep slopes *i.e.* more than 25°.
ii. 20 m wide strip on either side of perennial water courses (water courses in which water remains till month of December 31st).
iii. Eroded or liable to erosion areas.
iv. The area which directly drain into water reservoirs of the irrigation or drinking water projects.

2. Category "B"- Under stocked area: This includes area with crop density less than 0.4 or total blank areas and the area shall not be less than 2 ha in extent at one place. Under stocked areas can be categorised into 2 types:

- **B1-type**: Open forests (density < 0.4) with natural regeneration.
- **B2-type:** Open forests (density < 0.4) without natural regeneration.

3. Category "C"- Areas of old plantations and pole crop: This category includes the patches of pole crop and natural regeneration suitable for retention as future crop of both teak and miscellaneous patches. It also includes old plantations, the extent of which shall be minimum one ha at one place.

4. Category "D"- Well stocked areas: The areas having crop density more than 0.4 shall be considered as well stocked areas.

Coupe area and enumeration: Treatment maps shall be prepared on graph paper in 1:5000 scale. Laying of grids shall be done after demarcation of A, B, C and D type areas. Grids of one hectare shall be laid down. Grids shall be laid down using GIS software such as q-GIS. Grid wise record of enumeration, marking and felling shall be maintained. In the remarks column of marking register, reasons for marking such as mature, teak trees of coppice origin or seed origin, dead, malformed, live high stump, etc. will be recorded. Enumeration of all trees above 15 cm above GBH shall be carried out in D type areas. With respect to teak trees enumeration, the details of seed origin or coppice origin shall be recorded in D type areas. Grid wise details shall be maintained for enumeration.

Treatment: Different types of treatments are prescribed and adopted for these categories of areas are as under:

1. **Category – A or protection areas:** No felling is prescribed. Harvesting of standing trees (dead or alive) is prohibited in A type areas. Appropriate soil and moisture conservation measures shall be caries out.
2. **Category – B or under stocked areas:**

Treatments recommended for B-type areas: Preference will be given to natural regeneration and proper treatment will be given to the crop considering the existence of seedlings or rootstock in the areas. Identification of important valuable seedlings of seed and coppice origin shoots is essential. Seed based natural regeneration should be marked with red band and seedlings raised from coppice shoots should be marked with yellow band. ACF and RFO should ensure proper identification. Model estimate for three years for tending of natural regeneration and coppice shoots shall be prepared and approved by competent authority. Plantation register will be maintained in the lines of AR areas. All such sites selected for tending of natural regeneration including rootstock and coppice management shall be geo-referenced on digital maps in the division by taking GPS readings of each grid. These grids may be compared later with satellite imagery of the division for any change in the vegetation cover. A proper record in the form of natural

regeneration register should be maintained at the range level and division level regarding all activities of regeneration. Records such as register, number of seedlings identified, cleaned saplings, maps, GPS readings, operations, photographs etc. should be maintained on a regular basis. All entries should be made in the relevant coupe control forms and compartment history forms. Tending of natural regeneration of valuable species in the B-type will be carried out as follows:

A. Natural regeneration management in B1-type Areas: Following treatments are prescribed for B1-type areas:

Tending of natural regeneration (of seed origin): All seedlings and saplings (of seed origin) of valuable species, more than 60 cm. 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. Spacing out operation will be in favour of valuable species and species rarely found in the area. Natural regeneration shall be assisted and encouraged by soil working and mulching around them, in the following manner.

a) First year operations: Weeds in one-meter diameter around saplings of valuable species should be cleared during the first week of July. Uprooted weeds, grasses and leaf-litter should be mixed in the upper layer of soil as the organic mulch and facilitate loosening and aeration of the soil by worms and insects. One soil working should be carried out in October.

b) Second year operations: The soil working in October will be repeated in the following year. However, one scrap weeding of one-meter diameter should be carried out in the first week of August around the shoots of seedling coppice within the rootstock management area.

c) Third year operations: Singling of coppice shoots, management of damaged and malformed saplings, climber cutting and shrub clearance should be repeated as third year operations.

Singling of coppice shoots: 1 to 2 healthy and promising coppice shoot will be retained on the stumps and the rest will be removed. Such coppice shoots should also be

close enough to the ground so that it will not topple after gaining volume and weight and would be able to subsequently develop root system of its own. However, coppice shoots interfering with promising saplings of seed origin or coppice of valuable species shall be removed.

Coppice management of damaged and malformed saplings: The saplings and poles of 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, causing erosion and leading to soil loss. Poles having at least 2.50 meter of clean bole will not be treated as malformed.

B. Artificial regeneration in B2-type areas: Plantations will not be taken up in SCI areas unless a minimum of 5 hectares of clear open patch fit for plantation is available in an annual coupe. The choice of species will be decided as per the site. Teak and valuable mixed local spp. should be given preference in the plantation. Stump planting of Teak should be taken only in well drained areas with clear open patches.

C. Soil and moisture conservation works: Required soil and moisture conservation works will be carried out as per site requirement. Prescriptions in miscellaneous regulations will be followed.

Category – C: No plantation will be done in these areas. Thinning shall be done in the young pole crop as per the stand table. Marking rules have been mentioned subsequently.

Category – D: No Plantation will be done in these areas. Felling will be carried out as prescribed under marking rules.

2.6.10.4: Marking techniques:

Marking will be done under close supervision of ACF with guidance of DCF concerned. The DCF will himself inspect as many coupes as possible and impart proper guidance and instruct the staff so as to avoid any deviations of the prescription of the treatment.

Marking will be done along with the work of coupe demarcation, one year in advance of the main felling.

Marking technique and prescriptions described in the chapter of the Miscellaneous Regulations shall be followed, with required modifications described in the following paragraphs.

i. Marking shall be carried out under the close supervision of the RFO and under guidance of ACF concerned. DCF shall inspect the coupes to ensure proper marking and to guard against excessive marking, if any.
ii. The following rules shall be observed strictly for marking in different types of areas.

A-type areas (Protection areas): No tree shall be marked for felling.

B-type areas (Under stocked areas):

1. All dead and diseased trees shall be marked, retaining 2 dead trees/ha as snags and dens.
2. All live high stumps shall be marked and cut close to the ground.
3. Malformed seedlings shall be cut back. All multiple coppice shoots; retaining one promising shoot, shall be marked.

C-type areas (Congested group of young poles):

1. All dead and diseased and malformed trees shall be marked.
2. Multiple shoots shall be reduced to 1 per stool retaining the vigorous one.
3. Young poles will be marked for thinning to remove congestion. The spacing between two adjacent poles shall be approximately equal to 1/3rd of the crop height and/or to bring down stem number as per the yield table.
4. The thinning shall be carried out on the silvicultural principles with the help of stand table. The following prescriptions should also be followed for thinning operations.
    a. Age and site quality of crop shall be ascertained.
    b. Wedge Prism of suitable factor (generally for young crop, middle aged crop, prism with factor one is convenient) shall be used and basal area per ha of crop is obtained by averaging 3 or 4 counts at various representative sites.

c. The basal area as obtained above shall be compared with basal area given in the stand table and if the basal area is more than that of given in stand table for corresponding age and site quality, the crop is suitable for thinning.

d. The additional basal area required to be removed from those girth classes which are having more number of trees as compared to the stand table.

e. Care should be taken to remove the poles of coppice origin first while retaining the poles of seedling origin.

5. Unwanted undergrowth interfering or likely to interfere, the seed based natural regeneration of Teak and other valuable species, shall be removed.

D-type areas:

1. The marking for felling shall be carried out as per the marking rules.
2. No miscellaneous species including fruit and NTFP shall be marked.
3. All the climbers except those of NTFP values shall be cut.
4. Multiple coppice shoots or poles shall be marked to reduce, one per stool retaining the most vigorous one.
5. All dead, malformed trees shall be marked for felling leaving 2 dead trees per ha for wildlife. A tree shall be considered as malformed if it does not have clear standing bole exceeding 2.5 metres from ground level. Malformed trees having clear straight bole exceeding 2.5 metres height from ground shall not be marked for felling.
6. The silviculturally available teak trees of coppice origin with harvestable girth of 75 cm at GBH and above shall be marked for felling. A tree is considered silviculturally available when (a) removal will not lead to soil erosion; (b) removal shall create appropriate gap for improvement of young seedlings; (c) alternate trees for seed source is available.
7. The silviculturally available teak trees of seed origin with harvestable girth of 105 cm at GBH and above shall be marked for felling.
8. The felling of teak trees shall be from highest girth class to the next lower girth class.

9. The undesirable undergrowth which is preventing or likely to prevent the establishment and growth of seedling regeneration of the desired species will be removed.

2.6.10.5: Soil and moisture conservation works:

The forest of Pusad division suffered from frequent fires, heavy biotic pressure and excessive cattle movement resulted in compaction of soil, poor soil aeration and poor drainage. These soil conditions are not conducive to establish regeneration. All soil and moisture conservation works shall be carried out on watershed basis. The soil and moisture conservation works will be taken up along with marking operation and completed before on set of monsoon. The soil and moisture conservation works are to be based on the requirement of site. These works will be taken up after preparation of a detailed treatment map of the area and model of soil and moisture conservation measures duly sanctioned by the competent authority. To bring about conducive site conditions for establishment of seedlings, the soil and moisture conservation like contour trenches, nala bunding, cement plugs etc. can be taken up.

Prescriptions in miscellaneous regulations shall be followed for soil and moisture conservation works.

2.6.11: Subsidiary silvicultural operations:

CBO: The cut back operations will be carried out one year after the main felling of the coupes. The following prescriptions are given to carry out these operations.

1. The badly damaged trees during the main felling shall be felled.
2. Cutting of the climbers except those of known medicinal or NWFP value.
3. All left over established multiple coppice shoots and the poles will be reduced to one per stool.
4. Newly raising multiple teak coppice shoots will be reduced to two per stool retaining the most promising ones.
5. The trees marked for felling but left out during the main felling shall be felled.

Cleaning: It shall be carried out during the 6th year of the main felling as per the following prescriptions.

1. Climbers cutting shall be undertaken except those known for medicinal and NTFP value.
2. Multiple coppice shoots shall be reduced to one or removed it found interfering with the establishment of natural regeneration.
3. The established natural regeneration of teak shall be thinned for appropriate space.
4. All the inferior species including undesirable undergrowth interfering or likely to interfere with growth and development of seedling of teak and other valuable species (Including medicinal and NTFP) will be cut back.

2.6.12: Regeneration:

Natural regeneration: The young regeneration of seed origin are noticed in patches of both teak and miscellaneous species and usually die before getting established due to edaphic conditions resulted due to excess biotic pressure and recurrent fires.

To increase the development and establishment of natural regeneration and to induce the natural regeneration, the prescriptions given below shall be followed.

1. The areas containing promising natural regeneration shall be identified inside the coupe.
2. The undesirable undergrowth which is preventing or likely to hinder the establishment and development of regeneration of seed origin of the desired species will be removed.
3. The identification patches of natural regeneration should be rigidly protected from fire, grazing and other biotic interference.
4. The coppice shoots of both teak and miscellaneous species interfering with the young seedlings shall be removed.
5. The young seedlings shall be treated with soil working and soil mulching in each year in first 3 years after main felling. The soil and moisture conservation works shall be taken up in such identified patches if needed.

6. The natural regeneration should be cleared-off weeds within the diameter of one meter and these weeds, grasses, leaf litter, leaves, twigs and branches will be spread in a 15 cm. high layer all around the seedlings within the cleared area so that it will act at as organic mulch. 2 or 3 spade full of soil to each plant shall be added over it to keep it in place. So that it will keep the soil around the plants free from weeds as well as helping proper aeration of the soil by worms and insects. Apart from this, mulching small stones around the current year seedlings shall be arranged in the areas where stones are available.

Artificial regeneration and choice of species:

Supplemented to the natural regeneration, artificial regeneration is prescribed as per the site requirement. The choice of species shall be based on site conditions. In this context it is preferred to select the species of indigenous, naturally occurring and of proven fodder, fruit, non-wood forest produce. The species shall be selected in consultation with local people or the members of JFMC. Some of indigenous and preferred species are Arjun, Dhawda, Bel, Behda, Bamboo, Chinch, Jamun, Apta, Anjan, Biba, Hirda, Kulu, Shivan, Tiwas, Ber, Amba etc. In general, in the plantations 50% teak and 50% miscellaneous species shall be raised. Bamboo can be planted along the streams. The seedlings so raised from source of seed origin preferably obtained from known source especially from plus trees of high forests.

Method of planting: In the areas of plantation the spacement will be 2 x 2 mtr. For planting teak stumps alignment and stocking will be carried out and stumps will be planted. For root trainer teak seedlings, pit size of 30 x 30 x 30 cms will be used for planting. Saplings of miscellaneous species will be planted in pits of size of 45 x 45x 45cm.

Weeding and casualty replacement: Three weedings are prescribed in 1st year, 2 weedings in 2nd year and 1 weeding in 3rd year. Casualty replacement, if necessary, shall be carried out in 1st and 2nd year to the extent of 20%. One soil working shall be undertaken in October in the first and second year.

While digging pits care should be taken not to dig pit in the shadow of standing tree or 2 meter of existing established seedlings. The standing trees are having influence zone of spreading shadow and pits should not dig either in the shadow or in the influence

zone of a standing tree. Influence zone for various size trees may be taken as given in the table below:

Table No.2.10: Table showing the zone of influence

Sr. No.	Girth Class (Cm)	Influence zone (m)
1	<30	2
2	30-60	3
3	60-90	4
4	90-120	5
5	>120	6

2.6.13: Associated regulations and measures:

Fire protection: The main felling coupes shall be fire traced and rigidly protected from fire for a period of 5 years. The fire tracing activities shall be completed by 15th of February to avoid fire hazards to standing crop as well as to the natural regeneration. Effective protection against fire shall be undertaken for a period between February 15 to June 15 to ensure survival and establishment of natural regeneration of all species for developing it into the future growing stock.

Grazing: The coupe of main felling will be closed to grazing till cleaning operations in the 6th year.

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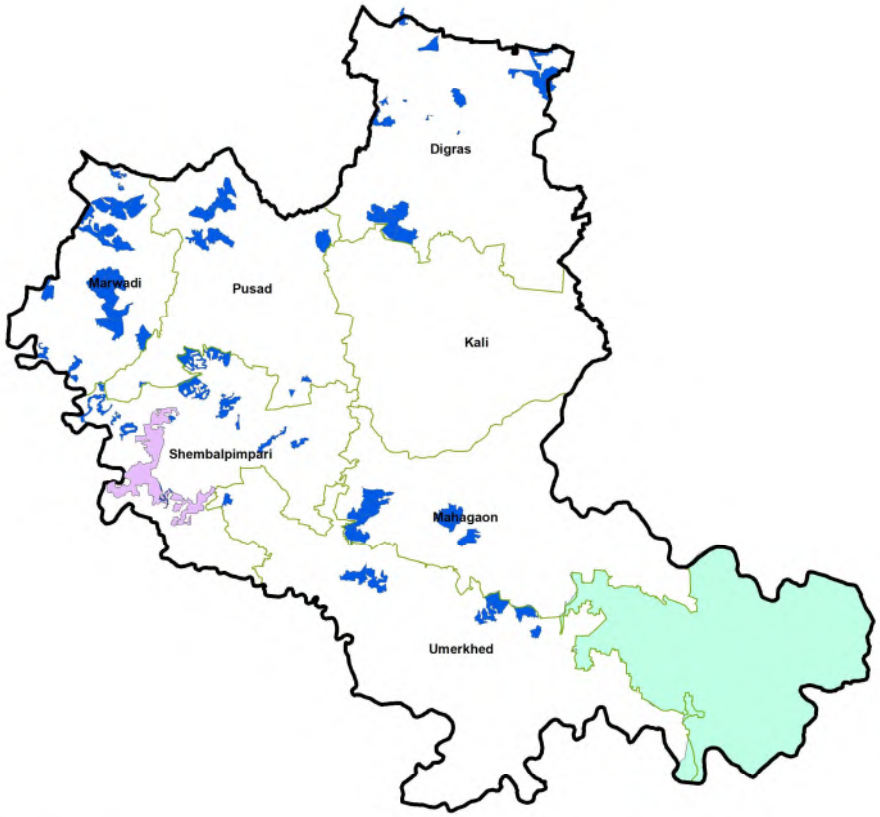
PUSAD FOREST DIVISION
Catchment Area Treatment Working Circle

1:150,000



Legend

- Division boundary
- Range boundary
- Painganga WLS
- Isapur WLS
- Catchment Area Treatment WC

CHAPTER 3

CATCHMENT AREA TREATMENT WORKING CIRCLE

3.1: NAME OF WORKING CIRCLE (CLEARLY MARKED ON GIS BASED MAPS (1:50000):

The area of this working circle has been marked on GIS based map of 1:150000 scale is appended and a copy of the same is given in A4 size here.

3.2: GENERAL CONSTITUTION OF THE WORKING CIRCLE:

This working circle includes the forest areas falling in the catchment areas of different major, medium and minor irrigation projects and also drinking water projects which are directly draining into the reservoirs and water bodies. The 'C' class reserve forest falling in the catchment areas of irrigation and drinking water projects having the area more than 200 Ha. The forest areas included in this working circle were managed under coppice with reserve, plantation, improvement, pasture, fodder reserve and miscellaneous working circles in the past. In D. K. Tyagi and G. R. K. Rao's plan these forest were managed under catchment area treatment working circle. The extent of area included in this working circle is 16414.79 ha, which constitutes around 23.78% of the division area.

Table No. 3.1: Distribution of area in catchment area treatment WC

Sr. No.	Range	Area (ha)	No. Of Compt.	Area allotted (ha.)		% to area of range	% to area of WC
				RF	Area		
1	Digras	12864.43	17	3598.57	3598.57	28.97	21.92
2	Pusad	7798.06	10	1848.30	1848.30	23.70	11.26
3	Shembalpimpri	7533.15	15	2391.37	2391.37	31.74	14.57
4	Umarkhed	10240.54	7	1784.29	1784.29	17.42	10.87
5	Mahagaon	14100.49	7	2206.02	2206.02	15.64	13.44
6	kali D.	8934.78	0	0	0	0	0
7	Marwadi	7564.49	17	4586.24	4586.24	60.62	27.94
	Total	69035.94	73	16414.79	16414.79	23.78%	100%

3.3: GENERAL CHARACTERISTICS OF VEGETATION:

These forests are well stocked in some patches and are under stocked with open patches in other areas. The 'C' class reserve forest assigned to this working circle is mainly of open type with little or no vegetation. Most of these areas represent stunted

tree crop, which falls in the local sub type of “poor quality teak forest or degraded scrub forest.” The principal species is Teak along with its natural associates such as Ain, Dhawda, Salai, Char, Tendu, etc. The soil is compact with little soil moisture and poor aeration. Natural regeneration is scanty and young regeneration of Teak and its major associates are noticed in many compartments in patches but they die back without getting established. Poor soils, heavy biotic pressure, recurrent fires are mainly responsible for poor natural regeneration in these forests. The density of the forest varies from 0.1 to 0.7 and the crop mostly young to middle age. The site quality in general confirms to IV B.

3.4: FELLING SERIES, CUTTING SECTION AND JFM AREAS:

Felling series and annual coupe: The working circle has been divided into 14 working series and each working series is divided 20 annual coupes. The details of felling series and coupes is given in **Appendix - XXIII and XXIV.**

3.5: BLOCKS, COMPARTMENTS AND JFM AREAS:

There are 73 compartments included in this working circle distributed over 6 ranges. The details of the compartments allotted are given in the table below.

Table No.3.2: Allotment of the compartments to various felling series in catchment treatment working circle

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha)
1	Digras	Digras Chondi	339	344.07	1414.87	3598.57
2	Digras	Digras Chondi	769	129.23		
3	Digras	Digras Chondi	772	186.50		
4	Digras	Digras Chondi	773a	38.40		
5	Digras	Digras Chondi	773b	9.32		
6	Digras	Digras Chondi	774	219.51		
7	Digras	Digras Chondi	775	13.78		
8	Digras	Digras Chondi	776	205.59		
9	Digras	Digras Chondi	785	268.47		
10	Digras	Harshi	340	361.80	1106.83	
11	Digras	Harshi	779	484.46		
12	Digras	Harshi	780	147.00		

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha)
13	Digras	Harshi	782	113.57		
14	Digras	Sakhri	341,	341.16	1076.87	
15	Digras	Sakhri	342	231.49		
16	Digras	Sakhri	343	217.73		
17	Digras	Sakhri	781	286.49		
18	Pusad	Ansing	365	267.61	819.22	1848.30
19	Pusad	Ansing	366	288.55		
20	Pusad	Ansing	370	263.06		
21	Pusad	Boradi	368	333.88	1029.08	
22	Pusad	Boradi	369	270.74		
23	Pusad	Boradi	827	17.34		
24	Pusad	Boradi	828	32.02		
25	Pusad	Boradi	829	31.06		
26	Pusad	Boradi	830	24.33		
27	Pusad	Boradi	353	319.71		
28	Marwadi	Brahmangaon	822	107.84	1735.47	4586.24
29	Marwadi	Brahmangaon	823	30.27		
30	Marwadi	Brahmangaon	376	214.10		
31	Marwadi	Brahmangaon	377	333.47		
32	Marwadi	Brahmangaon	378	288.15		
33	Marwadi	Brahmangaon	380	417.24		
34	Marwadi	Brahmangaon	381	344.40		
35	Marwadi	Panhala	382	218.94	1349.67	
36	Marwadi	Panhala	385	379.61		
37	Marwadi	Panhala	386	351.68		
38	Marwadi	Panhala	387	399.44		
39	Marwadi	Marwadi(BK)	391	395.80	1501.10	
40	Marwadi	Marwadi(BK)	392	372.73		
41	Marwadi	Marwadi(BK)	379	174.83		
42	Marwadi	Marwadi(BK)	396	268.73		
43	Marwadi	Marwadi(BK)	831	179.74		
44	Marwadi	Marwadi(BK)	832	109.27		
45	Mahagaon	Senad	424	343.18	1358.17	2206.02
46	Mahagaon	Senad	425	365.85		
47	Mahagaon	Senad	426	302.31		
48	Mahagaon	Senad	427	346.83		
49	Mahagaon	Marsul Mudana	443	240.80	847.85	

Sr. No.	Range	Felling Series	Compartment allotted	Area (ha.)	Total area of the W.C.	Total area allotted from each Range (ha)
50	Mahagaon	Marsul Mudana	444	341.57		
51	Mahagaon	Marsul Mudana	450	265.48		
52	Umarkhed	Dhansal-I	432	292.74	722.35	1784.29
53	Umarkhed	Dhansal-I	433	332.89		
54	Umarkhed	Dhansal-I	751	96.72		
55	Umarkhed	Piranji Nignoor	462	268.72	1061.94	
56	Umarkhed	Piranji Nignoor	463	352.90		
57	Umarkhed	Piranji Nignoor	465	274.39		
58	Umarkhed	Piranji Nignoor	466	165.93		
59	Shembalpimpri	Aamdari	409	278.43	1188.84	2391.37
60	Shembalpimpri	Aamdari	410	56.25		
61	Shembalpimpri	Aamdari	411	162.28		
62	Shembalpimpri	Aamdari	837	204.26		
63	Shembalpimpri	Aamdari	842	109.04		
64	Shembalpimpri	Aamdari	843	46.91		
65	Shembalpimpri	Aamdari	846	99.27		
66	Shembalpimpri	Aamdari	415	14.46		
67	Shembalpimpri	Aamdari	834	16.55		
68	Shembalpimpri	Aamdari	836	201.39		
69	Shembalpimpri	Dhansal	403	288.56	1202.53	
70	Shembalpimpri	Dhansal-II	404	371.11		
71	Shembalpimpri	Dhansal-II	407	454.07		
72	Shembalpimpri	Dhansal-II	408	48.97		
73	Shembalpimpri	Dhansal-II	839	39.82		
	Grand Total	F. S. - 14	Comp - 73	16414.79	16414.79	16414.79

3.6: SPECIAL OBJECTS OF MANAGEMENT:

1. Intensive soil and moisture conservation works to check the soil erosion and to arrest runoff in forest catchment areas.
2. Effective drainage treatment to check flow of silt into reservoirs.
3. To preserve and increase vegetal cover through appropriate measures that will enhance ground water table

3.6.1: Analysis of the crop :

Stock mapping was done by staff of territorial division and satellite imageries and density maps of FSI were used for verification of stock maps. The enumeration of the forest was undertaken by the SOFR unit of Amravati and the data obtained is analyzed. The result of same is given below.

Table No. 3.3: Enumeration data in catchment area treatment WC

Sr. No.	Girth Class	Teak			Others			Total	
		No.	% wrt total teak spp.	% wrt total stock.	No.	% wrt total misc spp.	% wrt total stock.	No.	% wrt total stock
1	15-30	62	14.15	9.81	29	14.94	4.58	91	14.39
2	31-45	120	27.39	18.98	77	39.69	12.18	197	31.16
3	46-60	95	21.68	15.03	36	18.6	5.69	131	20.72
4	61-75	61	13.92	9.65	21	10.82	3.32	82	12.97
5	76-90	59	13.47	9.33	15	7.73	2.37	74	11.7
6	91-105	24	5.47	3.79	5	2.57	0.79	29	4.58
7	106-120	11	2.51	1.74	7	3.6	1.19	18	2.93
8	121-135	5	1.19	0.79	1	0.51	0.15	6	0.94
9	136-150	1	0.22	0.15	1	0.51	0.15	2	0.3
10	>151	0	0	0	2	1.03	0.31	2	0.31
	Total	**438**	**100**	**69.27**	**194**	**100**	**30.73**	**632**	**100**

3.6.2: Silvicultural system:

The areas allotted to this working circle are those which fall in the catchment limitations of different irrigation projects and these areas shall be completely protected irrespective of its crop density, composition, etc. No felling shall be carried out in the area except removal of dead trees only. Natural regeneration shall be boosted with appropriate tending operations and supplemented by artificial regeneration with suitable species, wherever required to increase the vegetation cover in the catchment areas. The healthy coppice regeneration will be retained depending upon the site requirement and quality of coppice. Suitable soil and moisture conservation measures along with the afforestation must be taken up in order to prevent further soil erosion, siltation of reservoirs and to enhance the ground water level.

3.6.3: Rotation period: Not applicable.

3.6.4: Harvestable diameters: Not applicable.

3.6.5: Reducing factors and reduced areas: Not applicable.

3.6.6: Felling cycle: Not applicable.

3.6.7: Division into periods and allotment to periodic block (PB): Not applicable.

3.6.8: Calculation of yield: No yield is expected from these areas. The coupes will be laid in such a way so that equal area is made available for each year for drainage and other treatments.

3.6.9: Table of felling : Not applicable.

3.6.10 : Method of executing the felling : Not applicable.

3.6.11: Subsidiary silvicultural operations : Not applicable.

3.6.12 : Regeneration : Not applicable.

3.6.13: Associated regulations and measures:

Fire Protection: The coupes and main plantation shall be fire traced and the rigid fire protection measures shall be undertaken. The areas will remain closed to grazing for the period of 5 years from the year of planting. Fire tracing and fire protection works shall be done as per fire management plan.

3.6.14: Method of treatment:

For the purpose of treatment the forest areas of this working circle shall be divided into following categories.

Category A: Protection Areas: Steep slopes above 25°, erosion prone areas and 20 m on both the side of perennial water course.

Category B: Under Stocked Areas: Areas with density less than 0.4.

Category C: Pole Crop and Old Plantation Areas: The established natural regeneration with pole crop and old plantation areas with area of one hectare in extent at one place are included in this category.

Category D: Well stocked areas: Areas having crop density more than 0.4 are included in the type. The treatment map shall be prepared by the Range Forest Officer and verified by ACF.

The various treatments proposed for the above mention areas are as follows.

Category A: Harvesting of standing trees (dead or alive) is strictly prohibited in A-type areas. Soil and moisture conservation work shall be taken up on watershed basis. Soil and moisture conservation works shall be taken up as mentioned in miscellaneous regulations.

Category B: No felling is prescribed in 'B' type areas. Soil and moisture conservation shall be taken as given in miscellaneous regulations. Teak and suitable miscellaneous species shall be planted in the gap areas as per site requirement while taking plantations, indigenous naturally occurring species of fodder, fruit and non timber forest produce shall be preferred. Species such as Teak, Arjun, Dhawda, Chinch, Jamun, Ber, Apta, Anjan, Biba, Bamboo, Behada, Hirda, etc shall be planted. Tending of rootstock will be carried out as follows:

Singling of coppice shoots: One healthy and promising coppice shoot will be retained on the stumps and the rest be removed. However, coppice shoots interfering with promising saplings of seed origin should be removed. Such coppice shoots should also be close enough to the ground so that it would not topple after gaining volume and weight and would be able to develop root system of its own subsequently.

Coppice management of damaged and malformed saplings: The saplings and poles of 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 m of clean bole will not be treated as malformed.

Tending of natural regeneration: All seedlings and saplings of valuable species more than 1 metre height will be nursed as future crop. The natural regeneration operation should give priority to non-Teak species and Teak of seed origin and shall be assisted and encouraged by soil working and mulching around them, in the following manner.

(a) First year operations: Weeds in one-meter diameter around saplings of valuable species shall be cleared during the first week of July. Uprooted weed, grasses and leaf-litter shall 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 will be carried out in October.

(b) Second year operations: The soil working in October will be repeated in the following year.

(c)Third year operations: Singling of coppice shoots, management of damaged and malformed saplings, climber cutting and shrub clearance shall be repeated as third year operations.

Category C: No plantations will be taken up in these areas. Marking for thinning shall be done in the young pole crop and the old plantation to bring about appropriate spacing as per stand table.

Category D: No felling except dead trees removal and no plantations shall be undertaken. Two dead trees per hectare shall be retained for snags and dens. Singling and spacing out will be carried out among saplings of teak and other valuable species. Natural regeneration shall be encouraged by soil working and mulching around them.

Marking Rules: The coupes will be demarcated one year in advance of the working. Marking will be done by an officer not below the rank of Range Forest Officer. In the category B and D all the dead trees will be marked except 2 trees per ha which will act as snags and dens for wild life. Marking for thinning in category C areas shall be done as per the stand table. No marking shall be done for removal of any tree except mentioned above.

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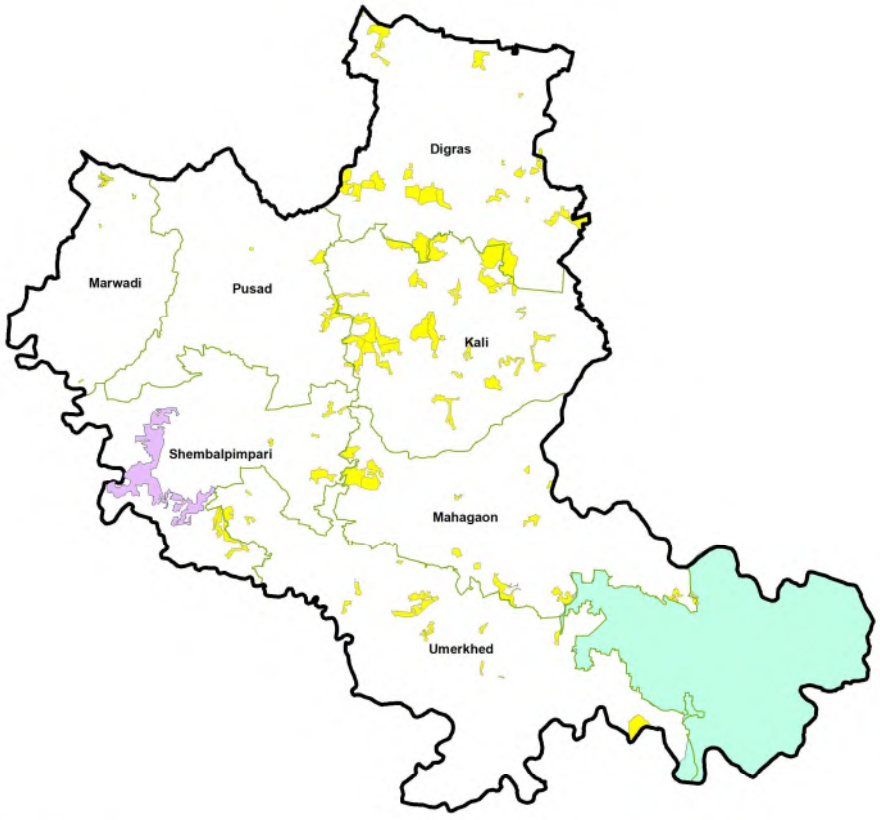
PUSAD FOREST DIVISION
Afforestation Working Circle

1:150,000



Legend

- Division boundary
- Range boundary
- Painganga WLS
- Isapur WLS
- Afforestation WC

CHAPTER 4

AFFORESTATION WORKING CIRCLE

4.1: AFFORESTATION WORKING CIRCLE: The area of this Working Circle has been marked on the GIS based map of 1:150000 which is appended in the plan and a copy of the same is given on A4 size here.

4.2: GENERAL CONSTITUTION OF THE WORKING CIRCLE:

This working circle comprises of open forests having density less than 0.4 with sparse vegetation and shrubby growth. It also includes areas of the 'C' class reserve forest outside the catchments areas of various of irrigation projects. The areas which were managed under miscellaneous working circle, coppice with reserve, pasture improvement, plantation and fodder reserve working circle of past management plans. The areas which were included in afforestation working circle of D. K. Tyagi and G. R. K. Rao's working plan. The areas having density of less than 0.4, open, degraded and understocked areas have been included in this working circle.

4.2.1: Area allocation:

The information from enumeration data, stock mapping, forest density classes from FSI and compartment wise density classes in digital format were utilized for allotment of this working circle. Forest areas with density of less than 0.4 with inadequate natural regeneration are included in this working circle. Areas of protected forests and unclassed forests are also included in this working circle. A total of 13679.82 ha is included in this working circle which constitutes 19.82% of the division area. The range-wise allocation of compartments and area is shown in the table below:

Table No. 4.1: Distribution of area in Afforestation WC

Sr. No.	Range	Area (ha)	No. of Compt.	Area allotted (ha)				% to the area of range	% to the area of WC
				RF	PF	UF	Total area		
1	Digras	12864.43	25	3803.91	0	0	3803.91	29.57	27.80
2	Kali D.	8934.78	25	4726.92	231.07	0	4957.99	55.49	36.24
3	Mahagaon	14100.49	13	1400.98	0	184	1584.98	11.24	11.59
4	Marwadi	7564.49	5	116.93	0	11.19	128.12	1.69	0.94
5	Pusad	7798.06	5	533.79	0	0	533.79	6.85	3.90
6	Shembalpimpri	7533.15	8	790.36	0	0	790.36	10.49	5.78
7	Umarkhed	10240.54	19	1820.78	0	59.89	1880.67	18.36	13.75
Total		69035.94	100	13193.67	231.07	255.08	13679.82	19.82%	100%

4.3: GENERAL CHARACTERISTICS OF VEGETATION:

The areas which are allotted to this working circle in general are under stocked and open with crop density less than 0.4. However some of the better stocked patches are also noticed in some compartments. The site quality is poor which represents from IV A to IV B. Teak constitutes as the major species along with its principal associates such as Ain, Dhawda, Char, Tendu, etc. in these forest areas. The soil is compact with little or no soil moisture or sub soil moisture and highly impoverished due to heavy grazing pressure. Natural regeneration is poor. The young recruits of Ain, Teak and Dhawda are observed in many compartments but they die back without getting established. Due to heavy grazing, establishment of natural regeneration is inadequate.

4.4: FELLING SERIES, CUTTING SECTIONS AND JFM AREAS:

Felling Series and Annual Coupes: The entire area of this working circle has been divided into 15 working Series with an average area of 912 ha. and each working series is further divided into 20 coupes with an average area of 46 ha. The details of felling series and annual coupes is given in **Appendix - XXV and XXVI.**

4.5: BLOCKS, COMPARTMENTS AND JFM AREA (MARKED ON GIS BASED MAPS): A total of 100 compartments is allotted to this working circle. The details of compartment wise area distribution are given in the table below.

Table No.4.2: Compartments allotted to Afforestation working circle

Sr. No.	Range	Working Series	Compartments allotted	Area (ha)	Total area of the W.S.	Total area allotted from each Range (ha)
1	Digras	Amala-Tuptakali	777	207.47	573.86	3803.91
2	Digras	Amala-Tuptakali	778	13.23		
3	Digras	Amala-Tuptakali	786	132.69		
4	Digras	Amala-Tuptakali	787	90.48		
5	Digras	Amala-Tuptakali	788	129.99		
6	Digras	Vithala	799	176.56	731.27	
7	Digras	Vithala	800	331.65		
8	Digras	Vithala	801	223.06		
9	Digras	Chichpad	338	372.73	737.9	
10	Digras	Chichpad	770 A	265.13		
11	Digras	Chichpad	770 B	18.00		

Sr. No.	Range	Working Series	Compartments allotted	Area (ha)	Total area of the W.S.	Total area allotted from each Range (ha)
12	Digras	Chichpad	771 A	64.82		
13	Digras	Chichpad	771 B	17.22		
14	Digras	Hiwalni-A	330	395.80	939.93	
15	Digras	Hiwalni-A	790	107.50		
16	Digras	Hiwalni-A	791	109.22		
17	Digras	Hiwalni-A	792	48.72		
18	Digras	Hiwalni-A	53	82.77		
19	Digras	Hiwalni-A	557	195.92		
20	Digras	Sakhra	802	79.66	820.95	
21	Digras	Sakhra	804	199.92		
22	Digras	Sakhra	805	119.22		
23	Digras	Sakhra	806	119.88		
24	Digras	Sakhra	807	285.27		
25	Digras	Sakhra	770C	17.00		
26	Pusad	Aregaon	811	30.63	533.79	533.79
27	Pusad	Aregaon	825	178.66		
28	Pusad	Aregaon	826	193.38		
29	Pusad	Aregaon	354A	119.82		
30	Pusad	Aregaon	360A	11.30		
31	Shembalpimpri	Dhanaj	840 B	14.56	790.36	790.36
32	Shembalpimpri	Dhanaj	847	18.25		
33	Shembalpimpri	Dhanaj	848	59.08		
34	Shembalpimpri	Dhanaj	852	194.91		
35	Shembalpimpri	Dhanaj	865	18.57		
36	Shembalpimpri	Dhanaj	849	11.04		
37	Shembalpimpri	Dhanaj	861	388.40		
38	Shembalpimpri	Dhanaj	862	85.55		
39	Mahagaon	Botha	819	32.37	1584.98	1584.98
40	Mahagaon	Botha	820	105.73		
41	Mahagaon	Botha	866	20.80		
42	Mahagaon	Botha	850	275.90		
43	Mahagaon	Botha	853	265.87		
44	Mahagaon	Botha	854	262.39		
45	Mahagaon	Botha	855	169.98		
46	Mahagaon	Botha	445A	24.50		
47	Mahagaon	Botha	450A	69.20		
48	Mahagaon	Botha	442A	40.00		

Sr. No.	Range	Working Series	Compartments allotted	Area (ha)	Total area of the W.S.	Total area allotted from each Range (ha)
49	Mahagaon	Botha	sur 147	184.00		
50	Mahagaon	Botha	868	45.58		
51	Mahagaon	Botha	869	88.66		
52	Umarkhed	Ambali-Warudbibi	757	70.82	753.17	1880.67
53	Umarkhed	Ambali-Warudbibi	758	303.61		
54	Umarkhed	Ambali-Warudbibi	759	168.80		
55	Umarkhed	Ambali-Warudbibi	856	38.52		
56	Umarkhed	Ambali-Warudbibi	858	42.99		
57	Umarkhed	Ambali-Warudbibi	860	128.43		
58	Umarkhed	Tembhi-Pimpalgaon	497	384.46	1127.50	
59	Umarkhed	Tembhi-Pimpalgaon	867	59.89		
60	Umarkhed	Tembhi-Pimpalgaon	870	15.00		
61	Umarkhed	Tembhi-Pimpalgaon	432A	59.51		
62	Umarkhed	Tembhi-Pimpalgaon	434A	15.23		
63	Umarkhed	Tembhi-Pimpalgaon	870	23.38		
64	Umarkhed	Tembhi-Pimpalgaon	870	16.38		
65	Umarkhed	Tembhi-Pimpalgaon	757A	20.00		
66	Umarkhed	Tembhi-Pimpalgaon	872 (P-I, II, III)	100.00		
67	Umarkhed	Tembhi-Pimpalgaon	460A	30.00		
68	Umarkhed	Tembhi-Pimpalgaon	461A	7.15		
69	Umarkhed	Tembhi-Pimpalgaon	462A	36.50		
70	Umarkhed	Tembhi-Pimpalgaon	463A	360.00		
71	Kali (D)	Hiwalni	808	34.89	1855.99	4957.99
72	Kali (D)	Hiwalni	747	142.85		
73	Kali (D)	Hiwalni	748	88.22		
74	Kali (D)	Hiwalni	795	126.67		
75	Kali (D)	Hiwalni	796	138.90		
76	Kali (D)	Hiwalni	797	402.23		
77	Kali (D)	Hiwalni	331	516.40		
78	Kali (D)	Hiwalni	793	241.26		
79	Kali (D)	Hiwalni	794	164.57		

Sr. No.	Range	Working Series	Compartments allotted	Area (ha)	Total area of the W.S.	Total area allotted from each Range (ha)
80	Kali (D)	Kasola-Malegaon	333	339.14	1044.61	
81	Kali (D)	Kasola-Malegaon	335	369.49		
82	Kali (D)	Kasola-Malegaon	809	335.98		
83	Kali (D)	Sawana-Injani	332	221.05	916.02	
84	Kali (D)	Sawana-Injani	814	95.70		
85	Kali (D)	Sawana-Injani	815	151.41		
86	Kali (D)	Sawana-Injani	816	190.31		
87	Kali (D)	Sawana-Injani	817	40.89		
88	Kali (D)	Sawana-Injani	818	216.66		
89	Kali (D)	kali (D)	746	322.54	1141.37	
90	Kali (D)	kali (D)	794A	35.10		
91	Kali (D)	kali (D)	797Part-I	13.10		
92	Kali (D)	kali (D)	808 P	173.38		
93	Kali (D)	kali (D)	810	186.19		
94	Kali (D)	kali (D)	812	276.94		
95	Kali (D)	kali (D)	813	134.12		
96	Marwadi	Marwadi	380A	8.93	128.12	128.12
97	Marwadi	Marwadi	sur 58	9.00		
98	Marwadi	Marwadi	sur 59	2.19		
99	Marwadi	Marwadi	822A	100.00		
100	Marwadi	Marwadi	831A	8.00		
	Grand Total :-	Felling series - 15	Comp - 100	13679.82	13679.82	13679.82

4.6: SPECIAL OBJECTS OF MANAGEMENT:

The special objects of management are:

1. To increase vegetative cover, improve quality and composition of the area by tending to natural regeneration and supplementing with plantations.
2. To improve soil condition by taking up suitable soil and moisture conservation measures.
3. To meet the local demand for fuel wood, fodder and NTFP requirements along with better employment opportunities.

4.6.1: Analysis and valuation of the crop:

Stock mapping of the area was carried territorial staff of Pusad forest division and was verified with the extensive enumeration data. The density map of Status of the Forest Report 2017 obtained from Forest Survey of India, Dehradun has been utilized. The density of the forest in these areas was analysed and used for allotment of compartments to this working circle. The density of the crop is less than 0.4. Enumeration was carried out by SOFR unit, Amravati. The data was analysed and the results are given in the table below.

Table No.4.3: Enumeration data (girth classwise) in Afforestation working circle

Sr. No.	Girth Class	Teak			Others			Total	
		No.	% wrt total teak	% wrt Total stock.	No.	% wrt Total Misc. spp.	% wrt Total stock.	No.	% wrt Total stock
1	15-30	22	22.44	11.16	22	22.22	11.16	44	22.32
2	31-45	33	33.7	16.75	28	28.28	14.29	61	31.04
3	46-60	17	17.34	8.62	33	33.33	16.75	50	25.37
4	61-75	15	15.3	7.61	10	10.11	5.07	25	12.68
5	76-90	7	7.14	3.55	5	5.05	2.53	12	6.08
6	91-105	2	2.04	1.01	1	1.01	0.50	3	1.51
7	106-120	1	1.02	0.50	0	0.00	0	1	0.50
8	121-135	1	1.02	0.50	0	0	0	1	0.50
9	136-150	0	0	0	0	0	0	0	0
10	>151	0	0	0	0	0	0	0	0
	Total	98	100	49.70	99	100	50.30	197	100

4.6.2: Silvicultural system:

The main limiting factors for the establishment of seedlings in this area are insufficient sub soil moisture, highly compact soil structure and heavy biotic pressure. Top soil has been washed away in a vast area since there is no significant vegetation. As a result these areas do not have even adequate soil depth and porosity to support the tree crop, therefore intensive soil and moisture conservation measures shall be undertaken in these areas. Tending of existing rootstock, saplings, coppice shoots, supplemented by plantations are the main activities in this working circle. A two phase approach has been prescribed for these areas.

Phase I: Restorative phase:

The duration of this phase will be minimum one year. Survey and demarcation, soil and moisture conservation works along with complete protection by digging TCM or fencing shall be undertaken in this phase. Nala bunding works and other appropriate soil and moisture conservation works shall be taken up on watershed basis. Contour trenches, deep CCT depending upon the site requirement shall be undertaken as prescribed in the miscellaneous regulations. Singling and cut back operations shall be carried out in order to improve rooted sock in the area.

Phase II: Productive phase:

The duration of this phase shall be of 5 years immediately after the completion of restorative phase. The RFO shall inspect the area and prepare the treatment map in the 2nd year. The RFO shall prepare the treatment map with the features of crop density, soil type, topography and natural regeneration areas of one hectare at one place and above features shall invariably be shown on the treatment map. The treatment map shall indicate about the treatment proposed to be given grid wise. Minor repairs of soil and moisture conservation works shall also be undertaken if necessary. PPO work shall be undertaken from 2nd year onwards.

4.6.3: Rotation period: Not applicable.

4.6.4: Harvestable diameters: Not applicable.

4.6.5: Reducing factors and reduced areas: Not applicable.

4.6.6: Felling cycle: Not applicable.

4.6.7: Division into periods and allotment to periodic block (PB): Not applicable.

4.6.8: Calculation of the yield: No yield is prescribed for this working circle.

4.6.9: Table of felling : Not applicable.

4.6.10: Method of executing the felling:

4.6.10.1: Demarcation: The annual felling coupe shall be demarcated one year in advance.

Preparation of the treatment map: After the demarcation of the coupe a treatment map will be prepared by the Range Forest Officer and it shall be verified by the Assistant Conservator of Forests emphasizing the suitability of sites for plantation, as well as the promising natural regeneration of areas. The following categories of area shall be shown distinctively in the treatment map.

1. **Category A:** Protection areas: It shall include the following areas.
    - Area with steeps slope *i.e.* more than 25°
    - 20 m wide strip on either side of perennial water courses (water courses in which water remains till month of December 31st).
2. **Category B:** Under stocked areas: Includes areas with crop density less than 0.4 and exceeding 5 hectares and above at one place.
3. **Category C:** Pole crop and old plantation areas: It includes pole crop of established regeneration of teak and other species suitable for retention as future crop in addition to old plantations. The survival of old plantation will be to the extent of not less than 1 hectare at one place.
4. **Category D:** Well stocked areas: It includes the areas crop density more than 0.4.

Treatments: Various treatments proposed for deferent categories of the areas are as under:

1. Category A: No felling is prescribed. The soil and moisture conservation works shall be carried out on watershed basis as given in the Chapter on miscellaneous regulations.

2. Category B: Soil and moisture conservation works shall be carried out in order to increase the productivity of the soil and to check soil erosion. Teak and other species shall be planted in the under stocked areas, where the area exiting 5 hectare and above in extent at one place as per requirements of site. No standing tree shall be marked for felling except dead trees retaining at least 2 trees/ha.

3. Category C: No plantations shall be carried out in this area. Marking for thinning shall be done in the young pole crop as well as in old plantations to create appropriate spacing as per the stand table.

4. Category D: No planting will be done in these areas. Felling will be done as prescribed in marking rules.

4.6.10.2: Marking rules:

Marking techniques: Marking techniques for felling of the trees is discussed in the chapter on Miscellaneous Regulations.

Marking rules: Marking will be carried out by the Range Forest Officer and under the guidance of Assistant Conservator of Forests concerned. The Deputy Conservator of Forests will himself inspect as many as coupes as possible to give proper guidance and instructions to the staff and also to have check against excess marking if any. The marking rules of various categories of areas are as under:

1. Category A: No tree will be marked for felling.
2. Category B:
    - No tree will marked for felling.
    - All live high stumps shall be cut back.
    - Multiple coppice shoots and poles will be reduced to one per stool retaining the vigorous one.
    - The unwanted under growth which is preventing or likely to prevent the development of seedling regeneration of the desired species will be removed.
3. Category C:
    - The congested young poles will be marked for thinning to reduce the congestion by bringing down the number of poles per ha. as per the yield table.
    - The dead, dying, disease and malformed poles will be marked first for thinning. The multiple poles will also be thinned retaining one most promising pole for stool.
    - Appropriate care shall be taken to retain the poles of seedling origin while removing poles of coppice origin.

- Congested crop in the old plantation areas will also be marked for thinning retaining the number of trees per ha as prescribed in the stand table.

4. Category D:

   - Marking will be done to reduce the number of stems or poles to one per stool retaining the most promising one in entire multiple coppice teak crop.
   - All live high stumps shall be cut back..
   - All the dead trees shall be marked for felling retaining 2 per hectare.

4.6.11: Subsidiary silvicultural operations : Not applicable.

4.6.12: Regeneration:

Natural regeneration:

Natural regeneration of teak and other species, through noticed in same patches at certain place usually die before getting established due to highly compact soil structure coupled with bad drainage, aeration, high incidence of cattle grazing and recurrent fires. To help young recruits of teak and other species to establish develop natural regeneration, the following prescriptions shall be adopted:

1. Identification of the areas containing promising natural regeneration shall be done inside the coupe.
2. The undesirable undergrowth which is preventing or likely to prevent the development of natural regeneration of the desired species shall be removed.
3. Identification of patches of natural growth and shall rigidly protected from the fire and grazing and suitable thinning and tending will be carried out coppice shoots which interfering with the development young natural seedlings shall be removed. A little opening up top of canopy by felling of marked trees and the ground cover at some places shall boost in establishment of natural regeneration of teak and other species by providing better light and aeration.

4. Natural regeneration should be cleared of weeds within the diameter of one meter and these weeds, grasses, leaf litter, twigs, leaves and branches shall be spread in 15 cm. high layer all around the seedlings within the cleared area to provide organic mulch. Two or three spread full of earth shall be thrown to the mulch in place. Therefore, it will keeps the soil around the plants free from weeds as well as help securing the loosening and aeration of the soil by worms and insects. In addition, stone mulching shall be done around the current year recruits in the areas where surface stones are available. Small stones shall be arranged in a circle closed around the very young seedlings which will help in retention of surface moisture as well as avoid accidental trampling by cattle or others.
5. These areas shall be protected from biotic interference as well as from recurring fires. Natural regeneration shall be supplemented with artificial regeneration in the under stocked areas.

Artificial regeneration:

In areas where natural regeneration is not sufficient, open or blank areas, plantation with suitable species shall be taken up under artificial regeneration. The number of seedlings to be planted is to be decided on the basis of soil conditions, rainfall and temperature. The choice of species to be planted will depend on the suitability of site.

Preplanting operations:

PPO will be carried out one year before actual planting work is to be taken up. The planting stock in nurseries should be in good condition. The planting stock must have different species and should be healthy with sufficient height and hardy enough to be planted. The seeds for raising nursery stock shall be from known sources preferably from plus trees of high forests and certified seeds.

Choice of species: The choice of species will be based on climatic and edaphic conditions and also preference of local community. The native species that occur naturally, and of proven fodder grasses, fruit, non wood forest produce and some of the timber species

shall be preferred. Some of the species like Teak, Neem, Dhawda, Arjun, Babul, Khair, Nilgiri, Glyricidia, Jamun, Bel, Apta, Anjan, Biba, Bamboo, Behada, Hirda etc. can be planted. Palatable grass species like Sheda, Paunya and Marvel shall be preferred. Bamboo can be planted along the nalas. Better planting stock shall be ensured and the area of plantation is closed either by TCM or fencing. It is advisable that on the mound of TCM a row of suitable fast growing thorny species shall be planted along with Agave bulbils.

First year operations:

Planting shall be completed within a fortnight from the outbreak of monsoons. The teak seedlings or stumps shall be planted after first monsoon showers. Polybag plantation will be taken in case of miscellaneous species.

Weeding and casualty replacement:

The weeding shall be done in the first year as per following schedule.

1st weeding : by end of July

2nd weeding : by beginning of September

3rd weeding : by mid of October

Casualty replacement shall be carried out along with 1st weeding.

Second Year Operations and Third Year Operations:

In the SYO plantation casualty replacement and two weedings will be done as per following schedule.

1st weeding : by end of August

2nd weeding : by end of October

Casualty replacement shall be done by mid July. Mulching and hoeing will be carried out along with 2nd weeding. In the third year operation only one weeding will be done during the month of September followed by thorough soil working in the month of October.

4.6.13: Associated regulations and measures:

All annual coupes and plantation sites shall be provided fire protection. Effective protection against fire must be ensured during the fire seasons so that the survival and establishment of the seedlings for development into future growing stock can be achieved. Fire protection can be achieved through Joint Forest Management Committees. A comprehensive fire management plan shall be prepared out every year.

The coupe shall remain closed to grazing for a period of 5 years after main felling. At the time of planting the under stocked area in each coupe, the seeds fodder grass like Paunya, Sheda, etc shall be shown to have enough fodder of good quality .

4.6.14: Soil and moisture conservation works:

Soil and moisture conservation measures shall be undertaken in the restorative phase. These works shall be taken up along with marking and completed before the onset of monsoon of the next year. Detailed descriptions regarding soil and moisture conservation works given in miscellaneous regulations shall be followed.

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PUSAD FOREST DIVISION
Fodder Improvement Working Circle

N
W E
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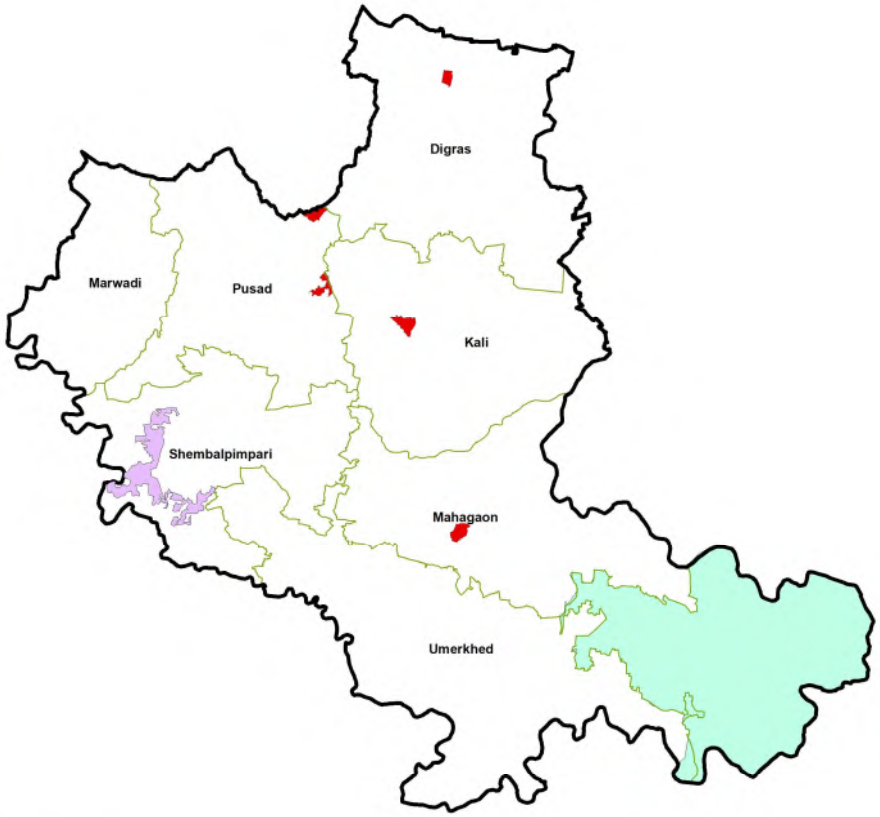
1:150,000



Legend

- Division boundary
- Range boundary
- Painganga WLS
- Isapur WLS
- Fodder Improvement WC

0 2.5 5 10 15 20 25
Kilometers

CHAPTER-5

FODDER IMPROVEMENT WORKING CIRCLE

5.1: NAME OF WORKING CIRCLE (CLEARLY MARKED ON GIS BASED MAPS (1:150000):

The area of this working circle has been marked on GIS based map of 1:150000 scale is appended and a copy of the same is given in A4 size here.

5.2: GENERAL CONSTITUTION OF THE WORKING CIRCLE:

These forests included in this working circle are the areas managed under Pasture Improvement Working Circle, CWR, Plantation Working Circle and Miscellaneous Working Circle in the past. In D. K. Tyagi and G. R. K. Rao's working plan these areas were managed under Fodder improvement Working Circle. These areas are in the vicinity of villages and under severe biotic pressure. The extent of area allotted to this working circle is 1307.27 ha which constitutes 1.89% of the division area. The range-wise allocation of area is shown in the table below.

Table No.5.1: Distribution of area in Fodder Improvement WC

Sr. No.	Range	Area (ha)	No. of Compt.	Area allotted (ha)		% to the area of the range	% to the area of WC
				RF	Total area		
1	Digras	12864.43	1	159.95	159.95	1.24	12.24
2	Pusad	7798.06	2	521.66	521.66	6.69	39.90
3	Shembalpimpri	7533.15	0	0	0	0	0
4	Umarkhed	10240.54	0	0	0	0	0
5	Mahagaon	14100.49	1	291.38	291.38	2.07	22.29
6	Kali D.	8934.78	1	334.28	334.28	3.74	25.57
7	Marwadi	7564.49	0	0	0	0	0
	Total	69035.94	5	1307.27	1307.27	1.89%	100%

5.3: GENERAL CHARACTERISTICS OF VEGETATION:

The area allotted to this working circle contains degraded soils with heavy biotic pressure. The site quality of the area is IV and the area is sparsely wooded with species like Teak, Hiwar, Palas, Bor, Khair, etc. In majority of these areas less fodder value grasses like Kushal grass (*Andropogon contortus*) and Burbushi (*Eragrostis tennela*) are

seen. The availability of palatable grasses such as Sheda, Pauniya and Marvel are also present but in less quantity. The sub type of vegetation is degraded scrub forest. The existing stock map have been updated the stock is assessed with the help of satellite imageries with appropriate ground truth verification. Mostly the areas are open and degraded.

5.4: FELLING SERIES, CUTTING SECTION AND JFM AREAS: Treatment series and annual coupe: The working circle has been divided into 2 working series and each working series is divided into 10 annual coupes. The details of felling series and annual coupes is given in **Appendix - XXVII and XXVIII.**

5.5: BLOCKS, COMPARTMENTS AND JFM AREAS:

There are 5 compartments included in this working circle. These five compartments are distributed over 4 ranges. The compartment numbers are Digras range 743, Mahagaon range 449, Kali range 336, Pusad range 349 and 356.

5.6: SPECIAL OBJECTS OF MANAGEMENT:

1. To augment the demand for good palatable fodder requirement of villages.
2. To improve fodder quality in the areas by introducing palatable species of grass and legume and fodder tree species.
3. To improve the site and conserve soil and moisture through soil and moisture conservation works.

5.6.1: Analysis of the crop:

Stock mapping was done by territorial staff of Pusad forest division and was verified with the enumeration data. Satellite imageries and density maps of FSI were used for verification of stock maps. Areas are mostly open and blank with sparse tree growth. The density ranges from 0.1 to 0.4. Analysis of the enumeration data highlights the non-teak percentage (57%) is more in comparison to teak (42%). The matured teak trees are very less in number whereas in miscellaneous species lower and higher girth classes is present. The total number of trees per ha is 198. The enumeration was carried out by SOFR Amravati and the results are given in the table below.

Table No.5.2: Enumeration data (girth classwise) in Fodder Improvement WC

Sr. No.	Girth Class	Teak			Others			Total	
		No.	% wrt total teak spp.	% wrt total stock.	No.	% wrt total misc spp.	% wrt total stock.	No.	% wrt total stock
1	15-30	5	5.95	2.52	5	4.38	2.52	10	5.04
2	31-45	7	8.36	3.53	35	30.73	17.67	42	21.20
3	46-60	20	23.80	10.10	17	14.91	8.58	37	18.68
4	61-75	22	26.19	11.11	0	0	0	22	11.11
5	76-90	20	23.80	10.10	0	0	0	20	10.10
6	91-105	0	0	0	10	8.77	5.05	10	5.05
7	106-120	10	11.90	5.05	5	4.38	2.52	15	7.57
8	121-135	0	0	0	20	17.54	10.10	20	10.10
9	136-150	0	0	0	12	10.52	6.10	12	6.10
10	>151	0	0	0	10	8.77	5.05	10	5.05
	Total	84	100	42.41	114	100	57.59	198	100

5.6.2: Silvicultural system:

Based on the grass and forest resources of the site, the silvicultural systems to be followed are as under.

1. Regulated and rotational grazing in pasture areas.
2. Regulating seeding, grass cutting and complete closure to grazing in identified grasslands.

5.6.3 : Rotation period: Rotational grazing is practiced.

5.6.4 : Harvestable diameters: Not applicable.

5.6.5 : Reducing factors and reduced areas: Not applicable.

5.6.6 : Felling cycle: Not applicable.

5.6.7 : Division into periods and allotment to periodic block (PB): Not applicable.

5.6.8 : Calculation of yield: The yield is fixed by area.

5.6.9 : Table of felling: Not applicable.

5.6.10: Method of executing the felling/cutting: The grass is to be cut by "Cut and Carry away basis" to be regulated by the department through the JFMCs, wherever exists.

5.6.11: Subsidiary silvicultural operations cleaning and thinning:

Demarcation: The coupe due for closure to grazing will be demarcated one year in advance, by cutting 3 metre wide lines and erecting pillars at suitable intervals.

Treatment: Each year about 150 to 200 hectare area suitable for fodder development will be selected from out of the coupes and developed for fodder either by removal of obnoxious weeds and unwanted grasses or through ploughing and seeding of suitable grasses. Depending on the requirement of site, suitable options for fencing can be taken up.

5.6.12: Regeneration : Not applicable

5.6.13: Associated regulations and measures:

(i) Seeding of grasses: In order to allow seeding of fodder grasses, the coupe shall be closed to cutting of grass and will be prohibited from first June to 30th November, after which the grass will be allowed to be removed by cutting.

(ii) Fire Protection: The areas will be protected from fire with the involvement of local people or JFM committees.

5.6.14: Method of treatment:

1. As it is degraded area extensive soil and moisture conservation measure works like gully plugging, nala bunding at suitable places and contour trenches depending upon the site quality is prescribed. Soil and moisture conservation works can be done as specified in miscellaneous regulations.
2. All obnoxious weeds and thorny shrubs and bushes shall be uprooted and the unpalatable grasses shall be removed by ploughing in the area in pre flowering stage.
3. Broadcasting of seed of superior grass species shall be taken up after ploughing along with contour trenches at the onset of monsoon. The tussocks of palatable

grass species of freshly excavated and heaped soil bund on the lower side of trenches.

4. Seed broadcasting and tussock planting of good palatable grasses like Sheda (*Sehima nervosum*), Paunya (*Schima salcutum*), Marvel (*Dicanthum annulatum*), Ned Gavat (*Panicum antidotale*), etc. The fodder tree species prescribed are Babul (*Acacia nilotica*), Anjan (*Harwickia binata*), Sirus (*Albizzia lebbek*), Apta (*Bauhina sp.*), Tiwas (*Ougenia daldergioides*), etc. However, the selection of fodder species shall be as per the site requirement.
5. The area shall be completely protected from grazing, fire, etc. The area shall be closed with fencing or cattle proof trenches in order to have a complete protection.
6. The area shall be effectively fire traced and protected from fire every year.
7. The fodder grasses shall be allowed to be cut only from 3rd year onwards after seedling.
8. The cutting of grasses for stall feeding of cattle shall be allowed in these areas for 1st three years after planting. The grazing shall be regulated as per Government policy on rotation basis.

Treatment for Ramnas:

1. All the ramnas shall be completely fenced or with TCM.
2. These ramnas shall be completely closed to grazing.
3. Every year 1/5th area of each ramna shall be treated as a coupe of working series. A treatment map shall be prepared indicating 1/5th area of ramna as coupe of working series. The area selected for treatment shall be kept closed for cutting for the same year.

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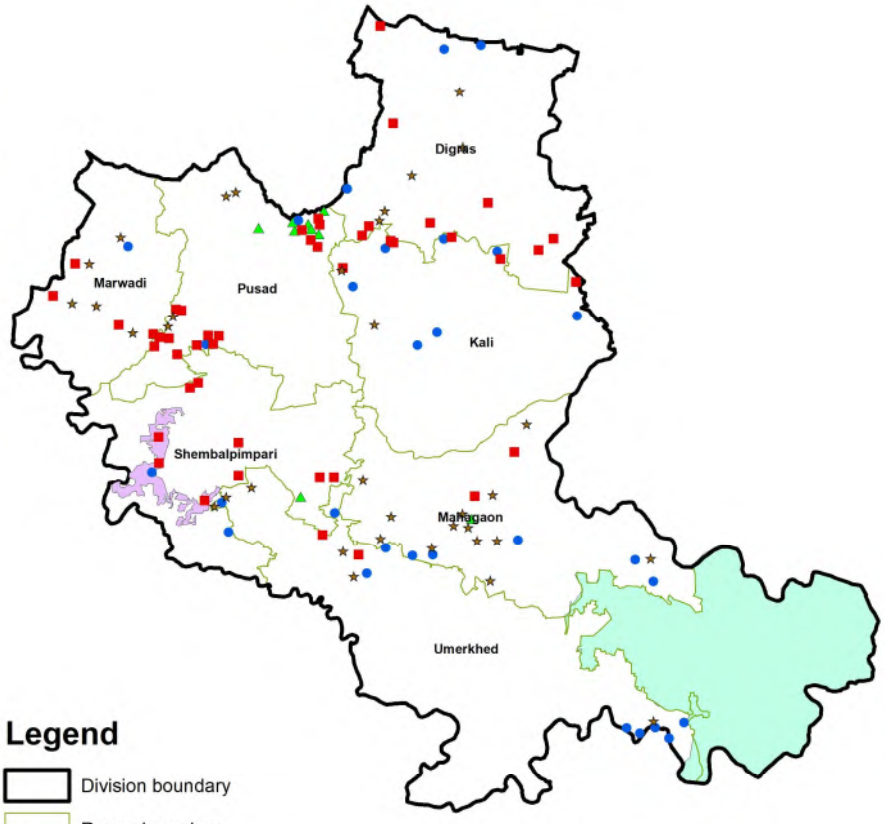
PUSAD FOREST DIVISION
WATER SOURCES

1:150,000



Legend

- Division boundary
- Range boundary
- Isapur WLS
- Painganga WLS
- Natural perennial water source
- Natural seasonal water source
- Artificial perennial water source
- Artificial seasonal water source

CHAPTER - 6

WILDLIFE MANAGEMENT

6.1: WILDLIFE MANAGEMENT: The area covers the whole division and is therefore not specifically marked on GIS based map.

6.2: GENERAL CONSTITUTION:

The forests of Pusad forest division has been a natural habitat for a wide range of wild animals especially the forest adjoining to river Painganga and its tributaries. Therefore, the concentration of wildlife has been mostly in this forest though they are present throughout the division. The forest of this division serves as buffer to Painganga Wildlife Sanctuary and Isapur Wildlife Sanctuary.

6.3: GENERAL CHARACTERISTICS OF VEGETATION:

The forest falls under the category of "Tropical, dry deciduous forest" of Champion and Seth's revised survey of forest types of India and belongs to sub group 5A/Cib "Southern Tropical dry, deciduous" and climax sub types are categorized on the basis of various local factors like soil- texture, depth, soil-moisture, topography and also environmental conditions. The forests of Pusad division is situated under soils derived from underlying trap characterized by presence of Teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. Majority forest area is represented by site quality IVa and IVb.

6.4: FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not Applicable.

6.5: BLOCKS, COMPARTMENTS AND JFM AREA (MARKED ON GIS BASED MAPS): Entire Forest area of the division.

6.6: SPECIAL OBJECTIVES OF MANAGEMENT:

1. To ensure protection and conservation of wildlife in this division.
2. Scientific management of wildlife by undertaking measures like habitat management and regular monitoring of population of wild animals.

3. To conserve areas of wildlife importance like perennial waterholes, natural grasslands, natural wallows, salt licks, natural resting, breeding and nesting sites (caves, snags, overhangs).
4. To reduce dependency of fringe villages on forests and to reduce human wildlife interactions.
5. To involve local people in wildlife conservation and reduce human wildlife interactions.
6. To promote and encourage ecotourism without disturbing and damaging wildlife.

6.6.1: ANALYSIS OF THE WILDLIFE IN THE DISTRICT:

Pusad forest division has two wildlife sanctuaries within it namely Painganga Wildlife Sanctuary and Isapur Wildlife Sanctuary. This division acts as buffer for both these sanctuaries. There is a wide variety of fauna noticed in this division; however, its distribution is quite uneven. Wildlife population density varies with the habitat depending upon availability of food, water and shelter. Wildlife commonly found in the division is as below (detailed list is given in the List of Fauna under Introductions):

(a) Carnivores: Leopard (*Panthera pardus*), Striped Hyena (*Hyaena hyaena*), Wild dog *(Duon alpinus)*.

(b) Herbivores: Barking deer (*Muntiacus muntjak*), Nilgai (*Boselaphus tragocamelus*), Sambar *(Cervus unicolor*), Chinkara *(Gazella gazella*), Spotted deer *(Axis axis),* Black Buck *(Antilope cervicarpa),* Sloth Bear *(Melursus ursinus),* Wild Pig *(Sus scorfa*), Common Langurs *(Presbytis entellus*), Rhesus Macaque *(Macaca mulatta),* Common Mongoose *(Herpestres edwardsi)*.

(c) Birds: Pea fowl (*Pavo cristatus*), Grey Jungle fowl (*Gallus sonneratii*), Painted partridge (*Francolinus pictus*), Grey partridge (*Francolinus pondicerianus*), Common quail (*Coturnix coturnix*), Crow pheasant (*Centropus sinensis*), Greater coucal (*Centropus sinensis*), Golden backed woodpecker (*Dinopium benghalense*), Black drongo (*Dicrurus adsimillis*) etc.

(d) Reptiles: Red Sand boa (*Eryx conicus*), Indian Cobra (*Naja naja*), Python (*Python molurus*), Rat snake (*Ptyas mucosus*), Varanus sp, Chameleon sp.

(e) Fish: Catla (*Catla catla*), Rohu (*Labio rhoita*), Carp (*Cyprinus carpio*).

(f) Rodents: Porcupine *(Hystrix indica)* , Hare *(Lepus ruficaudatus)*.

Table No.6.1: Wildlife population estimation

Sr. No.	Species	Wildlife census				
		2014	2015	2016	2017	2018
1	Leopard	13	0	2	0	2
2	Hyena	3	0	0	0	1
3	Wild dog	0	6	4	0	5
4	Jackal	39	32	28	31	15
5	Wolf	0	0	3	4	18
6	Sloth bear	0	0	1	3	3
7	Chausinga	36	0	0	0	0
8	Spotted deer	0	14	4	28	0
9	Blackbuck	2	0	8	0	7
10	Barking deer	192	20	54	9	63
11	Nilgai	1504	411	704	722	633
12	Peafowl	49	62	141	103	127
13	Jungle Cat	5	2	7	6	3
14	Palm civet	0	0	0	0	2
15	Mongoose	0	0	2	0	3
16	Wild pig	25	265	747	639	459
17	Hare	107	10	25	40	25
18	Common langur	1142	286	761	323	459

6.6.2: SILVICULTURAL SYSTEM: Not Applicable.

6.6.3: ROTATION PERIOD: Not Applicable.

6.6.4: HARVESTABLE DIAMETERS: Not Applicable.

6.6.5: REDUCING FACTORS AND REDUCED AREAS: Not Applicable.

6.6.6: FELLING CYCLE: Not Applicable.

6.6.7: DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not Applicable.

6.6.8: CALCULATION OF THE YIELD: Not Applicable.

6.6.9: TABLE OF FELLING: Not Applicable.

6.6.10: METHOD OF EXECUTING THE FELLING: Not Applicable.

6.6.11: SUBSIDIARY SILVICULTURAL OPERATIONS CLEANING AND THINNING: Not Applicable.

6.6.12: REGENERATION : Not Applicable.

6.6.13: ASSOCIATED REGULATIONS AND MEASURES : Not Applicable.

6.7: HISTORY OF WILDLIFE MANAGEMENT IN GENERAL:

General history of management: It was stated in Berar gazette of 1870 that tigers and panthers were numerous in the area and it was dangerous to travel in Yavatmal district. Prior to reorganization of state wildlife conservation was ensured under the provisions of Indian Forest Act 1927. Shooting rules were framed by the Government and detailed in the appendix of C.P. and Berar Manual Vol. 2, combined with Wild Birds and Animal Protection Act 1912. The Conservator of Forests in consultation with Divisional Forest Officer used to declare certain blocks of Reserve Forest as open for shooting. Then shooting permits were issued by the Divisional Forest Officer.

In 1952 the Indian Board for wildlife was constituted with an object of devising methods and means for conservation of wildlife through coordinated legislative and practical method. Subsequently the Bombay Wild Animals and Wild Birds Protection Act 1951 was enacted and it was considered as the most comprehensive legislation which was made applicable to Vidarbha region in 1961. This act did not propose any significant changes in the management of the game, however it was important as its provisions allowed to operate even in the areas outside the Reserve Forests. As per the provisions laid down in this act arms license holders had to register themselves with wildlife preservation officer. Hunting license was categorized into 4 kinds *i.e*.1. Small game, 2. Big game, 3. Special Big game and 4. Pet animals. The provisions of this act did not allow to carry out any trade in wildlife trophies without a separate trophy dealer license. For the purpose of hunting the forest division was divided into 20 shooting blocks.

6.7.1: Legal Position: The forest area of this division was a part and parcel of C.P.and Berar State. The provisions in Berar Forest Law in 1886 were passed on Oct. 22nd 1886. There was no separate act regarding protection of Wildlife in vogue at that time. It was, under Sec. 3, Sub rule (7), the deformation of the forest produce included “skins, tusks, bones and horns”. Under Sec. 8 of the said act “any person who acts in contravention of the said act in the state forests was punishable with the fine which may go up to Rs.50/-

when the damage resulting from his offence amounts to more than Rs.25/- , to double the amount of such damage". Under Sec.10, Sub Sec. (4) of the said act "the residency by orders may regulate any part of the state forest for the hunting, shooting, fishing, poisoning of water or setting trap or snares". The Berar Law of 1886 was amended by the Berar Forest Law of 1891. Under this amendment Sec.7 (b) states that, forest produce includes the following found in, brought from a forest *i.e.* to say wild animals, skins, tusks, horns, bones, cocoons, honey, wax and all other parts or produce of animals or forest produce. Sec. 7(2) (B) states offence was punishable with the fine which may extend upto Rs.50/- or when the damages resulting from the offence amounts to more that Rs.25/- , to double the amount of such damage.

6.7.2: Empowered the resident to frame the rules in relation to regulation of hunting, shooting, fishing, poisoning of water and setting traps and snares. In the year 1911 vide Notification No/GIFD/2197-1-B the definition of wildlife as forest produce was included under Sec. 2 (B) (III). Under Sec. 25 (1) of the said act, that any person in contravention of any rules made under this act, which local Government may from time to time prescribe, kills or catches elephants, hunts or shoots fishes, poisons water or sets traps shall be punishable with imprisonment for a term which may extend to 6 months or with the fine not exceeding Rs.500/- or in both in addition to compensation for the damage done to the forests. After the enactment of Indian Forest Act 1927, rules related to wildlife regulations were framed under Sec. 26 (1), 76 (d) which was essential to regulate hunting of wild animals and were given in the appendix VIII of M.P. forest Manual Volume 2.

Wild Birds and Animal Protection Act 1912 as amended in 1935 also ensured protection to certain animals and a check of hunting of animals. Shooting block system was initiated in the year of 1947 under the provisions of these two acts. The Conservator of Forests in consultation with the Divisional Forest Officer concerned used to declare the areas having abundant game as open to hunting and the Divisional Forest Officer accordingly issued shooting permits were in the type of game and the number allowed to be hunted together with, the other relevant conditions.

The Bombay Wild Animals and Wild Bird Protection Act 1951 was extended to Vidarbha region, which has enhanced the scope of management of game outside Reserve and Protected Forest also. Under the provisions of this act regulations were made for registration of armed license holders, categorization of game into small game, big game, special big game and pet animals and also regulated transaction in trophies and other wildlife products. Under this act the statutory wildlife advisory board was constituted in order to advice the Government on various important matters regarding wild animals. In 1952 the Indian Board of wildlife was constituted with the main object of devising ways and means for conservation wildlife through coordinated approach of legislative and political measures and sponsoring the measures to reconstitute National Parks and Wildlife Sanctuary. The comprehensive and unified National and State Park Act of 1971 was passed to provide for appointment of any advisory committee to advise in continuation and declaration of National Parks and Sanctuary and formulation of administrative policy.

In 1972 Parliament enacted Wild Life (Protection) Act 1972 which came into force in the state since 1st of June 1973 and superseded all other acts related to wildlife protection and management in the State. The subsequent rules made under the act are as follows.

1. The Wild Life (Stock declaration) Rules 1973 (came into force in the State since 1st of June 1973).
2. The Wild Life (Transactions and Taxidermy) Rules 1973 (came into existence since 1st June 1973).
3. The Wild Life (Protection) Rules 1975 (came into force since 6th March 1975).
4. The Wild Life (Protection), Licensing (additional matter consideration) Rules 1983 became effective since 14th April 1983.

The Wild Life (Protection) Act is a comprehensive legislation that facilitates for effective protection and preservation of Wildlife, moreover it enabled restrictions on hunting and regulation of trade in wild animals as well as the articles made out of wild animals.

Hunting of wild animals is strictly prohibited unless specially permitted as per laid down procedure. Under this act, wild animals have been categorized into V schedules and those animals which are included in schedule I, II and III received the privilege of stringent protection.

The wild animals included in the schedule are permitted to eliminate if they become threat to or cause damage to life or property and the animals included in schedule II become disabled completely or deceased beyond recovery. Whereas, only vermin included in scheduled V were excluded from strict protection.

Hunting of young and female of any wild animal other than vermin is strictly prohibited unless permitted (Sec.15). The persons who possess any wild animal trophies are required to declare in a specified proforma under the provisions of this act. The Government of India specified vide letter Dt. 18th Sept 1975 that, the management authorities are vested with the control over the tanks and rivers in National Parks and Sanctuaries.

The delegation of powers and duties of the Chief Wild Life Warden to the Police Sub Inspector for the purpose of Sec. 41 (1) and Sec. 55 of the Wild Life (Protection) Act 1972 was granted by G.R. No. WLP-1973/197578 –F-1, Dt. 5th April 1976. The schedules are revised by the Government from time to time as it was required under Sec. 61 of the Wild Life (Protection) Act 1972. The Government of Maharashtra framed rules under Sec. 64 of Wild Life (Protection) Act 1972 vide its letter No. WLP- 1679/95507 / F-5.

The Wild Life (Protection) Act was again amended hereinafter called as “Wild Life (Protection) Amendment Act 1986” and became effective since 25th November 1986. Under Sec. 44 of the Wild Life (Protection) Act 1972 the Government vide letter No/WLP/1682/100208/CR-43(1)/F-5 permitted the trapping of Cobra and Russell vipers by a licensed dealer for the purpose of extracting venom. Under the power conferred under sub Sec. (1) and sub Section (2) of the Section 64, the Government of India vide letter No. WLP/1682/10020 (iii)/F-5 framed the new rules called “Wild Life (Frog Leg Industry) Rules 1987” and it came into force from November 25, 1987. The Government of India vide letter No. F. no. 1-2/91/WL/I, Dt. October 21, 1991 further amended the

Wild Life (Protection) Act 1972. Subsequently Wild Plants have been brought under the provisions of this act. The zoo and circus have been defined and included in this act whereas the game reserves have been completely dropped. A total ban has been imposed on hunting of wild animals specified in schedule II, III, IV and I except as provided under Section 11 and 12 by amending Section 9 of Wild Life (Protection) Act 1972.

In 2003 compressive amendment was made to impose heavy penalty and stringent punishment in case of wildlife offences. Under the provisions of Section 17 of Wild Life (Protection) Act, the following acts are prohibited.

1. Hunting of wild animals from or by means of wheeled or mechanically propelled vehicles in water or on land or by air craft.
2. Use of mechanically propelled vehicles for the purpose of stampeding any wild animals.
3. Use of chemicals, explosives, pit falls, poisons, poisoned weapons, snares or traps except related to capture of wild animals under wild animal trapping license.
4. Hunting of special game or big game other than with a rifle unless specially authorized by the licensee.
5. Setting fire to vegetation for the purpose of hunting, using artificial light for the purpose of hunting except when specially authorized to do so under license in the case of carnivore over a kill. Hunting during night time except when specially authorized.
6. Hunting of any animals on water hole or a salt-lick or other drinking places or on path or approaches to the path except water birds or sand goose.
7. Hunting of any wild animals on any land not owned by the Government without the consent of the owner or his agent.
8. Hunting during closed period under Section 16.
9. Hunting with the help of dogs, any wild animals except water bird, partridge or quail.

10. The Government of Indian has passed Wild Life (Protection) Amendment Act 1991 with effect from October 2nd 1991 except the Section 35, 44, 55(c) Chapter III A, IV A. The main features of this amended act are given below.

- The words “game reserve”, “big game” and “small game” have been deleted from the act. Hunting of wild animals included in schedule I, II, III and IV of the act has been prohibited except as per the provisions of Section 11. Specified plants have been included in a new scheduled for the protection of the same by introducing Chapter 3 A.
- The Section 29 has been amended which prohibits any exploitations in National Parks and Sanctuaries.
- A new section has been added in the act to provide that no new armed license shall be issued within the 10 Km of Sanctuary without prior permission of the Chief Wild Life Warden of the State.
- Imposed ban on dealing with imported ivory and articles made there from.
- Introducing new Chapter IV A for Central Zoo authority and recognition of Zoos.
- The penalties related to wildlife offences have been enhanced substantially. Section 39 of the act has been amended to the effect that vehicles, vessels, weapons, traps or tools which have been used for committing an offence and have been seized, shall become the property of Government.
- Section 61 (1) of the act has been amended which provides the power to make any change in the schedules of the act vests only with the Central Government.

Rights and concessions:

No rights and concessions or privileges are granted to any person over wildlife except a person of Scheduled Tribes can pick up or collect or possess in the district in which he resides any specified plants or plant derivatives thereof for his bonafide personal use subject to the provisions of chapter IV of Wild Life (Protection) Act. The Chief Wild Life Warden can grant the permits with prior approval of the State Government for special purposes of education, scientific research and collection of specimen for recognized zoos, museums and scientific institutions.

6.7.3: Injuries to wild animals:

The forests of Pusad forest division used to support a variety of wild animals especially the forest adjoining to river Painganga and its tributaries. Improvement of road network, various developmental activities, increase of human and cattle population coupled with fragmentation and deterioration of the area and quality of forest have adversely affected the distribution and population of the wildlife in this area.

Poaching: Though there is no organized poaching in the area, incidences predominantly of poaching of wild pigs is noticed. Electrocution is a common method for hunting of wild animals.

Degradation of Habitat: Due to various human activities the habitats of various wild animals are degrading very fast and is manifested in the form of reduced population of many animal and bird species. The main factors adversely affecting the wild habitat are:

- Heavy biotic pressures, over grazing, encroachments on forest lands, large scale human and cattle movement in the forest areas, forest fires etc. are responsible for the general degradation of these habitats.
- Diversion of Forest land for projects like, irrigation dams and canals are also adversely affecting the wildlife habitat by fragmenting the forest areas and creating barriers for the movement of wild animals. Suitable mitigating measures should be included in such proposals.

Fire: Forest fire is frequent especially during dry seasons. Repeated forest fires occur in this tract. Forest fire damages natural habitat and drives the animals towards human habitations resulting in human wildlife conflict. The fires in the interior of the forests, besides destroying the natural habitat of the forest fauna, drive them to take shelter near the human habitation and make them easy targets of poachers. Due to fire even the young ones may perish. Besides other animals, reptiles and birds, which live on ground and cannot escape the fire and its heat. In case they survive, their food, grasses, herbs and shrubs are destroyed. The whole tract experiences water scarcity in summer.

These fires aggravate the already existing water scarcity and expose these animals to above mentioned risks. It in turn increases the man animal conflict.

Water: Water is scarce in forests and is confined to only few places. Rainfall is also erratic during monsoon leading to acute shortage of water in summer. Most streams and water sources dry up during summer season. Animals use a very few waterholes available during pinch period.

Grazing: During the last ten years there is a rise in cattle population. The total livestock population in Pusad division is 3,56,354. Grazing pressure has increased manifold in the past few years. Heavy grazing in forest areas takes away available fodder for most wild herbivores. Grazing also leads to spread of diseases to wild animals besides affecting the habitat severely.

Diseases: The livestock from the villages in the forests regularly frequent the forests and share the waterholes 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 foot and mouth disease. Other diseases which may occur are anthrax, rabies, FMD and canine distemper. FMD has a potential to wipe out large populations, while rinderpest, anthrax and rabies are highly infectious and lead to certain death. Therefore, coordinated efforts with Animal Husbandry Department to vaccinate domestic animals in wildlife rich areas are a must to safeguard wildlife.

Human animal interaction:

Damages to the Crops: Incidences of crop damages by herbivores have been reported predominantly in forest fringe villages. This is leading to economic losses to farmers. Details of crop damage by wildlife are given in **Volume II, Appendix XLVI**. Farmers are compensated for the losses as per the Government orders issued from time to time.

Injuries to Cattle and Human: Leopard sometimes kills domestic cattle grazing in the forests. There are also cases of human injury and even death due to attacks from other wild animals like wild pigs. Statistics of damage to livestock and humans is given in

Appendix - XXIX. The Government of Maharashtra, has therefore, evolved a policy of compensating for the loss of livestock (GR No.WLP-0718/C.No.267/F-1 of 11/07/2018 and GR No.WLP-0718/C.No.267/F-1 of 28/11/2018), crop damage (GR No.WLP-2012/ C.No.326/F-1, Dated 09.07.2015 and GR No.WLP-2012/C.No.326/F-1, Dated 23.12.2015) as well as for the injury or loss of human life (GR No.WLP-0718/C.No.267/F-1, Dated 11.07.2018 and 28.11.2018).

6.7.4: Future management:

6.7.4.1: Standing Order (Wildlife) No.001:

The PCCF (WL) MS, Nagpur has issued a standing order (Wildlife) No.001. 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 outside the Protected Areas. The territorial staff of the division shall scrupulously implement these prescriptions.

1. Duties of Forest Guard, Forester, RFO and ACF include:
    - Keeping information of waterholes, particularly in summer and special vigilance at all the waterholes in the division is prescribed.
    - 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 Government orders from time to time with speedy and transparent disposal of cases.
    - Keeping 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.
    - Local staff shall maintain record of sensitive wildlife areas such as areas with heavy wild animal concentration.
    - Establishing a network of informers with the aid of Secret Service Fund.

- There shall be regular short-term training/workshops in anti-poaching activities and legal requirements in dealing with wildlife offence cases.
- Cases of man-animal conflict should be handled swiftly and efficiently. Keeping in view the area of the division, at least one Rapid Response team shall be operationalized 24 x 7. Such team should be given need based training. Every range headquarters should contain equipments necessary to handle conflict situations.

2. Nature education programme in the villages adjoining forests, schools and colleges shall be arranged.
3. Ecologically sensitive habitats shall be identified and protected.
4. Antler trade is now banned; hence, no collection of shed antlers is to be allowed.
5. The involvement of Honorary Wildlife Warden and serious NGO's be encouraged for nature education programme.
6. It will be ensured that cattle grazing in forests near the important wildlife habitats are inoculated against contagious diseases.

6.7.4.2: Creation of database:

The division will carry out survey of riparian zones, mesic sites, perennial waterholes, saltlicks, natural wallows, resting places, breeding and nesting sites, etc. and map them on GIS platform for their protection and management. The range office will also maintain a meticulous record of these sites on a register named "Register of the Special Wildlife Habitat" and update it annually by an officer not below the Range Forest Officer.

The division will undertake annual population estimation of the wildlife, including the migratory and other rare birds, in addition to All India Tiger and Panther population estimation. Special note should be taken if any of nesting site of endangered birds like Vultures is noticed. Concurrent monitoring of top carnivores through camera traps shall be made. All cases of compensation (crop, livestock and human) along with GPS coordinates should be mapped on GIS platform for better management.

6.7.4.3: Delineation and mapping of Special Habitat Areas: Delineation of special wildlife habitat sites including natural water seepage sites (mesic sites), waterholes, natural wallows and saltlicks used by the wildlife, breeding sites, dens or nesting sites of animals and birds appearing in the Schedules of the Wildlife (Protection) Act, 1972 shall be carried out and marked on the divisional/range maps. A strip of 50-meter around special habitat sites shall also be delineated and mapped to serve as buffer for the site.

While preparation of treatment map of coupe for working in the area-specific working circles, the special wildlife habitat sites given above shall be identified and marked on the map along with its buffer of 50 metre width strip around.

6.7.4.4: Habitat development works: Due to continuous biotic pressure, wildlife habitat has also deteriorated and has reached a critical condition. The most important factors in the habitat are water, food, safe places for resting, breeding, and nesting. Wallows and salt licks are other factors. To meet the minimum requirement of the wild animals the following activities are recommended:

Marking reservations and other restrictions: The following prescriptions have been made for implementation along with coupe operations and other treatment prescriptions, in the wildlife area-specific coupes.

- No felling of trees or harvesting of any sort shall be allowed in riparian zone.
- While marking of dead, wind fallen and malformed trees in annual coupes, 2 trees per hectare shall be kept reserved, as snags and dens to provide for nesting and resting of wildlife. No fruit tree of wildlife importance shall be marked for felling in the annual coupes.
- While harvesting at least 2 down hollow logs, of low commercial value, per hectare shall be reserved for shelter of wildlife.
- Tendu collection centres or labour camps shall not be allowed near waterholes frequented by the large mammals or other important wildlife species. The labour camps shall be established away from areas of high wildlife density.

Development of fodder

- The existing grass areas shall be protected from biotic pressure and restricted near habitations. Due to heavy domestic cattle grazing these grassland patches are invaded with unpalatable grass and weed growth.
- The carrying capacity for grazing is determined after excluding the forest area required to meet fodder requirements of the wild animals and ecologically sensitive sites and special habitat sites for wildlife in the area.
- Habitat improvement is proposed at places having high density of wildlife and the areas frequented by both domestic animals and wildlife. Special efforts are to be initiated to develop meadows.
- Plantations prescribed in various working circles shall include at least 10 percent of fodder and fruit species of wildlife importance. *Ficus spp.* (Vad,Gular, Umbar), Ber, Anjan, etc. are recommended for this purpose.

Water management: Water management includes maintenance, strengthening of all existing waterholes and creation of new artificial waterholes. Water availability, or the scarcity of it, is one of the major factors that decide the health of the habitat. Its non-availability at sufficient places in the forests also increases probability of animals being found on the limited waterholes or near villages and thereby increases their susceptibility to poaching. Water is a major limiting factor during the summers in these forests. The waterhole density shall be commensurate with the density of wild animals found in the area and as per the wildlife management regulations. To meet the requirement the following steps may be taken:

i. All the perennial and ephemeral waterholes will be identified, recorded and marked on divisional/range maps.
ii. De-silting, if required, shall be carried out during summer to provide adequate drinking water. Leaf litter which falls in the waterholes and gets decomposed making water unhealthy shall be cleared during April and May.
iii. Creation of additional waterholes (permanent and temporary) is prescribed so that undisturbed waterholes are available. Waterholes shall not be created at least 2 kms from the nearest village boundary so as to avoid the animals moving

towards the human habitation. Approach to waterholes shall be made accessible by providing rough surfaces and smooth slopes.

iv. Small nala bunds, underground bunds and other technically sound small water harvesting structures may be constructed across the streams to create waterholes and habitat development.

v. Small cement concrete saucer shaped waterholes shall be constructed at suitable and safe places and be linked with solar powered pumps fitted to bore wells.

Food/prey base: Whether the prey base is adequate or not shall be ascertained from regular herbivore count. Any downward trend should be looked into seriously and possible reasons for its downslide must be found out and rectifying steps must be taken. To improve the prey base, care of herbivores should be taken by improving the assured fodder availability in the forest, especially during the summer season, when the forest grasslands are burnt. The open areas in wildlife rich zones should be developed into meadows for the herbivores.

Development of nesting sites: To provide suitable nesting places to these birds, seed sowing of species like Babul and stake planting of species like Banyan and other *Ficus spp*. should be done near water-bodies and in the riparian areas.

6.7.4.5: Protection measures for wildlife:

Considering the presence of wildlife, monitoring of wild animal health is important. Presence of considerable domestic cattle increases the vulnerability of wild animals. Communicable animal diseases of bacterial, viral, protozoan and rickettsial origin may dwindle the animal population. The total livestock population in four talukas of Pusad forest division is 3,56,354. There are many villages adjoining the forest area. They are dependent on agricultural and forestry works. These villages, with large number of livestock, are a threat to wild animals as they share the same water bodies and grazing grounds. Due to common grazing and drinking water at same places, many contagious diseases may spread in the wild animals. With the help of the veterinary department the following preventive measures in such villages should be undertaken.

Vaccination of village cattle: All cattle of adjoining villages within 5 km from the boundary of Protected Areas should be vaccinated every year for important diseases. This activity shall be monitored by the PA manager and also DCF (Territorial).

Regular health check-up for cattle: Forest staff, with the help of veterinary doctor of the area, should organize annual cattle health check-up camps in villages. Required vaccination should be done and if required, proper treatment to sick animal should be given.

Sensitization of field staff: The field staff of the division should be trained in day to day wildlife management and protection works. They should work in close cooperation with the wildlife wing.

Protection from poaching and trade: The forest staff shall develop an intelligence system with the help of local people, specially with Joint Forest Management Committee, to gather information about any activities related to poachers and traders of wildlife. Special funds are provided by the department for gathering such information.

Regular patrolling by the staff shall be carried out in the areas where the population of wildlife is more, specially during summer when these animals become more vulnerable due to shortage of water in the forest areas. The forest staff shall also be vigilant in the towns' market where at times birds like Parakeets, Partridges, Quails, Water-Birds, Monitor lizards, Tortoise, Turtles etc. are brought for sale.

Protection of forest from over-grazing and fire: After poaching, uncontrolled grazing and fire are the most important factors which adversely affect wildlife. To restrict illegal grazing, by cattle including goat, sheep etc., and during the fire season, to prevent the forest fires, patrolling parties should carry out regular patrolling in the sensitive areas of the forest.

Dr. Shyama Prasad Mukharjee Jan Van Vikas Yojana:

This is a wholistic scheme operational since 2015. The areas falling within 5 kms of Tiger reserves/National Parks and Wildlife Sanctuaries can be addressed through this scheme. This scheme includes activities like –

1. Wildlife protection and conservation.

2. Decrease man – animal conflict.
3. Alternate livelihood.
4. Cleanliness aspects.
5. Dairy development.
6. Watershed development.
7. Agricultural development.

This scheme should be used to the fullest extent to reduce man – animal conflict in villages adjoining Painganga and Isapur wildlife sanctuaries. So far no activities have been carried out under this scheme in Pusad forest division.

Capacity building: Books related to disease of wild animals, treatment, tranquilization, wildlife management etc. should be supplied to the field staff to improve their management skills. Short duration training for tranquilization of wild animals, to the forest staff and veterinary doctors, shall be imparted. Special care to motivate and orient the field staff should be through regular meetings, guidance and workshops. Some of the RFOs and Foresters shall be sent to short term training in the Wildlife Institute of India, Dehradun. Visits to Protected Areas should be carried out to expose the field staff to the technical aspects of wildlife management.

Eco-Development, Awareness Generation and Eco-Tourism:

Effective protection and management of sensitive ecological and special habitat sites/areas is not possible without active involvement and support of village communities in the vicinity. Their help and support can only be ensured if their genuine needs and concern are given due consideration by the department. If the people living around are poor and anguished, the objective in question cannot be achieved. Thus, to seek their willing support and goodwill it is proposed to undertake eco-development works by the division in villages around these sites. It is also proposed to promote and encourage eco-tourism in the division by extending and developing camping and nature interpretation facilities at sites/spots, rich and unique in natural and cultural beauty and diversity. It is, in accordance with, the current policy focus of the State and Government of India on eco-

tourism. The forest department should be in touch with the MTDC for the development of such sites.

The prominent water-bodies and specific habitat sites in the division are proposed as sites for creation of Eco-centres with facilities of nature interpretation and eco-tourism and to serve as centres for awareness generation and dissemination of issues and concerns of forestry and wildlife. The villages adjoining sensitive sites are proposed to be taken up under eco-development program for their overall development. Eco-development plans shall be prepared with the help of local communities.

It is also prescribed to delineate sacred sites/grooves and worship sites, including, sites for tribal deities with involvement of the local village communities. They are marked on the division/range maps. Archeologically important sites identified as such by the Archaeological Survey of India or the State Department of Culture shall be delineated to serve as focal sites for eco-tourism. The division will maintain record of sacred and cultural sites on a register named *"*Register of the Cultural Sites" and verify and update it annually by an officer not below the Range Forest Officer.

Awareness generation campaign be taken up to involve local villagers in the wildlife conservation programme. Village Panchayats and JFMCs shall be involved actively to further the cause of wildlife protection. Teaching institutions viz. schools, colleges, etc. and NGOs shall be involved through nature camps, wildlife film shows, exhibitions, seminars, competition, etc.

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CHAPTER 7

NON TIMBER FOREST PRODUCE

7.1: NON TIMBER FOREST PRODUCES: The area of this chapter covers the whole division and hence not specifically marked on the GIS based map.

7.2: GENERAL CONSTITUTION OF WORKING CIRCLE:

Traditionally Non Timber Forest Produce (NTFP) refer to all biological materials other than timber extracted from natural forests for human and animal use and have both consumptive and exchange value. Globally NTFP/NWFP are defined as "forest products consisting of goods of biological origin other than wood, derived from forest, other wood land and trees outside forests". It is estimated that 275 million poor rural people in India (27% of total population) depend on NTFPs for at least part of their subsistence and cash livelihoods. According to an estimate the NTFP sector alone is able to create about 10 million workdays annually in the country. Historically, NTFP sector was neglected for many decades from main stream forestry and they were considered as 'minor' (Minor Forest Produce). NTFPs have a tremendous potential to involve local collectors for establishing micro, small and medium enterprises through clear tenured rights, better collection methods, financial support, capacity development, infrastructure and institutional support in near future. With these efforts there is a potential to create large scale employment opportunity thereby, helping in reducing poverty and increasing empowerment of particularly women, tribal and poor people of the poorest and backward districts of the country.

Non Timber Forest Produce (NTFP) plays a key role in the life and economy of communities living in and around forest. NTFP is mostly collected by the economically backward people living in and around forest area. The tribal people have been conserving plant and crop genetic resources as well as the knowledge on their utility. The people living in forest mostly supplement their food with leaves, tubers, flowers and fruits all year around. The medicinal plants play a key role in the health support systems in remote villages.

7.3: GENERAL CHARACTERISTICS OF VEGETATION:

The forest falls under the category of "Tropical, dry deciduous forest" of Champion and Seth's revised survey of forest types of India and belongs to sub group 5A/Cib "Southern Tropical dry, deciduous" and climax sub types are categorized on the basis of various local factors like soil-texture, depth, soil-moisture, topography and also environmental conditions. Most of these forests suffer from biotic factors like uncontrolled and heavy grazing, illicit felling and repeated fire incidences and to some extent encroachments. The forests of Pusad division is situated under soils derived from underlying trap characterized by presence of Teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. Majority forest area is represented by site quality IVa and IVb.

7.4: FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not Applicable.

7.5: BLOCKS, COMPARTMENTS AND JFM AREA (MARKED ON GIS BASED MAPS): Entire Forest Area of the division.

7.6: SPECIAL OBJECTIVES OF MANAGEMENT:

As per the National Forest Policy, 1988 and 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006', the development of Non Timber Forest Produce (NTFP) has been one of the most important objectives in forest management. Therefore, consistent with the above policy and law, the special objects of management is enunciated as below:

i. To protect and manage Non Timber Forest Produce and to utilize the existing potential optimally and to enhance the productivity.
ii. To improve stocking of various NTFP species in the forest areas and enhance collection of various NTFPs by improved collection techniques.
iii. To get enhanced economic returns by training the local communities on value addition techniques and marketability of various NTFPs found in the division.
iv. To generate employment and improve the economy of the local people and thereby improving their socio-economic conditions.

7.6.1: Analysis of the crop:

The species of non timber forest produce are available throughout the tract with varying degree. These contribute to a large extent to meet the non wood forest produce demand of local forest dwellers directly or indirectly. They play an important role in generating employment to the local people. The important non wood forest produce Moha flower, Moha seed, Tendu, Hirda, Behada, Aonla, Charoli, Kulu, Dhawda and Honey.

Table No.7.1: NTFP species of Pusad division
(As per Enumeration data - 2016)

Sr. No.	Name of species	Trees/ha.
1	Behada	2
2	Bel	1
3	Biba	4
4	Bor	1
5	Char	11
6	Moha	13
7	Neem	11
8	Palas	296
9	Tendu	50
	Total	**389**

Medicinal Plants: A wide range of medicinal plants are found in Pusad forest division which yields a variety of medicines that are used by the local people (**Appendix-XXX)**. The medicinal plants play an important role in socio-economic, cultural, spiritual lives of local villagers and in conserving biodiversity.

At present the knowledge about the use of various products of medicinal plants is meager. The distribution of medicinal plants is in the entire tract but the present methods of extraction of medicinal plants are not well studied. In this area people are unaware of scientific and non destructive method of collection of medicinal plants.

7.6.2: Silvicultural system: Not Applicable.

7.6.3: Rotation period: Not Applicable.

7.6.4: Harvestable diameters: Not Applicable.

7.6.5: **Reducing factors and reduced areas:** Not Applicable.

7.6.6: Felling cycle: Not Applicable.

7.6.7: Division into periods and allotment to periodic block (PB): Not Applicable**.**

7.6.8: Calculation of the yield: Not Applicable**.**

7.6.9: TABLE OF FELLING: Not Applicable**.**

7.6.10: Method of executing the felling/cutting: Not Applicable

7.6.11: Subsidiary silvicultural operations cleaning and thinning: Not Applicable**.**

7.6.12: Regeneration: Not Applicable**.**

7.6.13: Associated regulation and measures : Not Applicable.

7.6.13.1: Ownership of NTFP:

The statutory provisions have vested ownership rights over the listed NTFPS species in the village communities in the Scheduled Areas without granting such rights over the trees and the land. Till recently, this list did not include Tendu, gum the prominent NTFP species in this tract. But after the enactment of 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006', even these forest produces have been included in the category of NTFP.

The Seventy-third Amendment of the Constitution of India has brought the NTFPs under the management of the Village Panchayat. NTFPs (MFPs) in the state and its sale procedure can be categorised into two parts:

1. 33 NTFPs (MFPs) in scheduled areas.
2. Other NTFPs (MFPs) excluding 33 NTFPs in Scheduled Area and NTFPs in Non Scheduled Areas**.**

A) 33 Minor Forest Produce in Scheduled Areas:

1) "Government of India passed the Provisions of the Panchayat Extension to the Scheduled Areas in 1996". In pursuance to this, Government of Maharashtra passed Maharashtra Act No. XLV of 1997, "Maharashtra Transfer of Ownership of Minor Forest Produce in the Scheduled Areas and the Maharashtra Minor Forest Produce (Regulation of Trade) (Amendment) Act 1997."
2) As per 1997 amendment, 33 Minor Forest Produce found on Government land in Scheduled Areas; ownership lies with Gram Sabha.

B) Other Non Timber Forest Produce (excluding 33 NTFPs in Scheduled Area) and NTFPs in Non Scheduled Areas:

1. R and FD, GoM, Government Resolution dated 5th October 2011, confers the rights of NTFP collection, processing and sale to the JFMCs. Therefore, capacity building

of JFMCs is crucial for realising the potential of harnessing employment generation to JFMC members and additional income to the committee to further invest in the development of NTFPs.

2. Forest Rights Act, 2006 confers the rights over NTFPs to the community right holders. Therefore, in areas where the CFRs (involving NTFPs) have been vested with village community, in such areas, the process of NTFP collection, processing and sale has to be initiated by that community.
3. Excluding the above mentioned areas, DCF can form NTFP units and put for auction. However, mechanism has to be evolved to regulate excess harvesting.

7.6.13.2: NTFP Collection:

The details of NTFP collection is given in **Appendix-XXXI and XXXII**. Though a few species are identified there is huge lacuna in the quantum of availability, collection and sale of the products. 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 NTFPs should also ideally find their due place in the JFM micro-plan. Proper grading, value addition and exploring new markets for the traditional NTFPs (such as gum), shall be included under the JFM programme of the division.

7.6.13.3: Methods of treatment:

Documentation of NTFP Collection: The beat guards will send monthly reports to the Range Forest Officer on the quantity of NTFPs collected in their beats. The Range Forest Officer will compile and send the detail report, mentioning the quantity as well as the market price, to the division office. The division office will compile the figures for each species for division with the view to monitor the collection and to improve the productivity of these NTFP to sustainable limit. Involving JFMCs in this exercise would be beneficial as they are the major stakeholders in collecting, processing and sale of NTFPs. To capture such information with uniformity, suitable printed registers be supplied to all JFMCs through the division office.

Fire Protection Measures: Collection of NTFPs is often associated with forest fires, because the villagers set fire around the NTFP 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. If it is left unattended, such fires spread into forests as forest fires.

- The Village Panchayats and FPCs shall be involved in awareness generation programme to help control forest fires.
- In case of forest fire, legal action should be taken against the defaulters. Strict vigilance is necessary during the months of February-April to check the spread of fires specially during the Tendu and Mahua flower season.
- Jandhan Vandhan shops:- Jandhan Vandhan shops can be opened up in Pusad Forest Division and produces of NTFP species can be sold through these shops. JFM Committees shall be actively involved in collection, processing and sale of NTFPs.

The treatment to be given will be different for different types of NTFPs. Therefore, each NTFP will have separate treatment as follows.

Management of Tendu:

Collection of Tendu Leaves: Tendu is the prominent revenue generating NTFP of this tract. Tendu leaves are used for manufacturing bidis. Tendu trade has been nationalised by the Government of Maharashtra Act No.LVII of 1969. Tendu leaves were collected by the department through agents till 1990 season. During the 1991 season Tendu units were sold on lump sum basis. The collection of Tendu leaves commences from the last week of April each year and continues up to first week of June. Quality of leaves is a major criterion for bidi manufacturers. The quality depends on the colour, texture and presence of nodules and veins. The best quality leaves are those ranging from ashy to palest hue; Almond colour is also prized shade. Leaves with leathery texture either too thick or thin are good quality for making Bidi. The leaves are collected at various collection centres called phadies. The leaves (pudas) are dried and then packed in gunny bags. The quantity is measured in standard bags.

- Tendu leaf collection is governed by the policy of the State Government in conjunction with various laws presently in force.
- Tendu leaf collection is an income generating activity for most local and tribal villages in the region. The local village communities shall be engaged in Tendu collection in the division to support their livelihood.
- Pruning of young Tendu plants does help in increasing leaf yield. Saplings having more than 5 centimetres collar diameter shall not be pruned.

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 to be given added focus.

- Maintenance and improvement of Tendu in the forest crop composition is prescribed by ensuring regeneration of Tendu and its subsequent protection.
- Singling of shoots and soil working around Tendu seedlings is prescribed in the plantation and rootstock areas to promote growth of Tendu seedlings along with the annual coupes in area-specific working circles.
- Tendu regenerates through root suckers. Hence, young root suckers should be identified and aided for creation of congenial growth conditions such as cleaning of bushes, protection from fire etc.

Year wise production of revenue obtained for the last 10 years is given in **Appendix-XXXI.** In order to increase the production of Tendu, pruning and pollarding of tendu trees are carried out every year to get good flush of tendu leaves. No other scientific efforts are made to improve the production of tendu. Sometimes local people ignite fire to forest to get good flush of tendu leaves which causes adverse impact on regeneration.

Formation of units:

The entire division is divided into 11 tendu units and which are constituted for the purpose of regulation of trade of tendu leaves under its Forest Produce (Regulation of Trade) Act 1969 vide its No.MFP 2182/240911/F-1, dt. 19th November 1983 of Government of Maharashtra. The tendu units formed in this division are given below.

Table No.7.2: Tendu units

Sr.No.	Range	Unit name
1	Digras	Digras
2	Kali	Kali
3	Mahagaon	Fulsawangi
4	Mahagaon	Mahagaon
5	Mahagaon	Mudana
6	Marwadi	Marwadi
7	Pusad	Pusad
8	Shembalpimpri	Shembalpimpri
9	Shembalpimpri	Fulwadi
10	Umarkhed	Krushnapur
11	Umarkhed	Umarkhed

Management of Gums:

Gum is an important NTFP and is exuded by plants, partly as normal phenomena and partly as the result of disease or injury to the bark. Wood Gum is a substance of more or less sticky nature. Dhawda (*Anogeissus latifolia*) is the main source of gum in the area. These gums are used in medicines, chemicals, cosmetics, food industries and incense. Dhawda gum is used in food industry for making sweets. It may also be suitable in the manufacture of elastic adhesive, lacquers, oil cloth compositions, ink and perfumery. The year wise production of Dhawda gum is given in **Appendix - XXXII.** For the purpose of collection of Dhawda gum the entire division is divided into three gum units in Digras, Kali and Marwadi ranges which are sold by auction. JFM Committees shall be involved in collection of gums. In this area, tapping of gum is through traditional methods as scientific tapping or non destructive method of tapping is not in practice.

Tapping rules:

The tapping rules of gum derived by the FRI Dehradun are as follows:

The tapping season will commence from November to end of May each year. No tree below 90 cm in girth will be tapped.

1. 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.
2. Only trees above 90 cm in girth at breast height will be tapped.

3. Each tree will be tapped continuously for 3 years and will be given rest for 3 years thereafter. The second tapping cycle will begin in the 7th year after the commencement of tapping season and will continue for another period of 3 years.
4. The initial blaze of 20 cm width and 30 cm in length or height may be made on trees in the month of November. The blaze is made 0.6 cm deep in the bark. Blaze may be made horizontally leaving equal space between two blazes.
5. The gum starts oozing out soon after blaze is made and may be collected after a month, *i.e.* about December. Subsequent collection and freshening may be done fortnightly up to May. Thus 12 freshening may be required to be made during the year.
6. The lowest row of blaze will be at 1 m above the ground level. The next row of blaze will be made at the height of 60 cm from the lower *i.e.* at a total height of 1.6 m from the ground level, the vertical portion of the blaze of upper row will alternate with similar portion of the row and no 2 blazes of the two rows will be directly one above the other.
7. The number of blazes to be made on each tree will depend on its girth at breast height as given in the following table.

Table No.7.3: Number of blazes on tree for gum

Sr. No.	Girth at breast height (in metres)	Maximum no. of blazes to be made on each tree
1	0.9 to 1.3	2
2	1.3 to 2	3
3	2 to 3	4
4	Over 3	1 blaze for every 45 cm girth in addition to category 3 above.

No fresh blaze will be made on the partially healed up surface or old wounds. Each blaze will be in a shape of parabola with a 2.5 cm side base. The curved side of parabola will be upwards and of height not more than 7.5 cm and depth of the blaze will not be exceed 0.6 cm in the wood. At the end of the season, the height of the blaze shall not be greater than 12.5 cm. Maximum permissible dimension of each blaze shall be 10X12.5X0.6 cm in width, height and depth respectively.

Since the tapping is to be done continuously for 3 years the total height of blaze at end of 3 years of tapping will be 37.5 cm the width and depth remaining the same. In the second cycle *i.e.* in the 7th year (after 3 years rest) new blazes will be made in the same way in the unblazed portion, in between the blazed portion of the first cycle. This blazing will continue for another 3 years in the manner described above and operation will be repeated till unblazed is fully covered.

The "Drill method" for gum extraction can also be done for better gum production. The methodology is as follows.

- The tapping season will commence from November to end of May each year.
- No tree below 90 cm in girth will be tapped.
- Drills of 2 to 3 cm depth (slightly slanting towards base) are made at a spacing of 20 cm at breast height. A tree of 120 cm will have 6 drill holes.
- 1 ml of ethephon (39%) will be injected in each hole.
- Within 4 to 5 hours of ethephon injection, Gum oozing commences.
- Gum can be harvested as clumps every 15 days.

7.6.13.4: Management of Hirda, Beheda, Aonla, Char and Other NTFPs:

Collection of Hirda, Beheda, Aonla, Char and other NTFPs: Fruits of Hirda, 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 therefore, poor indicator of their potential in the tract.

Collection of species, which are not covered under the monopoly procurement by government agencies, should be allowed by the Joint Forest Management Committees or Village Panchayats for better protection of Hirda, Beheda, Aonla, Char trees and to increase its stock, few of the above trees be numbered and these trees be allotted to members of JFM committee**.** The members of committees who have been assigned should protect and nurture these trees. Range Forest Officer is supposed to monitor this activity of JFM committee regularly and make proper documentation.

Removal of NTFPs shall be within the sustainable limits of production. Felling of trees and lopping of branches shall not be permitted for NTFP collection. Destructive removal shall not be permitted, in any case. Digging up of plant roots, branch cutting, debarking on a plant will be considered as destructive removal.

Regeneration of Hirda, Beheda, Aonla and Char: Required tending is prescribed where saplings of Beheda, Aonla and Char are found in worked coupes, to remove congestion. Soil working and mulching are prescribed along with planted seedlings and to be done during coupe operations of various areas in working circles. Atleast 10% of species taken up for plantations shall be of NTFP species. Hirda, Beheda, Aonla and Char are prescribed for plantations.

7.6.13.5: Future Interventions:

The NTFP management on sustainable basis has remained a complex process for the last several decades but in the present scenario, there is a need to adopt multipronged strategy, as under, to build up an environment to strengthen community based management and trade of NTFPs which in turn would strengthen the livelihood of poor forest dependant population.

Resource Augmentation:

Due to unrestricted and unscientific collection and over-use of products NTFP resources have greatly been depleted in past years while their regeneration has gone down. Special effort is required for reducing the pressure on forest by cultivating selected species and undertaking intensive conservation of existing forests supported by Natural Regeneration and other conservation activities. One of the important strategies for resource generation is conservation, development and harvesting (CDH) methods which is an integrated approach from conservation and production to the end use.

Undertaking *in situ* conservation measures for NTFPs including protection and Assisted Natural Regeneration (ANR) to reduce resource depletion and reviving endangered NTFPs is required. Conservation of all genotypes including RET species, development and sustainable harvesting with locally feasible models of community participation. Additionally cultivation and plantations of NTFP can be promoted in private

lands, lands with gram panchayat to reduce the gap in demand and supply. Special efforts need to be taken for all activities of NR, ANR, nursery raising, plantations and tissue culture etc.

Detailed inventory and prioritization:

NTFP sector is still unorganized. There is no comprehensive detail available on most of the NTFPs. Hundreds of NTFP species are of medicinal value and are in active trade. Only few species are recognized and traded while no or a little data is available at the division level. Since NTFP collections are seasonal and may vary from year to year it is difficult to provide demand and supply data until a dedicated system prevails. The first priority would be to prepare a base line data. A first-hand knowledge towards the identification of species should be available at a beat level. Hence a compartment wise inventory of the species, quantity, mature trees available, their production potential and quantum collected needs to be documented. Attributes such as species wise availability, season of harvest, economic part, cultivation status, quantity which is self-consumed, value added and traded also needs to be documented. Range wise species prioritization and selection for conservation, development and harvesting of important NTFP species, demand and supply for NTFPs needs to be determined. All these information needs to be developed in on GIS platform for better management.

Forward and backward linkages:

Traditionally the whole NTFP sector, particularly its collection, trade and local value addition are managed in an unsystematic and unorganized manner. JFM committees, Gram sabhas and Panchayats were given some responsibilities for NTFP management but are still not in a position to independently and successfully handle the overall management of NTFP. Most NTFPs are biological and seasonal products where several produce are perishable and require immediate disposal. In most places the primary collectors do not have proper storage facilities. Hence, primary collector is vulnerable to sale at a low price.

In this division a few species can be identified based on the availability. For each prioritized species, value chain analysis and development needs to be carried out

followed by need based infrastructure development, processing facilities, standardization, certification, enterprise development, purchase and selling, arrangements for working capital/loans etc. Importance should be given to those species which come under RET (rare, endangered and threatened) categories. There is a need to involve financial institutions to promote community based micro-enterprises with clear benefit sharing mechanisms. Involve financial institutions like public sector banks in NTFP enterprise development. Apart from these the following aspects can be considered for NTFPs.

1. Minimum support price (MSP) for NTFPs: Ministry of Tribal Affairs, Government of India has announced MSP for 24 NTFPs namely, Karanj Seed, Mahua Seed, Sal Leaf, Sal Seed, Lac (Rangini and Kusumi), Chironjee, Wild Honey, Myrobalan, Tamarind, Gums (Gum Karaya), Kusum Seed, Neem Seed, Puwad Seed, Baheda, Hill Broom Grass, Shikakai, Guggul (exudate), Bael (dried and without crust), Nagarmotha, Palash Kesuda (flower), Shatavari (dried), Madhunashini, Kalmegh, Tamarind (de-seeded).

2. Mechanism for market intelligence and information system.

3. Efficient Certification system for improved trade.

4. Revolving Fund or similar financial support to primary collectors through JFM committees.

5. Better access and benefit sharing mechanism with necessary legal provisions needs to be ensured.

6. Value chain development by aggregation, primary processing, grading, branding and certification. Works initiated by some of the divisions like Gadchiroli can be taken as a reference.

Capacity building:

Skill/capacity development is very important for the foresters (particularly the field staff) to successfully face the emerging challenges of accommodating community rights in forest conservation, ensuring biodiversity conservation and managing climate change. At the same time, complimentary facilitation should be made for forest protecting JFM committees too in the form of NTFP management protocols. The following aspects need to be taken up for capacity building.

1. Formation and strengthening of local institutions-JFM committees, Self Help Groups.
2. Special training of front line staff and members of JFM.
3. Strengthen and restructure existing institutions, particularly public sector procurement and marketing agencies.
4. Modular training for NTFP collector, growers, entrepreneurs and traders.
5. Local, state and national level exposure visits of relevant stakeholders.

Income generation:

For empowerment of community and sustainable forests a symbiotic relationship between forests and forest dwellers must be maintained in order to provide income for the poor population. Women are mostly dependent on NTFPs due to the nature of its production, quantity, collection procedure, processing and local selling.

Research and Development:

Research and Development activities in the past were more or less timber centric. Except for few NTFPs like lac, resin, tendu most have been ignored even though they are highly exploited. There is a need of action oriented R and D in areas of developing new/alternate marketability particularly for low value and high volume NTFPs on the basis of a special drive, post harvesting, semi processing, genetics, management, nursery, plantation, collection, storage, chemical analysis for useful contents, etc. Research is required on biological, social, trade and market and economic dimensions.

R and D focus is also necessary to develop NTFP silviculture, sustainable harvesting protocols, low-cost and user-friendly (preferably women-friendly) value addition techniques and processing machines, eco-friendly and safe storage methods. To develop the NTFP sector in a holistic way a co-ordinated effort between various Government sponsored programmes is necessary.

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CHAPTER-8

JOINT FOREST MANAGEMENT

8.1: NAME OF CHAPTER (CLEARLY MARKED ON GIS BASED MAPS (1:150000): The area of this chapter has been marked on GIS based map of 1:150000 scale is appended and a copy of the same is given in A4 size here.

8.2: GENERAL CONSTITUTION:

Since the inception of community participation in forest management, JFM committees play an important role in conservation and management of forest and wildlife resources. In recent times they have become an integral part of peoples' participation.

Pusad forest division has a total of 240 JFM committees in the forest fringe villages. The total area allotted for these committees is 38179.15 hectares. This covers around 54% of the total area of the division. JFM committees have taken up plantation activities to the extent of 2647 hectares during the previous plan period. The quality of forest is degraded nearby habitations. The entire forest area of Pusad division is covered under this chapter for implementation of JFM.

The number of villages is more in this division leading to heavy biotic pressure resulting in degradation of forests areas adjoining to habitations. These forests required to be regenerated through intensive protection and development of rooted stock and natural regeneration. If necessary natural regeneration will be supplemented with artificial regeneration with the active involvement and cooperation of the members of JFM committees. Areas generally degraded with density less than 0.4, open forest with eroded soils are included for JFM activities.

8.3: GENERAL CHARACTERISTICS OF VEGETATION:

The forest falls under the category of "Tropical, dry deciduous forest" of Champion & Seth's revised survey of forest types of India and belongs to sub group 5A/Cib "Southern Tropical dry, deciduous" and climax sub types are categorized on the basis of various local factors like soil- texture, depth, soil-moisture, topography and also

environmental conditions. Most of these forests suffer from biotic factors like uncontrolled and heavy grazing, illicit felling and repeated fire incidences and also to some extent encroachments. The forests of Pusad division is situated under soils derived from underlying trap characterized by presence of Teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. Majority forest area is represented by site quality IVa & IVb.

8.4: FELLING SERIES, CUTTING SECTION AND JFM AREAS: Not applicable.

8.5: BLOCKS, COMPARTMENTS AND JFM AREAS: Entire forest area of the division.

8.6: SPECIAL OBJECTS OF MANAGEMENT:

1. To strengthen and empower local institutions for protection and conservation of forests and wildlife resources through peoples' participation.
2. To increase the vegetation cover and to carry out soil and moisture conservation works with the active co-operation of local people.
3. To involve local people in forest protection to generate sustainable employment.

8.6.1: ANALYSIS OF THE CROP:

In Maharashtra JFM committees in the forest division are guided by Government of Maharashtra Resolution dated 16th March 1992, 5th October 2011 and 10th July 2012. In Pusad forest division there are 471 villages of which there 225 villages which are within forests, 124 villages adjoining the forest areas and 122 villages which have no forest area. In this division 240 JFM committees have been formed till 2018.

As per the Government GR, the total number of members in a committee is a minimum of 12 and maximum of 24 with one third members from gram panchayat. 50% of the members should be women and the members from SC/ST and OBC. In the 240 JFM committees there are a total of 77359 members. A total of 217 Memorandum of Understanding (MoU) has been signed. The details of JFM committees is given in **Appendix –XXXIII.**

Maharashtra forest department has issued guidelines for grading of JFM committees into A, B and C categories based on various criteria. Based on this, of the 240 JFM committees, 57 committees, 70 committees and 113 committees have been

graded into A, B and C category committees respectively. General body meetings and executive committee meetings of JFM committees are conducted periodically. The overall attendance in General body meetings is 60% and executive committee meetings is 80%. During these meetings various resolutions pertaining to the concerned JFM committee is approved. Various registers are also maintained at the committee level.

Table No.8.1: Range-wise distribution of JFM committees

Sr. No.	Range	No. of JFMC	Area allotted (ha)	Plantation area (ha)
1	Digras	45	4473.35	480
2	Kali D	25	5516.79	335
3	Mahagaon	39	6723.99	365
4	Marwadi	21	3677.38	145
5	Pusad	29	7547.57	290
6	Shembalpimpri	42	5286.64	427
7	Umarkhed	39	4953.43	605
Total		240	38179.15	2647

8.6.2: SILVICULTURAL SYSTEM: Not applicable.

8.6.3: ROTATION PERIOD: Rotational grazing is practiced.

8.6.4: HARVESTABLE DIAMETERS: Not applicable.

8.6.5: REDUCING FACTORS AND REDUCED AREAS: Not applicable.

8.6.6: FELLING CYCLE: Not applicable.

8.6.7: DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not applicable.

8.6.8: CALCULATION OF YIELD: Not applicable.

8.6.9: TABLE OF FELLING: Not applicable.

8.6.10 : METHOD OF EXECUTING THE FELLING / CUTTING : Not applicable.

8.6.11 : SUBSIDIARY SILVICULTURAL OPERATION : Not applicable.

8.6.12: REGENERATION: Regeneration and protection of MFP areas and collection, grading, value addition and marketing of various MFP in the division are to be given focus for working under the JFM program.

8.6.13: ASSOCIATED REGULATIONS AND MEASURES:

8.6.13.1: Background of Joint Forest Management:

Degradation of forests is a reality due to various factors such as over exploitation of forest resources due to heavy biotic pressure such as illegal removals from forest, overgrazing, forest fires, loss of top soil due to excessive erosion etc. Rate and magnitude of degradation is directly proportional to the involvement of rural communities in the protection and management of forest resources. In the past, local communities enjoyed free access to the forests. With the bringing of forests under Government control through the process of reservation the access to forest resources were substantially regulated. Thus, forest reservation policy came in conflict with the interest of local communities dependent on these forests to meet their basic needs of forest produce for bonafide requirements. Forests were managed as Government property in larger national interest as provided for in the National Forest Policy 1952 which stated that the use of forests by village communities in their neighbourhood should in no event be permitted at the cost of national interest. Such policy of managing forest only in larger national interests, overlooking the basic needs of local communities did not succeed and forests were degraded as a result of over use.

Forest resource being common property resource entails participation of communities in protection and management so that, the belongingness of the community acts as a catalyst for long term forest and wildlife conservation. Therefore, the National Forest Policy, 1988 accordingly provided for creating a massive people's movement for the conservation of forest resources.

The National Forest Policy, 1988 emphasized that domestic requirements of the tribal and other poor people living within and near the forest for fuel wood, fodder, NTFP and construction timber should be the first charge on forest produce and the holders of customary rights and concession in forest areas should be motivated to identify themselves with the protection and development of forest from which they derive benefits. In pursuance to the National Forest Policy, the Ministry of Environment and Forests advised the State Governments to adopt the Joint Forest Management (JFM) approach for the protection and rehabilitation of degraded forest. The Government of Maharashtra vide Resolution No.SIF-1091/199/F-11, dt.16$^{th.}$ March 1992

adopted JFM approach for degraded forest areas. Thereafter, the State Government vide Resolution dt. 25/4/2003, expanded the scope of JFM to Good quality forests also. On 5th October 2011, the JFMCs were provided legal backing by bringing them under the umbrella of Mumbai Gram Panchayat Act 1959. Similarly, to further strengthen the institution of JFM, special schemes have been introduced to reduce the biotic pressure on forest and to improve the success of plantations viz., distribution of LPG/Biogas, distribution of improved cattle in lieu of scrub cattle, protection of plantations.

JFM is a concept under which Forest department and village committee jointly protect and manage the forest. The starting point of JFM has to be the realization of the need of JFM both by Forest department and the local people. Generally, the scarcity of forest products such as fuel wood, fodder etc. as a result of degradation of forest on which the local communities depended, forces the people to think of steps for the protection and improvement of degraded forests. People are usually reluctant to participate in JFM where sufficient forest areas are still available to meet their requirements. On the part of Forest department, the challenge to effectively protect forests with limited resources is enormous. The JFM program succeeds where the initiative comes from the people's side and it usually fails where it is forced from Forest department side as it would only be a Government driven and target oriented program. Villagers themselves are required voluntarily to participate in the program.

Forest Protection Committee (FPC) is to be formed in each village through the resolution of Gram Sabha. Each Forest Protection Committee constitutes a Managing Committee consisting of members elected from general body and with local Forest Guard/Forester as the member secretary. The managing committee is responsible to implement the decisions of general body with regard to the execution of JFM works in partnership with Forest department. Memorandum of Understanding (MoU) is signed between Forest department and managing committee clearly specifying the duties and responsibilities of both parties. Entitlement of FPC members to the share in forest produce is subject to the fulfilment of conditions of MoU.

The members of the FPC will help in protection and development of forests and in turn they will receive share in the usufructs from the forest areas assigned to such committee. The JFM area will be managed as per the micro-plan prepared by the JFMC and approved by the DCF. These micro-plans shall contain the details of forest and village development works. This has to be sustainable, should cater to needs of local communities and the same time, the silvicultural requirements of the forest are to be factored properly.

Government of Maharashtra vide Resolution dated 5th October 2011 and 10th July 2012 has issued revised guidelines for implementation of JFM programme. Important provisions of these guidelines are summarized below:

1. JFMC will be constituted by the Gram Sabha through a resolution under the provisions of Section 49 of Mumbai Gram Panchayat Act, 1958. It would consist of 12 to 24 members, of which, atleast 50% are women. Representation to SC, ST and VJNT will be as per prevailing Government norms.
2. The ex-officio member secretary of JFMC would be Forest Guard/Forester if the village population is less than 1000 or more than 1000 respectively.
3. The forest area to be assigned to JFMC would be decided based on parameters such as production potential, available eco-tourist sites etc. through consultative process. In general, forest areas within 3 km of *Gaothan* would be identified for assignment. Apart from degraded forest areas, even dense forest areas can also be assigned to JFMCs.
4. Memorandum of Understanding (MoU) will be signed in prescribed format by DCF (T) and JFMC.
5. Micro-plan will be prepared by the JFMC and would be approved by the DCF. All JFM activities should be taken up as per the approved micro-plan. The micro-plans are to be dovetailed with the broad prescriptions of the approved Working Plan of the division.
6. JFMC is authorized to promote Eco-tourism activities in their assigned areas and can levy entry fee and nuisance tax from eco-tourists to preserve these sites sustainably and also generate livelihoods to local people.

7. JFMC is authorized to impose penalties on persons involved in forest and wildlife crimes.
8. RFO and JFMC have to submit an annual performance report jointly to the DCF with respect to the responsibilities assigned and achievements of the committee.
9. The JFMC would be eligible for usufruct sharing from intermediate and final felling as per working plan if the responsibilities thrust on the committee are executed for a period of five years. However, in case of bamboo, yield from dense areas/degraded areas, the same would be available to JFMC soon after execution of MoU and upon protection of bamboo for 3 years respectively. All removals would be as per the provisions of approved Working Plan.
10. In case, the JFMCs do not perform the responsibilities assigned to them, DCF is authorized to dissolve such committees by applying the principles of natural justice.
11. Non forest land available in the village can be included in the JFM programme if the Gram Panchayat agrees to do so.
12. To reduce the biotic pressure on forests for fuel wood, Government of Maharashtra vide Resolution dated 10th July 2012 has launched schemes for distribution of LPG/Biogas connections on 75% subsidy. Similarly, to reduce grazing pressure, distribution of improved breed of cattle in lieu of disposal of scrub cattle has been introduced on 50% subsidy. To improve the performance of plantations, scheme for plantation protection through financial incentive has been launched.

8.6.13.2: Potential Areas for JFM:

The following areas will be suitable for JFM program.

- Areas prescribed under the Afforestation Working Circle.
- Areas under miscellaneous management are proposed to be covered under JFM.
- Areas under Fodder Management Working Circle are also proposed to be included in JFM.

- Regeneration and protection of NTFP areas and collection, grading, value addition and marketability of various NTFPs in the division are proposed to be given focus for working under JFM program.
- Villages which are adjoining to potential Eco-tourism sites are proposed to be included in JFM programme.
- All potential wildlife areas are to be included in either JFM or EDC programme as per provisions contained in Government Resolution.

8.6.13.3: Area Covered and Committees Formed under FDA:

The Government of India started direct funding to the circle in charge for the developmental works in the forest with the participation of the villagers under the JFM programme through Forest Development Agency (FDA). In this division there are 16 JFMCs under FDA Scheme.

8.6.13.4: Village Forests:

"Village forests" or "Gram Van" means such part of reserved forests or protected forests in the village as assigned to the Village Panchayat under the Indian Forest Act, 1927 and the Village Forest Rules 2014 and also under the Maharashtra Village Panchayats Act 1959 for management through Joint Forest Management Committee. The JFMC shall manage its village forests on behalf of the Village Panchayat with due reference to the relevant provisions of the Panchayats (Extension to the Scheduled Area) Act, 1996, the Maharashtra Minor Forest Produce (Regulation of Trade) (Amendment) Act, 2006, the Indian Forest Act, 1927, the Wildlife (Protection) Act, 1972, the Biological Diversity Act, 2002, the Maharashtra Village Panchayats Act and rules made thereunder and any other law in force as applicable to the State of Maharashtra.

Maharashtra Village Forest Rules, 2014: In exercise of the powers conferred by sections 26, 28, 30, 32, 34 and 76 of the Indian Forests Act, 1927 (Act No. XVI of 1927) and all other powers enabling it in that behalf, the Government of Maharashtra has notified the Village Forest Rules on 13th May, 2014. The salient aspect of these rules is mentioned below:

(a) JFMCs fulfilling the criteria of zero encroachment, positive rate of natural regeneration, effective control of forest fire (area burnt not more than 5 % in last three years), over 60% survival in plantations raised in the said area at the end of fifth year, effective implementation of "charaibandi" and "kurhadbandi" are eligible for assignment of village forests if atleast three criteria are fulfilled.

(b) The village forests assigned to the village community or the Village Panchayat shall be managed by a committee called as the "Van Vyavasthapan Samiti" or the Village Forest Management Committee.

(c) "Van Vyavasthan Samiti" has to prepare "Ten year micro-plan" by dovetailing with the Working Plan of the landscape and an "Annual implementation plan" every year for managing the village forests and place the micro-plan before the Gram Sabha for ratification and its approval by the ACF or Sub-DFO in charge of independent sub-division and revise it periodically.

8.6.13.5: General Prescriptions:

- JFM micro-plans will be prepared for each village through the process of participatory rural approach. Micro-plans are to be dovetailed with the prescriptions of the approved Working Plan.
- Silvicultural management, maintenance of forest boundary, removal of forest encroachment and control over illicit cutting, illicit grazing and fire should receive high priority.
- Gradations of JFM Committees into A, B and C categories is being done. Efforts should be taken to improve the JFM Committee and upgrade them from C category to B and B category to A.
- Forest protection cannot be viewed in isolation. The works depicted in the micro-plans should be reflected in the planning process of the Gram Panchayat.
- Wherever required, NGOs be involved for creating awareness programmes.
- Documentation of successful initiatives under the JFM approach must receive importance at the range and division level. A compilation of works undertaken in

JFM villages in a financial year should be done at division level and published. This work should be given wide publicity in print and electronic media.

- JFM programme should be implemented with complete transparency. The accounts of JFMCs shall be annually audited as per Government instructions and a copy of such audited statement shall be shared with Gram Panchayat. All payments to JFM members shall be made either through A/c payee cheques or RTGS transfer or depositing directly into respective bank accounts. Payments through cash shall be strictly discouraged.
- As far as possible, all works are to be executed by JFM members only. Monitoring of JFM activities by supervisory cadres (ACF to CCF) is the key for effective implementation of JFM programme. Periodic reviews at various levels will aid in good implementation.
- Often, there is thinking in the grass roots level functionaries that, JFM has to be implemented only if funds are allotted to a village. This notion is detrimental to the core values of JFM. Therefore, the supervisory officers should strive to bring suitable awareness among the grass root functionaries (FG to RFO) to change attitudes and mindset.
- Dedicated NGOs/Civil society groups can aid the village communities in strengthening JFM institution. Their services can be utilized by the department in areas of capacity building of JFMCs in micro-planning, community motivation, eco-tourism initiatives, evolving models for enhancing livelihoods etc.
- Periodic evaluation of JFMCs should be done to identify performers and non-performers. While performing JFMCs should be rewarded, the non-performers should be given opportunity for improvement.
- One of the important reasons for forest degradation is the dependence of local people for firewood from forests. Therefore, to reduce such dependence, Government of Maharashtra vide resolution of 10th July 2012 decided to distribute LPG connections to forest fringe villages. JFMC's have played a key role in implementing this scheme. In the division, 4291 families have been distributed with

LPG connections. This includes 2272 SC beneficiaries, 356 ST beneficiaries and 1567 from the open category. Similarly, biogas also has been distributed by the department. A total of 55 biogas has been distributed which includes 26 SC beneficiaries, 15 ST beneficiaries and 14 from the open category. The details are given in **Annexure – XXXIV.**

The comparative scenario of the area allotted to the Dhundi JFM committee in Pusad range: This JFM was allotted compartment number 353 with an area of 1032 hectares. The images shown here are from the in which the area was allotted to JFM committee (2007) and the present day status (2018). It clearly shows the improvement of forests in terms of area and density.

Image of 2007

Image of 2018

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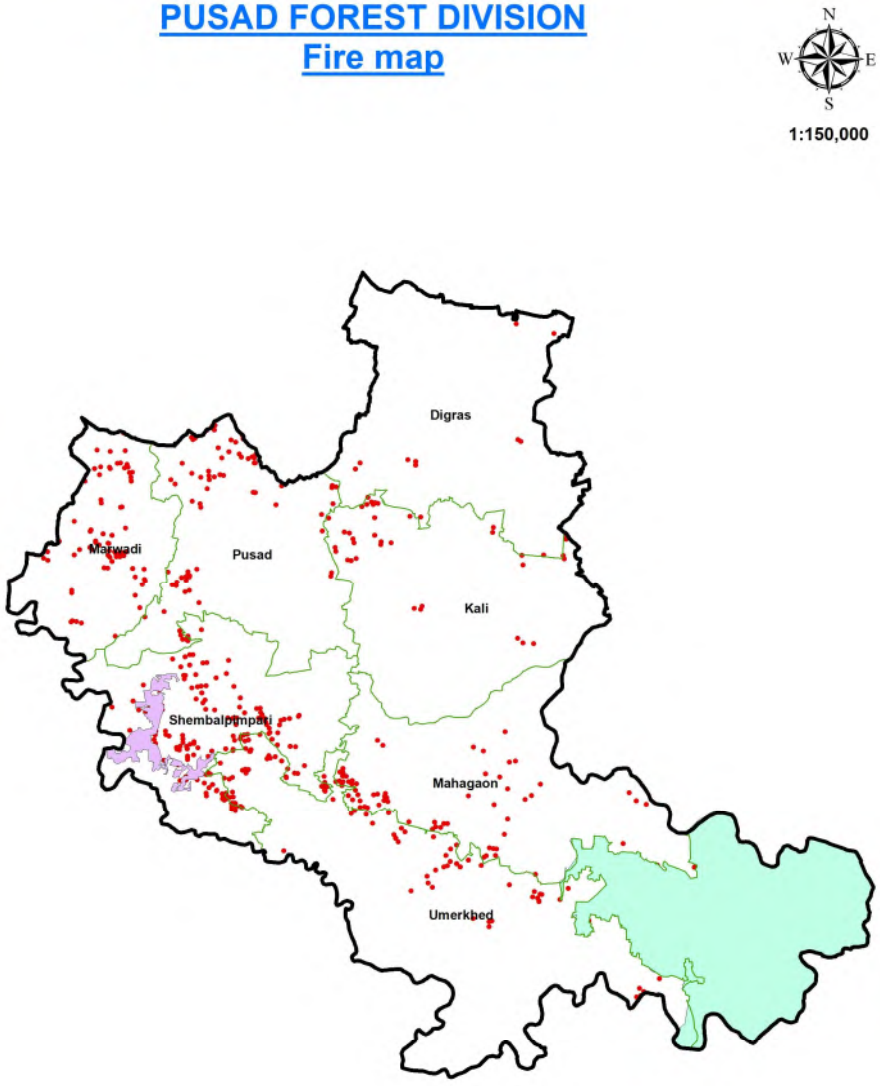
PUSAD FOREST DIVISION
Fire map



Legend

- Division boundary
- Range boundary
- Isapur WLS
- Painganga WLS
- Fire points 2009-18

CHAPTER-9

MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

9.1: FOREST PROTECTION: The area of this chapter covers the whole division and hence not specifically marked on the GIS based map.

9.2: GENERAL CONSTITUTION:

Forests are endowed with rich fauna and flora. National forest policy 1988 emphasizes environmental stability and maintenance of ecological balance. The productivity of forests is to be increased to meet essential national needs like fuel wood, fodder, minor forest produces and small timber for the rural and tribal populations. Forest protection is one of the most important and difficult aspects of forest management. Lots of degradation of forest has already been taken place due to increase of human and cattle population and consequently their requirements. The developmental works require diversion of forest land for cultivation, irrigation projects, industries, etc. which resulted in shrinkage of forest cover as well as reduction in forest area. This resulted in huge gap between demand and supply for forest produce.

The forest of this division has pressure of illicit felling, encroachment, grazing and fire because of excessive biotic pressure of the adjoining villagers and nature of vegetation, climate and social factors. As almost 70% forest constitutes teak, the problem of illicit felling is more acute particularly in the forest of Umarkhed range which is adjoining to state border of Telangana and along the Nanded district of Maharashtra. Pusad forest division has 7 ranges, 25 rounds with 117 beats. All the beats in this division are considered as hypersensitive.

9.3: GENERAL CHARACTERISTICS OF VEGETATION:

The forest falls under the category of “Tropical, dry deciduous forest” of Champion and Seth’s revised survey of forest types of India and belongs to sub group 5A/Cib “Southern Tropical dry, deciduous” and climax sub types are categorized on the

basis of various local factors like soil- texture, depth, soil-moisture, topography and also environmental conditions. Most of these forests suffer from biotic factors like uncontrolled and heavy grazing, illicit felling and repeated fire incidences and also to some extent encroachments. The forests of Pusad Division is situated under soils derived from underlying trap characterized by presence of Teak of different qualities depending upon the configuration of ground, soil depth, structure and moisture contents of the soil. Majority forest area is represented by site quality IVa and IVb.

9.4: FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not Applicable

9.5: BLOCKS, COMPARTMENTS AND JFM AREA (MARKED ON GIS BASED MAPS): Entire forest area of the division.

9.6: SPECIAL OBJECTIVES OF MANAGEMENT:

1. To protect the forest from illicit felling, encroachment, fire and grazing.
2. To sensitize local people about forest protection and involve them in preventing forest offences with their cooperation.
3. To raise the moral of field staff and strengthen their capabilities to deal with forest offences using modern technology.

9.6.1: Analysis of the crop:

Pusad forest division comprises of Pusad, Digras, Shembalpimpri, Mahagaon, Kali (D), Umarkhed and Mahagaon ranges. Area of the division lies in Pusad, Digras, Mahagaon and Umarkhed Talukas of Yavatmal district. The district headquarters is at Yavatmal while the division headquarters is at Pusad. The total geographical area of the division is 4,45,840 ha and the forest area is 1,12,782.92 hectares which is about 25.29% of the total geographical area of the division. The district is bordered by Nanded district and Painganga river in the South, Washim district in the West, Nanded district in the East and Dharwa taluka of Yavatmal district in the North. Telangana state is adjoining to the eastern border of the division. In Pusad forest division there are 471 villages of which there 225 villages which are within forests, 124 villages adjoining the forest areas and 122 villages which have no forest area. There are 117 beats in this division with 157 beat

guards protecting the entire area. Therefore, for effective protection there is a need to seek cooperation and involve local people in forest protection.

9.6.2: Silvicultural system: Not Applicable.

9.6.3: Rotation period: Not Applicable**.**

9.6.4: Harvestable diameters: Not Applicable**.**

9.6.5: **Reducing factors and reduced areas:** Not Applicable**.**

9.6.6: Felling cycle: Not Applicable**.**

9.6.7: Division into periods and allotment to periodic block (PB): Not Applicable**.**

9.6.8: Calculation of the yield: Not Applicable**.**

9.6.9: Table of felling: Not Applicable**.**

9.6.10: Method of executing the felling/cutting: Not Applicable.

9.6.11: Subsidiary silvicultural operations cleaning and thinning: Not Applicable**.**

9.6.12: Regeneration: Not Applicable**.**

9.6.13: Associated regulation and measures:

9.6.13.1: Protection strategy: The strategy to be adopted to protect forest is of integrated approach by undertaking collective measures based on situation and time. The strategy shall be direct field oriented in a participatory manner with active involvement and co-operation of local people especially members of Joint Forest Management committee. Some of the strategies proposed are -

- Existing forest needs to be well protected and developmental works like soil and moisture conservation measures, natural and artificial regeneration works and other cultural operations shall be carried out in order to increase the productivity of the forests.
- Creation of database regarding forest offences at division and range level. These data should be available on GIS platform for better planning, monitoring and implementation of activities regarding forest offences.
- Regulation of grazing and controlling forest fire.

- Seeking cooperation and active participation of local people in all operations of forest management especially JFM committee members.
- Employment generation to local people during lean period.
- Fulfilling the demands of local people for forest produce.
- Effective utilization of existing infrastructure, strengthen and updating infrastructural facilities.
- Installation of new check nakas at hypersensitive and sensitive points in Umarkhed, Pusad and Mahagaon ranges apart from existing check nakas.
- Improvement in communication facility and mobility of the forest staff.
- Patrolling sensitive forest areas along with the local people/Joint Forest Management Committee members.
- Introducing rewards and awards and informer system and making the forest offence high risk low gain process.

9.6.13.2: Protection measures: A protection plan is to be prepared at division level in January of every year for taking strict protection measures as per GR dated 13.08.2014. Protection plan shall cover the following issues.

- All beats of the division are considered as hypersensitive beats.
- The DCF shall prepare an annual program for beat inspection. It must be ensured that all the beats in the division shall be inspected once every 6 months. In a year, RFO shall inspect all the beats under his jurisdiction and in a month he shall inspect at least one beat in his jurisdiction. If any serious offence has been detected, the concerned ACF shall re-inspect that beat. Apart from this, DFO (Vigilance) shall inspect the coupes randomly within the division.
- During beat inspection apart from forest offences, forest boundaries, pillars, records of beat guard, POR book, beat map, topo sheet, diary, uniform, GPS, mobile, PDA shall also be checked. Proper use of GPS and PDA shall be ensured.
- After every quarter, the DCF shall review and analyse the beat inspection report and data and appropriate measures and instructions shall be given to the field staff.

- Office inspection must also be done. RFO should inspect round office once in 3 months, while ACF should inspect round office once in 6 months. Range office shall be inspected by ACF and DCF once in a year.
- Saw mil inspection shall be done by RFO (minimum 8 saw mills per month), ACF (minimum 4 saw mills per month), DCF (minimum 2 saw mills per month) and CCF (as and when required).
- DCF, ACF, RFO should ensure that all offence cases registered should be brought to a logical conclusion. All cases in court should be regularly monitored and review should be taken. Help should be taken from the legal advisor in the o/o CCF for all required cases.
- The CCF/DCF shall also organize meetings with officers of the adjoining Telangana state regarding forest protection. They should also ensure proper coordination between Police and Revenue officials.
- At the division level, a control room should be operational that will be in work for 24/7.

9.6.13.3: Illicit Felling: Illicit felling is a major problem in this division. The forests area along with border of Telangana and Nanded district are sensitive from the point of illicit felling. To have effective protection regular patrolling needs to be undertaken.

Patrolling: Regular patrolling is essential in all sensitive areas to control illicit felling. Separate day and night patrolling around sensitive areas, roads leading from forest to towns shall be carried out. A register should be kept in range office regarding patrolling team, time and duration. ACF should supervise patrolling and involve in patrolling once in a month. Patrolling should include inspection and regular checking of waterholes. Joint patrolling with JFM committee members along with staff of adjoining range, round and beat. During patrolling weekly markets should be checked for prevention of illegal trade of NTFP and wildlife parts and products. Analysis of offence cases reveals that the following beats need intense patrolling.

Table No.9.1: Beats requiring intense patrolling

Sr.No.	Range	Beats
1	Pusad	Khandala, Yeldari, Dhundi
2	Digras	Dehani-2
3	Umarkhed	Jewali, Dindala, Piranji, Pinpalgaon
4	Mahagaon	Borgaon, Shirpuli, Beldari-2
5	Shembalpimpri	Shilona, Sawargaon Bang., Jamnaik, Shembalpimpri
6	Marwadi	Panhala, Hiwalni, Udadi, Marwadi Kh.
7	Kali (D)	Wadad, Bramhi, Kali

Check nakas: Check nakas are established at various strategic points to control the transportation of illicit forest produce. Presently there are 10 permanent check nakas and 7 temporary check nakas in the division. Seven more nakas are proposed to be established. These check nakas are manned by beat guard and van majoors. The Check nakas must be duly notified by competent authority and published for the benefit of public as well as law enforcing authorities. It is required to strengthen existing check nakas with effective controlling force *i.e*. manpower and modern communication system. Check nakas need to be installed with CCTV cameras for better monitoring of vehicles. The details of status of check nakas is given in the table below.

Table No.9.2: List of check nakas

Sr. No.	Range	Permanent naka	Temporary naka	Proposed naka
1	Digras	0	0	0
2	Pusad	3	1	1
3	Umarkhed	2	1	0
4	Mahagaon	0	2	1
5	Shembalpimpri	1	3	2
6	Marwadi	3	0	2
7	Kali D.	1	0	1
Total		10	7	7

Protection huts: Protection huts can be established in sensitive places.

Mobile squad: The territorial DCF has been provided with one mobile squad which consists of RFO, Forester, four forest guards, van majoors, a police constable, a driver and a vehicle. The RFO along with his staff will supervise the protection of entire Pusad division and he works directly under the control of DCF.

Inspection of area of illicit felling: The Government has issued various directions and circulars from time to time in relation to dealing of forest offences. The Government has issued GR no. TRS-04/2014/F-6/R and FD, Dt. 14th August 2014. The following time schedule has been provided for inspection of illicit felling areas by respective officers.

Table No. 9.3: Inspection of area of illicit felling

Sr. No.	*In situ* value of illicit cutting at a place	Inspecting Officer	Period within which inspection should be completed
1	Upto Rs.50,000	RFO	3 days from detection/receipt of intimation of detection
2	Above Rs.50,000 but not exceeding Rs.2,00,000	ACF/ Sub DFO	3 days from the receipt of information.
3	Above Rs.2,00,000 but not exceeding Rs.5,00,000	DCF/DFO	3 days from the receipt of information.
4	Above Rs.5,00,000	CCF	7 days from the receipt of information.

Wireless network: Presently there is no wireless network in this division. The field staff is provided with mobiles and PDA for better monitoring. Since mobile network is not available throughout the division wireless network will have an added impact in forest protection. Therefore, it is prescribed that wireless communication system should be provided for effective protection of the forest.

Modern technology like smart phones, PDA, drone may be used in detection, prevention and subsequent actions against forest offences. Various applications developed by ITP cell of Maharashtra forest department can be used.

Mobility of the staff: In Pusad division government vehicles are provided for DCF, ACF and all RFOs. It has equipped the staff with better movement that enhances forest protection. As the forests along Painganga river is of good quality teak, offenders from Marathwada and Telangana indulge in illicit felling in this belt and transport the felled material with the help of boats or by way of rafters to the point of convenience. Therefore, it is essential to provide motor boat for patrolling along Painganga river.

Provision of arms: Forest offenders are resorting to use modern weapons *i.e* fire arms in committing forest offences. Government has provided weapons to the staff for forest protection and for self protection. The arms and ammunitions provided to the staff members should be put to use and deal with the offenders. Field staff should be regularly

trained for the use of fire arms. Firing practice should be done periodically in coordination with police department.

Transit rules for Forest Produce: Illegal transportation of forest produce should be checked by concerned staff as well as staff of mobile squad. Special surprise checking and nakabandi shall be organized on major district roads and known routes from the forests to towns through local staff and mobile squad once in a month.

Collection of information and intelligence: The RFO/ Round officers should frequently interact with the villagers to collect information regarding illicit felling, poaching, encroachment etc. through intelligence network and keep the information in a register under their personal custody. Through this intelligence network, village wise record of habitual offenders must be prepared. Secret service fund provided by the department may be used to the fullest to gather, raid and apprehend offenders involving in forest offences. This fund may also be used for intelligence gathering regarding forest offences.

Rapid response unit: A rapid response unit is needed to quickly respond and attend conflict situations created as a result of man-animal interactions. The unit should consist of Round officers, beat guards, vanmajoors and be provided with a vehicle which can accommodate a trap cage, equipment, tranquilizing kit, mobile phones, wireless handsets and other necessary equipments. This unit can be placed at Pusad. A special task force can be created to deal with organized gangs if any engaged in illicit felling, encroachment and poaching. This may include staff of forest, police and revenue department.

9.6.13.4: Fire protection:

The areas of Pusad forest division are subjected to repeated fires due to heavy biotic pressure and the nature of vegetation and atmosphere due to deciduous nature and the dry climate. Fire caused extensive damage to the forest specially the regeneration, forest growth, ground flora, soil organisms and the soil productivity. Prevention of fires and effective control of fires as prescribed in the plan is essential for the forest development. The fall of leaf litter on the ground combined with highly combustible under growth consisting of dense grasses, can trigger a fire in a short time. In summer high speed hot winds aid the fire to spread easily to the rest of area before it

can be brought under control. Analysis of fire data for the past 10 years reveals that in the certain beats there is repeated occurrence of forest fires. These beats require specific fire management interventions. The details of the beats are given below.

Sr.No.	Range	Beats
1	Umarkhed	Vidul, Krishnapur, Chilli, Warudbibi, Pardi
2	Shembalpimpri	Shembalpimpri, Shilona, Sawargaon (Bang.), Hiwalani
3	Mahagaon	Chilli, Ghanmukh, Wadad, Shenad-2, Shirmal, Amdapur, Shirpuli

The areas needed to be protected from fire are classified into the following categories based on purpose of fire protection.

1. Class I: Forest completely protected; this area includes.

- All main felling coupes, thinning coupes, all the forest of protection working circle, afforestation working circle, catchment area treatment working circle, fodder improvement working circle.
- All regenerated coupes of all working circles till the young crop has attained the age of 10 years.
- All plantations.
- All forest nurseries.
- All Government timber depots.
- Special habitat areas or any other special important areas as specified by the concerned CCF.

These areas are cleared with appropriate width of fire line as per the guide lines and patrolled by fire watchers. If any fire incidence takes place in this area it should be reported to the concerned DCF in detail.

2. Class II: (General Fire Protection):

- The remaining areas of Selection-cum-Improvement working circle.
- All other areas as specially directed by the CCF(T) of Yavatmal Circle on special grounds.
- These areas are separated from surrounding areas by means of external fire lines and will be divided into suitable blocks of interior fire lines and no trees will be cut. Fire watchers may be engaged as sanctioned by the CCF(T).

3. Class III: (Forests Protected by Law only): Those categories which are not included in class I and II are included in this class. Generally deliberate burning is prohibited and no special measures of fire protection will be undertaken. The following categories of fire lines will be maintained kept clean of all the growth and combustible material.

- All external boundaries of reserve forest to the extent of width of 12 m.
- 6 m width around all the plantation upto 10^{th} year from planting.
- 3 m wide coupe lines upto 10 years of main felling.
- 6 m wide line on both sides all along the roads and cart tracks that are passing through forests.
- 40 m wide fire lines around timber and fuel wood depots.

9.6.13.5: Fire control measures:

To control and reduce fire the following operations shall be undertaken.

- The cutting and cleaning of fire lines shall be completed by end of December and controlled burning shall be completed by end of February. Leaf litter on the fire lines shall be collected from time to time and burnt before the fire season starts. No fire line shall be burnt after February unless there is a special order from the concerned DCF.
- A consolidated fire protection scheme shall be prepared in consistent with the prescription given in the working plan with the provisions of watch point, strategic location, fire watcher at each location, deployment of vehicles and the supervisory forest staff.
- The fire watchers and the forest staff are required to be given training in fire protection and handling of fire fighting tools.
- The fire watcher shall constantly patrol the areas of class I and class II.
- The fire watch towers shall be erected at strategic points where the fire watchers sit on the tower observe location of fire.
- After receiving information the fire watchers move in group to particular location and extinguish fire with the help of fire fighting tools.

- The division office will maintain a register of fire lines showing the length and width of fire line and the period of cutting and burning and a consolidated map will be prepared based on the actual position of the fire lines. Any negligence in fire protection duty shall be viewed as dereliction of duty and the supervisory officer must extensively tour in the area and verify the fire control measures.
- The members of Joint Forest Management committee shall be involved in the fire protection and their participation and cooperation shall be obtained to have effective fire protection.
- The vehicles that are available will be deployed at strategic location where the fire protection gangs can reach easily whenever they require vehicles. These vehicles are means for transporting fire protection labourers and fire protection equipments.
- **Fire alerts:** Forest survey of India, Dehradun provides alerts on forest fires on real time basis. These alerts are being sent to the concerned beat guards directly along with information on Lat/long of the fire spot detected. These alerts should be utilized to the maximum and fires can be brought under control in a quick time. These fires spots should be collected and made available in a GIS platform for better fire management and utilization of available resources. It serves as an important tool for the field officers.

9.6.13.6: Responsibility:

The RFO is personally responsible for efficient fire protection in his range. If there is a common boundary in 2 ranges the responsibility of clearing fire line will be decided by the DCF. In case of common boundary in 2 divisions the fire line cutting and maintenance will be decided by the CCF (T).

The DCF is responsible for carrying out efficiently all protective measures for fire protection. The DCF must satisfy himself that external fire lines and other fire lines are prepared before February by carrying out extensive tours in the area. He is required to move in the jurisdiction extensively during fire season and during his tour must keep a strict watch on fire protection by means of local enquires and inspections. A constant

watch should be kept on Tendu contractors and their agents who engage local labourers to put fire to the forest to get good flash of Tendu leaves.

9.6.13.7: Fire reports:

If any fire incidence takes place the concerned Range Forest Officer must inform the DCF at once. The Range Forest Officer must keep a proper communication and co-ordination with the DCF. After the fire is extinguished, a detail report shall be submitted to the division office regarding extent of area, damage, value of damage with the detail map within 15 days. Forest Survey of India provides geo coordinates of fire daily. While preparing fire reports all these points within the division must be verified on the ground.

The division shall submit monthly return in prescribed proforma to the CCF showing serial number of fires, date of occurrence, cause, area burnt, extent of damage and the steps taken to extinguish fire. A register of fire record shall be maintained at division office giving details of length fire line Class I, II and III. The fire incidence that takes place in Class I, II, III areas shall be indicated with different marks on the map. Deliberate burning of debris on silvicultural principles to encourage regeneration need not be included in fire protection scheme and fire should not spread outside the targeted area.

9.6.13.8: Grazing control:

Fire and grazing hamper the success of regeneration of forest to a great extent. To control grazing, grazing units are formed in the division. The number of cattle heads is fixed as per the carrying capacity of the area. In Pusad forest division heavy cattle population pressure has degraded the forests. The number of villages in this division is 471 whereas the number of compartments is 300, which means there is more than one village in each compartment. The 'C' class Reserve Forests are excessively grazed, therefore, these forests are mostly open or scrub type. The Government of Maharashtra formulated the grazing policy vide its resolution no. MFP-1365/1322-Y, Dt. 6/12/1968 and the grazing rules were framed vide its G.R. no. MFP/137/237035-Z, Dt. 3/11/1973.

The main felling coupes of all working circles will remain closed for a period of 10 years from the main felling as felling cycle is fixed at 20 years *i.e.* 1/4th area of the felling series will remain closed for grazing at any time. All the forests are not possible to open for grazing at a time and as the cattle population is not uniformly distributed therefore, it is prescribed the cattle exceeding carrying capacity of an area open for grazing should not be allowed to enter into the forest. The excess cattle units can be managed through fodder development activity on common community lands and waste lands. The villagers shall be persuaded to go for stall feeding of some of their cattle which are more than carrying capacity of the forest adjoining to them and local people shall be educated and made aware of ill-effects of excessive grazing on forests growth. Apart from this the forest staff should open a dialogue with the local villagers to discuss regarding grazing policy, carrying capacity of forests and the area available to graze their cattle in the adjoining forests. The DCF should consider all the factors and prepare a consolidated plan based on area, cattle units, carrying capacity, rotational grazing and avenue for excess cattle units.

9.6.13.9: Encroachment:

The problem of encroachment is common in almost all the areas specially the forest areas located adjoining to habitations. The problem of encroachment is because of lack of appropriate survey and demarcation on the ground, the greed of the people and the apathy of local people towards Government lands. In order to mitigate the problem, it is essential to take up survey and demarcation works on top priority. Precast pillars of 1st and 2nd class type shall be erected after the survey is over which can be completed in a phase manner. The existing cairns shall be repaired and maintained under 1/5th boundary demarcation scheme. The powers that were entrusted to the officers of Assistant Conservator of Forests and above rank under Sec. 53 and 54 of Land Revenue Code will effectively be utilized. The encroachment, if any, can be tried summarily and evicted as early as possible. The following instructions shall be followed regarding encroachments.

(1) Special care shall be taken to ensure protection of such patches from encroachment. The civil powers of eviction are entrusted to ACF and DCF. The procedure

laid out in the Land Revenue Code shall be followed before the execution of eviction. Habitual encroachers shall be prosecuted as per Indian Forest Act.

(2) All external boundaries shall be demarcated with concrete pillars. All sensitive and important boundaries and wherever disputes are there, be surveyed and concrete pillars be laid immediately.

(3) All encroachments shall be listed with their names, age, residence, profession whether belongs to SC, ST, OBC/NT, extent of encroachment, s.no. and location of encroachment, village/block.

(4) A detailed report of the case be prepared for each encroacher and submitted to ACF to obtain summary eviction orders in a time bound programme.

(5) After the completion of due procedure of Land Revenue Code and after giving a reasonable opportunity of being heard to the encroacher, ACF shall pass a summary eviction order if he satisfies so quoting the findings.

(6) The concerned RFO shall execute the eviction order.

(7) If the encroachments in a village are more in number, police protection be obtained for the operation. Use of Cr. P.C. provisions like section 106 and 110 be used to smoothen the eviction operations as well as to prevent the tendency of future encroachments.

(8) For the encroachments on the un-classed forests (though 7/12 shows clear possession of the department) FIR shall be lodged in the concerned police station for the prosecution.

(9) Regularisation of the encroachments made earlier to 1980 be settled as early as possible and necessary proposals be submitted to Government.

(10) After the listing of all encroachments, sample verification shall be carried out by all supervisory officers to detect unregistered encroachments.

(11) In the month of May, a drive for encroachment prevention be taken up in all the sensitive areas by taking meetings in the villages, distribution of leaflets and posters.

(12) Keep a watch on all the sites meant for debris cleaning, ploughing etc., in the month of May, so that encroachments are removed even before the sowings.

In the recent past the tendency for encroaching forest land for cultivation has increased. The eligible encroacher's encroachment is under enquiry by the District Magistrate Committee in relation to regulation of the Schedule Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 and Act 2008. The causes of forest encroachments shall be examined thoroughly and corrective measures be taken. All necessary support should be extended to evict the encroachments as early as possible. The boundary management and standard administrative guidelines will help to control the encroachment. RFO must inspect at least 50% of the boundary demarcation, ACF at least 10% of the boundary demarcation, DCF at least 2% of the boundary demarcation. RFO Mobile Squad shall check 2 % of the boundary demarcation.

9.6.13.10 : Role of joint forest management :-

JFM committee will contribute to a large extent in protection of the forest from illicit felling, encroachment fire, grazing, etc. provided if the forest staff have a constant dialogue with the members of the committees and involve them for joint patrolling, management and development of the forest.

The JFM committees shall be entrusted with a specific area ear marked them for the protection, management and development of the area. The committee members needed to be given training in technical matters of protection at the same time they should be provided with gainful employment by taking up management and developmental activities in the areas entrusted to them.

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CHAPTER-11

WORKING PLAN FOR MISCELLANEOUS WORKING CIRCLE

11.1: GENERAL CONSTITUTION: This working circle consists of the following areas.

1) Areas of 'A' and 'C' class Reserve Forest handed over to other departments which are yet to be disforested.

2) 'C' class forests which are yet to be given compartment numbers.

Table No. 11.1: Area of miscellaneous working circle

Sr. No	Range	'A' Class area handed over to other dept. (ha)	'C' Class area handed over to other dept.(ha)	'C' Class area balance and yet to be given Compt. No. (ha)	Total (ha)
1	Digras	191.88	429.98	248.34	870.2
2	Pusad	149.72	0	16.1	165.82
3	Umarkhed	32.01	0	0	32.01
4	Shembalpimpri	0	231.71	30.57	261.94
5	Mahagaon	14.02	287.85	18.04	319.91
Total		387.63	949.2	313.05	1649.88

11.2: GENERAL CHARACTERISTICS OF VEGETATION:

The nature of vegetation is of scrub or open type with poor quality of teak in few pockets. Majority of the area has already been handed over to other department **(Appendix- XXXVI)**.

11.3: METHOD OF TREATMENT:

1. The areas which were handed over to other departments will have the same legal status until they are denotified. Therefore it is prescribed that a proposal shall be mooted to denotify these areas and necessary entries should be made in form no. 1 after denotification.
2. The 'C' class reserve forest is mostly opened and scrub which are nearer to habitations. These areas shall be properly demarcated and these shall be brought under forestry uses, such as nursery, forest garden, medicinal plants, forest demonstrative plots, eco tourism, residential accommodation of staff and other forestry activities depending upon the suitability of the area and availability of funds.

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CHAPTER 12
FINANCIAL FORECAST

The prescriptions of this working plan confirms to the emphasis laid in the National Forest Policy 1988. It lays emphasis on protection and conservation of forests, catchment treatment of rivers and streams, preservation of natural forests, increase in productivity of forests, increase in forest cover, protection of rights and concessions of people, tribals, meeting the requirements of people for small timber, fuelwood, NTFP etc. Various prescriptions have been given to achieve the objectives. The implementation of prescription of this working plan will incur expenditure on establishment, execution of works and also generate ecological services as indirect benefit and revenue and sale proceeds of different produce.

Expenditure:

Expenditure on establishment: To run proper administration, an efficient administrative set up is needed. It is a recurring expenditure on the salary and other benefits to officials and staff, maintenance of offices, vehicles, roads, buildings, machines, communication facilities etc.

Expenditure on harvesting forest produce and other activities: During the implementation of the prescriptions forest produce is to be harvested. In SCI and other working circles forest produce in the form of timber, firewood, and other produce like tendu leaves, gums etc will be harvested. The activities incur expenditure on harvesting.

The sources of funds during the last Plan were Plan Schemes, Non-Plan schemes, CAMPA, District Plan (DPDC), MGNREGA, special projects like Jalyukt Shivar, etc. The expenditure and revenue during the implementation of the past working plan period is given in the table below.

Table No. 12.1: Details of expenditure, revenue and surplus

Year	Revenue (Rs in Lakh)	Expenditure (Rs in Lakh)			Total expenditure (Col. 3+4+5)	Surplus (+) or Deficit(-) (Rs)
		Conservancy & Work (Rs. In Lakh)	Establishment (Rs in lakh)	Plan (Rs in Lakh		
1	2	3	4	5	6	7
2008-09	202.49	36.98	424.30	65.76	527.04	-324.55
2009-10	200.26	16.80	511.23	84.89	612.92	-412.66
2010-11	380.35	36.97	554.27	193.39	784.63	-404.28
2011-12	251.32	11.05	645.43	196.75	853.23	-601.91
2012-13	244.29	13.05	769.54	239.25	1021.84	-777.55
2013-14	76.53	25.77	957.40	314.53	1297.70	-1221.17
2014-15	95.403	56.05	976.76	320.95	1353.76	-1258.357
2015-16	78.57	29.73	1026.58	410.26	1466.57	-1388
2016-17	160.60	77.60	1092.86	636.52	1806.98	-1646.38
2017-18	312.23	28.70	1142.21	930.96	2101.87	-1789.64

Forecast: Since the expenditure on various items is linked with the wage rate and the prevailing salaries of the staff and officers, it is not possible to work out expenditure on all the specific items. The forecast is based on certain assumptions like quantum of work, areas to be tackled, wage rate etc. Based on assumptions like these, the following calculations are made. These are symbolic and not final figures.

FINANCIAL FORECAST

Estimated Annual Expenditure (details) for the Working plan implementation in Pusad Division.

Selection–cum-Improvement Working Circle

Expected expenditure during the plan period

Sr. No.	Particulars of work	Avg. Quantum of work	Unit	Man days/ unit	Rate/unit (Rupees)	Annual (Rs. In Lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs. In Lakh)
1	Demarcation and marking	1810	Ha.	4.5	1441.71	26.09	26.09	26.09	26.09	26.09	26.09	26.09	26.09	26.09	26.09	26.09	26.09
2	Coupe working																
2a	Timber harvesting	3077	Cum.	8.4	2691	82.80	82.80	82.80	82.80	82.80	82.80	82.80	82.80	82.80	82.80	82.80	82.80
2b	Firewood extraction	950	Stacks	1.63	522	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
3	Natural Regeneration																
	Nursing of naturally occurring seedlings and coppice management etc. in "D" area+B1 area NR	905	Ha.	10	3204	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
3a	PPO/PYO (Pre-planting work)	905	Ha.	207.38	66440.40	601.28	601.28	601.28	601.28	601.28	601.28	601.28	601.28	601.28	601.28	601.28	601.28
3b	FYO(First Year Operation)	905	Ha.	91.60	29346.80	265.58	0	265.58	265.58	265.58	265.58	265.58	265.58	265.58	265.58	265.58	265.58
3c	SYO(Second Year Operation)	905	Ha.	57.49	18418.64	166.68	0	0	166.68	166.68	166.68	166.68	166.68	166.68	166.68	166.68	166.68
3 d	TYO (Third Year Operation)	905	Ha.	58.88	18864	170.71	0	0	0	170.71	170.71	170.71	170.71	170.71	170.71	170.71	170.71

4	Soil and Moisture Conservation work																
	100 cum/ Coupe	1500	Cum.	0.92	245	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
5	Cutback Operation	905	Ha.	11.50	3684	0	33.34	33.34	33.34	33.34	33.34	33.34	33.34	33.34	33.34	33.34	33.34
6	Plantation (Teak/Mix) B2																
6 a	PPO/PYO (Pre-planting work)	200	Ha.	51.93	16637	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27
6 b	FYO(First Year Operation)	200	Ha.	158.70	50844.30	101.68	0	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68
6 C	SYO(Second Year Operation)	200	Ha.	103.00	32999.14	65.99	0	0	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99
6 d	TYO (Third Year Operation)	200	Ha.	76.00	34348.88	48.69	0	0	0	48.69	48.69	48.69	48.69	48.69	48.69	48.69	48.69
6 e	4th YO (Fourth Year Operation)	200	Ha.	38.50	12334.63	24.66	0	0	0	0	24.66	24.66	24.66	24.66	24.66	24.66	24.66
6 f	5th YO(Fifth Year Operation)	200	Ha.	38.50	12334.63	24.66	0	0	0	0	0	24.66	24.66	24.66	24.66	24.66	24.66
7	Cleaning	864	Ha.	8	2563	22.14	0	0	0	0	0	0	22.14	22.14	22.14	22.14	22.14
	Total-			926.93	306919.13	1671.85	814.4	1181.66	1414.33	1633.73	1658.39	1683.05	1705.19	1705.19	1705.19	1705.19	1705.19

Note:- 1. The mandays approved for demarcation and marking is for 'D' type areas.
However, mandays for 'B' type and 'C' type areas be decided by territorial Dy. CF as per crop condition.
2. Mandays for Fire Protection will be sanctioned after preparing "Fire Protection Plan" for the entire division.
3. The fund requirement will vary as per prevailing wage rate.
4. The above items are only indicative and not exhaustive. DCF can change the quantity shown as per site requirements.
5. ANR area of 864 ha shall be carried out as per site conditions requirement and staff capacity.

Estimated Annual Expenditure (details) for the Working plan implementation in Pusad Division

Afforestation Working Circle

Sr. No.	Particulars of work	Avg. Quantum of work	Unit	Man days/ unit	Rate/unit (Rupees)	Annual (Rs. In Lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs. In Lakh)
1	Demarcation and marking	1368	Ha.	1.5	480.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
2	Coupe working (Hygienic Felling)																
2a	Timber harvesting	653	Cum.	8.4	2697	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61
2b	Firewood extraction	600	Stacks	3.5	524	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14
3	Natural Regeneration																
	Nursing of naturally occurring seedlings and coppice management etc. in understocked patches.	153	Ha.	10	3203.80	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90
3a	PPO/FYO	153	Ha.	207.4	66440.40	101.65	101.65	101.65	101.65	101.65	101.65	101.65	101.65	101.65	101.65	101.65	101.65
3b	FYO (First Year operations)	153	Ha.	91.60	29346.80	44.90	0	44.90	44.90	44.90	44.90	44.90	44.90	44.90	44.90	44.90	44.90
3c	SYO(Second Year Operation)	153	Ha.	57.49	18418.64	28.18	0	0	28.18	28.18	28.18	28.18	28.18	28.18	28.18	28.18	28.18
3d	TYO (Third Year Operation)	153	Ha.	58.88	18863.97	28.86	0	0	0	28.86	28.86	28.86	28.86	28.86	28.86	28.86	28.86

4	Soil & Moisture Conservation work																
	2000 cum/ Coupe SMC in whole coupe including Plantation area.	500	Cum.	0.92	294.74	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
5	Plantation (Teak/Mix) B2																
5a	PPO/PYO (Pre-planting work)	200	Ha.	51.93	16637	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27
5b	FYO(First Year Operation)	200	Ha.	158.70	50844.30	101.68	0	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68	101.68
5c	SYO(Second Year Operation)	200	Ha.	103.00	32999.14	65.99	0	0	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99	65.99
5d	TYO (Third Year Operation)	200	Ha.	76.00	34348.88	48.69	0	0	0	48.69	48.69	48.69	48.69	48.69	48.69	48.69	48.69
5e	4th YO (Fourth Year Operation)	200	Ha.	38.50	12334.63	24.66	0	0	0	0	24.66	24.66	24.66	24.66	24.66	24.66	24.66
5f	5th YO(Fifth Year Operation)	200	Ha.	38.50	12334.63	24.66	0	0	0	0	0	24.66	24.66	24.66	24.66	24.66	24.66
	Total-				299768.5	536.23	168.61	315.19	409.36	486.91	511.57	536.23	536.23	536.23	536.23	536.23	536.23

Estimated Annual Expenditure (details) for the Working plan implementation in Pusad Division

Catchment Area Treatment Working Circle

Sr. No.	Particulars of work	Avg. Quantum of work	Unit	Man days/ unit	Rate/unit (Rupees)	Annual (Rs. In Lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs. In Lakh)
1	Soil and Moisture conservation work 200 cum/coupe	1660	Cum	0.92	295	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89
	Total				295	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89

Estimated Annual Expenditure (details) for the Working plan implementation in Pusad Division.

Fodder Improvement Working Circle

Sr. No.	Particulars of work	Avg. Quantum of work	Unit	Man days/ unit	Rate/unit (Rupees)	Annual (Rs. In Lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs. In Lakh)
1	Demarcation of coupe	327	Ha.	0.50	160.19	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
2	Deep Ploughing in 10 ha. area suitable for grass land	40	Ha.	0	2000.00	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
3	Seed broadcasting in July	40	Ha.	2.50	800.95	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
4	Enclosure	40	Ha.	0	30000.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
5	Removal of shrub growth and weeds	50	Ha.	5.00	1601.90	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	Total				34563.04	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44

Estimated Annual Expenditure (details) for the Working plan implementation in Pusad Division.

Boundary Demarcation

Sr. No.	Particulars of work	Avg. Quantum of work	Unit	Man days/ unit	Rate/unit (Rupees)	Annual (Rs. In Lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs. In Lakh)
1a	Fixing boundary pillars(Artificial and Natural RF Boundary)	196	Pillar	1	320.38	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
1b	Fixing boundary pillars(Artificial and Natural PF Boundary)	4200	Pillar	1	320.38	13.45	13.45	13.45	13.45	13.45	13.45	13.45	13.45	13.45	13.45	13.45	13.45
1c	New Demarcation of Non Forest Land For C.A. And undemarcated Protected Forest	130 Ha/ Year	Ha.	10 Pillar /Ha.	15000 /Ha	19.50	19.50	19.50	19.50	0	0	0	0	0	0	0	0
	Total				640.76	33.58	33.58	33.58	33.58	14.08	14.08	14.08	14.08	14.08	14.08	14.08	14.08

Abstract of Yearwise Requirement of Funds for Implementation of Working Plan (Rs. In Lakh)

Sr. No.	Working Circle /Activity	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
1	Selection-cum-Improvement	778.21	1133.44	1358.62	1570.29	1594.95	1619.61	1641.75	1641.75	1641.75	1641.75
2	Afforestation	169.41	315.99	410.16	487.71	512.37	537.03	537.03	537.03	537.03	537.03
3	Fodder Improvement	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44	14.44
4	Catchment Area Treatment	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89
5	Boundary Demarcation	33.58	33.58	33.58	14.08	14.08	14.08	14.08	14.08	14.08	14.08
	Grand Total	1000.53	1502.34	1821.69	2091.41	2140.73	2190.05	2212.19	2212.19	2212.19	2212.19

Revenue Forecast of Pusad Forest Division

Sr. No.	Working Circle	Approximate Expected yield (Annual)						Avg. Unit Price in Rupees (As per Schedule of Rates)					
		Timber		Beat		Poles		Timber		Beat		Poles	
		Teak	Non Teak	Teak	Non Teak	Teak	Non Teak	Teak	Non Teak	Teak	Non Teak	Teak	Non Teak
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SCI	3077	900	1468	900	5000	1000	40000	5000	3000	1200	200	50
2	AWC	653	165	326	600	500	200	40000	5000	3000	1200	200	50
	Total	3730	1065	1794	1500	5500	1200	80000	10000	6000	2400	400	100

Sr. No.	Working Circle	Approximate Annual Revenue (Rs. In Lakh)						Grand Total
		Timber		Beat		Poles		
		Teak	Non Teak	Teak	Non Teak	Teak	Non Teak	
15	16	17	18	19	20	21	22	23
1	SCI	1230.80	45.00	44.04	10.80	10.00	0.50	1341.14
2	AWC	261.20	8.25	9.78	18.00	1.00	0.10	298.33
	Total	1492.00	53.25	53.82	28.80	11.00	0.60	1639.47

Note- The expected Annual Revenue would vary as per the prevailing market prices.

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CHAPTER-13

MISCELLANEOUS REGULATIONS

13.1: BOUNDARY DEMARCATION:

A well-defined forest boundary is a prerequisite for effective forest protection and its sustainable management. 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 forest encroachment. Areas which are un-demarcated and forest boundaries adjoining private land shall receive the highest priority to ensure protection of these areas. 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.

13.2: 1/5th BOUNDARY DEMARCATION: It is prescribed to work the entire boundary of Reserve Forest and Protected Forest in 5 years period. Details of the compartment boundary for the purpose are given in **Appendix - XXXVII.**

13.3: ROUTINE BOUNDARY MAINTENANCE:

1. The beat guard is mainly responsible to protect and maintain the boundary pillars every year. All boundary marks shall be inspected by the beat guard every month in his beat. The boundary marks inspection will be mentioned in his diary and sent it to RFO.
2. The Round Officer is also equally responsible for protection and maintenance of all boundary marks in the forest in his round. He is required to see proper maintenance and colour wash by the beat guard as directed. Round Officer is responsible to inspect all boundary marks in a year which are due for maintenance and repairs as per 1/5th boundary demarcation scheme. This matter will be mentioned in diary. Half of his inspection should involve checking of the work

done during the previous month by the beat guard in his jurisdictions, and the other half should involve checking of the compartments not reported by the Beat Guards during the months.

13.4: 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, Chief 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 1.40m long cement concrete pillars at roughly 50m 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 100-150m and intermediate pillars may be 0.90m long. Both types of pillars should be embedded to 0.40m depth in the cement-concrete base. The prescribed tapering cross-section of the 1.40m pillar is 0.10 x 0.15m at the top and 0.15 x 0.23m at the base. The 0.90m pillars are parallel pipe with 0.15m width and thickness.

13.5: 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 30cm 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 1.20m high, and have 1.20m top diameter and 1.80m base diameter, as described in the Central Province and Berar Forest Manual. A slab stone (0.20 x 0.20 x 0.90m) or a timber stake projecting ½ m (half) 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 250m. 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.

13.6: 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 with GPS reading. Also the register for maintenance of boundary pillars be updated at range and division level.

13.7: 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 12m. The internal compartment boundary lines should be 3m wide.

13.8: COMPARTMENT PLATES:

Metal plates on the boundary trees at a height of 2.5 to 3.0m 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.

13.9: 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 RFO will carry out sample checking of the report in the manner decided by the RFO. Only material cost should be admissible for the purpose.

13.10: REVIEW AND MONITORING OF BOUNDARY DEMARCATION WORKS:

Continuous review and monitoring of boundary demarcation works is absolutely necessary to ensure time bound implementation.

13.11: DEMARCATION, PREPARATION OF TREATMENT MAP AND MARKING OF COUPE:

13.11.1: Demarcation of Coupe:

1. The annual coupes for harvesting will be demarcated one year in advance, and each coupe, if so required, may 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 ACF.
2. Format for the coupe demarcation certificate is prescribed, as follows,

"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 m wide line and by erecting pillars or posts up to 2 m 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 breast height 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 as follows.

Sr.No.	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 will be divided into approximately equal sections (Each section not more than 20 ha). 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 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 breast height and one coal tar band 5 cm above it.

13.11.2: Treatment map:

1. Immediately, after completion of demarcation of the coupe, Round officer will prepare the treatment map of the coupe under the close supervision of RFO by clearly showing the various treatment-type areas as prescribed in each working circle. The concerned ACF will verify the treatment map and make corrections, if necessary, before submission to the DCF for approval.
2. Preparation of treatment map shall be done one year in advance of the coupe working. Timely preparation would facilitate necessary checking and corrections, if any in time.
3. 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 to the competent authority.

13.12: 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 Round officer 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.

   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

3. Trees marked for felling will be given geru bands at breast height and will bear marking hammer impression at breast height as well as at the base on the blazes of sizes 10 cm x 10 cm. The blaze size should be strictly adhered to so as to aid in identification of marked trees at the time of felling. Trees marked for felling will be serially numbered with coal tar.
4. All trees bearing serial numbers will be individually recorded in marking (recording) book Serial number of trees along with details shall be recorded in the marking book. Remarks column shall invariably mention about the deformities if any, such as dead, top broken, hollow, severe insect damage etc.
5. Abstract of trees marked for felling will be made in 15 cm girth classes. Timber, poles and firewood trees will be shown, separately.
6. 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.

13.13: SUBSIDIARY SILVICULTURAL OPERATIONS:

All these operations shall be carried out departmentally. These operations shall include –

1. Cut Back Operations: CBO shall be carried out in the following year of the main felling.

- Climber cutting of entire area.
- Removal of badly damaged or broken trees desiring main felling.
- Cutting back of malformed advance growth.
- The unwanted under growth interfering with the Teak and other Valuable miscellaneous species shall be removed.
- The multiple copper shoots or poles shall be reduced to one per stool.

- In eroded areas or areas liable for erosion soil conservation measures shall be taken up by way of gully plugging, nala bunding, check dams, etc.

2. Cleaning: This operation will be carried out departmentally in the 6th year after main felling.

- Climber cutting of entire area of the coupe.
- Removal of damaged and malformed saplings in teak plantation area.
- All coppice shoots shall be completely cut except in areas were planted stock has not come up successfully and in such areas multiple coppice shoots shall be reduced to 1 per stool which is most promising and vigorous one.
- The undesirable growth interfering with teak and other valuable miscellaneous species will be cut.
- In the patches of advance growth of teak and other valuable species proper spacement will be created by removing inferior force in tree growth.
- Cleaning of weeds at the base of teak plants and intensive soil mulching shall be carried out immediately after rainy season is over.
- Cleaning shall be carried out before 1st thinning.

3. Thinning:

Thinning in plantations is very essential and one of the silviculture requirements to provide appropriate spacing based the number of plants required in a site in relation to age of crop. For appropriate utilization of soil many of the original number of plants of planted have to be removed. In the plantations thinning operation shall be carried out as per standard technique for thinning in teak plantation.

For teak, the 1st thinning will be carried out of the age of 10th year of plantation and subsequent thinnings shall be carried out at the interval of 10 year.

13.14: PETTY FELLING :

13.14.1: Restriction on irregular harvesting: Irregular harvesting of timber, firewood and other NWFPs is prohibited, except in the following cases:

13.14.2: Harvesting for the fire lines and the transmission line: The DCF 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 CCF(T).

13.14.3: Felling for the haulage roads: The DCF may permit felling of trees for the purpose of haulage roads that are temporary in nature, and should be aligned properly to ensure minimum possible felling of trees.

13.14.4: 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 and as per latest guidelines issued by GOI from time to time for specific projects. The DCF 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 as per departmental procedures.

13.14.5: 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 RFO will estimate availability for such material in each compartment and ACF concerned will verify the same. If more than 2 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 DCF. 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.

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.

13.15: ARTIFICIAL REGENERATION:

13.15.1: Planting of teak and miscellaneous species:

Plantation of suitable teak and miscellaneous species will be taken up in the following year of main felling as per the suitability of site. Stump planting will be carried out in case of stump planting or root trainer planting where as in case of misc. species root trainer or poly pot planting will be prescribed. The planting works will be carried out as given below.

Pre-monsoon works: These operations well be done in the year of main felling. The different operations of pre-monsoon works are given below.

Fencing or TCM will be prepared for the protection of plantation. The TCM will be having standard cross section 1.90 X 0.60 X 1.0 m will be dug where the boundary runs along the contour. No TCM will be aligned which runs across the contour and in that case live it fencing shall be undertaken.

Pit digging: The size of pit will be 45 X 45 cm. for miscellaneous plantation and the pit digging will be completed before of March and it should be allowed to whether during summer. The pit refilling will be completed before end of May.

13.15.2: Nursery Operations:

Teak stumps: These will be prepared form one year old seedlings raised on the beds as per standard nursery techniques. The seed sources must be from a known place and duly certified by the competent authority. The stumps will be prepared by following standard technique and 'A' class root shoots shall be used for raising good quality of plantation.

Miscellaneous plants: These plants will be raised in polythene bags by following standard miscellaneous nursery techniques. Standard size of poly bags for raising miscellaneous plants to obtained optimum size of plants. The nursery will be started by

October of the previous year of the planting. The height of plants will vary from species to species. Shifting of poly bags will be taken up with in nursery, every 15 days once the plant attained 10 cm. height however while shifting care should be taken that the plants shall not be damaged. The potting mixture shall be managed properly and application of suitable mixture and fertilizer will be carried out at appropriate intervals. Before plantation good quality, healthy and appropriate size plants will be selected and these will be inspected by the officer not below the rank of ACF.

1st Year Operation:

Species of live hedge species shall be taken up in three rows. Planting of Agave on the outer rows of fencing at a spacement of 15cm and planting of shrub cuttings in inner rows will be done. Teak stump plantation will be done in crowbar holes whereas the polythene bag planting will be done in pits after the onset of monsoon.

13.15.3: Subsequent operations:

1st weeding along with causality replacement shall be completed within 20 to 25 days after the plantation is over. 2nd and 3rd weeding will be carried out in the month of September and October respectively. The 3rd weeding shall be coupled with soil working and mulching to reduce vaporization losses. One more soil working will be done in the month of January if there are winter rains, based on availability of funds. Weeding and soil working to the seedlings and livehedge will also improve the growth and survival of plants on live hedge. In the second year plantation the causality replacement will be carried out after onset of monsoon and weeding will be done in the month of August and October respectively. Soil mulching will be carried out along with 2nd weeding. In case of teak, debudding will be done in the month of May. In 3rd year plantation only one weeding along with soil mulching will be done in the month of September. Debudding in teak plantation will be done as in 2nd year.

13.16: SOIL MOISTURE CONSERVATION WORKS: All soil moisture conservation works shall be carried out on watershed basis.

13.16.1: Watershed treatment methodology:

Watershed development in forest areas tries to reduce the volume and the velocity of runoff through a series of interventions. The aim is to lower the water velocity, to make the water flow vertically downwards rather than horizontally across the village. Interventions are considered at diverse points in the village in a location-specific manner utilizing locally available materials and the vast knowledge of the local people regarding water flows and resource availability. Interventions are generally planned according to the "ridge-to-valley principle."

A usual mistake is to begin by constructing a water harvesting structure in the lowest part of the watershed without treating the upper part of the catchment. These results in rapid silting up of the storage capacity created because of the soil erosion taking place in the upper part of the catchment. Therefore, ideally it must begin with the treatment of the ridge area followed by the smallest drain, moving on to larger and larger drains in the watershed, arresting the runoff at each point.

Broadly the interventions are categorized into two groups; (1) Ridge area interventions and (2) Drainage Line interventions.

13.16.2: Ridge Area interventions:

Ridge area interventions include forest area and lands of marginal farmers located usually on the ridges and upper reaches. These areas are traditionally managed initially. These results in reduction in velocity of water, soil conservation and prevention of silt deposition in water harvesting structures on the downstream site. Soil and water conservation measures undertaken in the ridge area will help recharge deeper aquifers in the discharge zone as well as regenerate the degraded forest cover.

While doing ridge area treatment, one must remember we are trying to reduce soil erosion and not to increase it, or in another word the aim of watershed development is to reduce the slope of land and not to increase it. The following points need to remember while selecting the Ridge Area interventions:

- The utmost care should be exercised not to disturb the existing vegetation.

- If boulders are to be used in any structure, they should never be dug out from the soil.
- On slopes greater than 25%
    - Intensive plantation of grasses and shrubs
    - Where boulders are available, contour bunding with boulders
- On slopes greater than 10% and less than 25%, contour trenching
- On slopes less than 10%, earthen contour bunding
    - Plantation of trees on barren patches and where the crown cover is less than 40%
    - Encouraging natural regeneration by grazing control, stump dressing of freely coppicing varieties, micro-water harvesting structures and weeding around saplings, treating bamboo clumps by shoring them up with mud.

13.16.2.1: Ridge area treatments:

Ridge area treatment by forest regeneration and plantation:

On slopes steeper than 25% in the ridge area, it is advisable to undertake vegetative interventions only. Where the ridge maintains an existing forest with some vitality, the general thrust should be towards protection and regeneration. In other situations, the plantation may need to be undertaken. In this module we highlight the role of shrubs in dry land afforestation and also provide a short list of those suitable trees, grass and shrub species, which could be usefully integrated into such afforestation programme.

Ridge area treatment contour trenching:

The contour trenching is a simple and a low-cost method of checking the velocity of runoff in the ridge area of any watershed. A contour trench is a trench dug along a contour line. A contour line is a line, which joins points together of the same elevation. Digging a trench along such a line increases the chances of containing runoff for a more extended period of time within the trench. It is equally accurate that if trenches were not to follow a contour, such digging could actually increase the possibility of soil erosion

because there would be a rise in the velocity of runoff following an increase in the slope of the land.

Objectives:

• Slowing down the velocity of runoff

• Checking soil erosion, and

• Improving local soil moisture profile

Contour trenches are constructed in the ridge area of a watershed. Rainwater, which falls in this area, flows unchecked carrying with it eroded soil into the flatter portion of the watershed referred to as the "valley." This eroded soil gets deposited as silt in the reservoirs and ponds, thereby reducing their life. Thus, any water harvesting work undertaken in the valley will become meaningless unless appropriate measures like the contour trenching are undertaken to control runoff and soil erosion on the ridge. Contour trenches serve to collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the trench gets improved. Along with the water, the eroded fertile topsoil on top gets deposited in the trench. It is, therefore, necessary to combine trench construction with the plantation.

Location:

- If the slope of the ridge area is 25% or more, the best form of treatment is the planting of grasses, shrubs and trees. This is because for contour trenches to be effective on such high slopes, they will have to be constructed at very close intervals, which could end up causing more soil erosion due to excessive digging.
- On the other hand, if the slopes are less than 10%, even then contour trenches are not considered to be the best measure. This is because in such a situation, in comparison to contour trenches, contour bunds are a more effective means of checking runoff and soil erosion. In a contour bund, water not only stops in the excavated portion but also against the bund. Therefore, wherever possible, contour bunds must be constructed in place of contour trenches. However, on very high slopes, it is not possible to make contour bunds since there is a great danger of the bunds breaking.

- Thus, given the above considerations, contour trenches are the most appropriate where the slope of the ridge area lies between 10 to 25%.
    - It is an ideal treatment for the non-agricultural land.
    - If the depth of soil is less than 20cm, avoid the CCT; CCT should also be avoided in black cotton soil areas.

The Distance between trenches: The distance between the two successive trenches depends on the volume and the velocity of runoff they are expected to handle. This in turn depends on:

- The quantum of rainfall: The greater the rainfall, the lesser the distance
- The permeability of the soil: The more permeable the soil, the greater shall be the distance
- The slope of the land: The greater the slope, the lesser the distance

That is, as the volume and velocity of runoff increase due to any reasons given above, the trenches should become more closely spaced. In several watershed programmes, however, a specific procedure has been adopted for fixing the intervals between trenches: "The vertical interval between contour trenches is fixed at 1m".

Thus, with a constant vertical interval of 1m, the contour trenches would be spaced at a horizontal interval of 20m on a 5% slope and 10m on a 10% slope. However, one must not follow this rule blindly without taking into account the catchment area that each contour trench has to handle. For example, on high slopes one may end up making too many trenches even though there is very little water, which each trench needs to handle. And on low slopes, very few trenches are made which however are unable to intercept most of the runoff, since each trench is expected to do much more than its fair share of work. In practice, thus, one must fix the maximum and minimum horizontal interval between the two successive contour trenches in a way, which is depicted as follows:

- On high slopes, the trenches should be close to each other but never closer than 10 m.

- On low slopes, the trenches should be far from each other but never farther than 30 m.

Thumb rule: for the vertical interval between two rows;

V.I.= Slope (%)/C, where value of C = 12 for the medium rainfall.

It is commonly expressed in term of vertical interval (V.I.), which is defined as the difference in elevation between the two similar points on two consecutive bunds. The basic principle involved in fixing the spacing between the two bunds is to keep the velocity of runoff below the critical value, which creates scour.

Vertical interval is usually expressed as:

V.I. = 0.305 x [(S/a) + b]

Where V.I. = Vertical Interval in meter, S = Slope in percent, a and b = constants specific to particular region. For soil with good infiltration rates values of a and b are respectively taken as 3 and 2; whereas for soils of low infiltration rates the corresponding value are 4 and 2, respectively.

Staggered *vs* Continuous Trenching:

Over time, experience of watershed programmes has shown that it is better to stagger the digging of contour trenches. This is because it has been found that invariably errors have been made in contouring over long distances.

Therefore, instead of making trenches continuously, they should be made in a staggered and discontinuous manner. Dig a trench 4 m long on a contour line. Give a gap of 4 m and dig another 4 m trench along the contour. The trenches are further dig in the similar fashion along this particular contour. Then, come to the next contour line. Begin digging in a stretch, which covers the gap left in the higher contour line. The gaps in this contour line should fall below the trenches in the higher contour line. In this way, we maximize the amount of harvested runoff by the trenches. In other words, chains of staggered trenches should be made along successive contour lines so that water left by one line of trenches is captured by the immediately lower line and so on.

In areas where there is an abundance of trees and vegetation, gaps in excavation are in any case essential to allow space for the roots of the trees to spread. Also, where there are hard rocks underneath the soil, trenches must be staggered.

13.16.3: Drainage Line interventions:

These interventions are implemented along the existing drainage lines with an objective to enhance the recharge of groundwater and increasing the duration of flow in the drainage line. Some general considerations should be borne in mind while selecting the site for locating structures on the drainage line:

- The width of the drainage line at that point should be narrow.
- The width of the drainage line upstream of the point should be more considerable.
- The embankments at that point should be clearly defined, stable and high.
- The upstream bed slope of the drainage line should be low.
- The upstream bed of the drainage line should be made up of impervious material if the principal aim is to harvest water for irrigation. On the other hand, if the main aim is to increase the rate of groundwater recharge, this material will be relatively pervious.
- Ideally in structures where waste weirs have to be constructed, the substrata of the nala banks should be hard enough; so that the banks of the weir do not easily get eroded.
- In all those structures were overtopping is allowed, it is to be ensured that the height of the structure plus the depth of peak flow in the stream is habitually less than the height of the embankments.
- Always locate a structure at such a point, where the construction materials are of requisite size and quantities are adequately available.

Some of the drainage line interventions are mentioned below:

1. Where the local bed slopes are above 20% and where thinning operation yields adequate raw material: brushwood checks
2. Where local bed slopes are between 5-20%

a. If boulders are freely available dry boulder checks
b. If boulders are not freely available boulder cum earthen checks

3. Where local bed slopes are less than 5%
    a. Nala bunds, which serve as percolation reservoirs in the upper catchment. These are to be located on pervious strata to improve vertical percolation.
    b. Sand-filled bag structures to check the velocity of stream flow and where sand is locally available
    c. Gabion structures where velocity and volume of peak run-off are excessively high for loose boulder structures
4. Where the stream embankments have been severely eroded
    a. Nala training, including deepening of channels and raising embankments, along sections of streams; especially where during peak floods, the stream flows over its embankments and damages the fields alongside.
    b. Embankment stabilisation through gabions or sand-filled bag structures in stretches where the banks are exceptionally vulnerable and require reinforcement.
5. Where groundwater harvesting wells are located alongside
    a. Underground dykes in the discharge zone where the impermeable strata are overlaid by thin layer of permeable deposits.

13.16.3.1: Drainage line treatments:

Drainage line treatment with boulder checks:

Boulder checks are loose rock dams made on small drainage lines, which have a catchment area of around 10 to 20 ha. As per rainfall parameters the permissible catchment area of the drain for the construction of loose boulder gully plug varies.

Objectives: The main aim of constructing boulder checks is to reduce the velocity of water flowing through the drainage line. By reducing the velocity of runoff, boulder checks help in;

- Reduction in soil erosion.

- Trapping silt, which reduces the rate of siltation in water harvesting structures in the lower reaches of the watershed.
- Creating a hydraulic head locally which enhances infiltration of surface runoff into the groundwater system; and
- Increasing the duration of flow in the drainage line.
- Therefore, the capacity of the water harvesting structures created downstream on the drainage line is utilized more fully as they get many more refills.

Location:

- Boulder checks should be made as a series on a drainage line, with each structure dividing the overall catchments of the drainage line into smaller sections.
- The independent catchment of each boulder check should not be more than 1 to 2 ha.
- Boulder checks should not be made where the bed slope of the drainage line at that point is above 20% because the check will not be able to withstand the high velocity of water flow. However, on a drainage line with an overall high bed slope boulder checks can be constructed in sections where the local bed slope is less than 20%.
- Boulder checks should be made where boulders are available in large quantities in the requisite size.
- A boulder check should be made where the embankments are well defined and stable, and high enough to accommodate peak flows even after the check has been made, thereby preventing water from rising over and cutting the banks. The height of the embankment at the location of the structure must at least equal the maximum depth of flow in the stream including the design height of the structure in the central portion of the drainage line. This rule is applicable to all structures in which overtopping is permissible.
- Even though storage is not a primary consideration in the case of boulder checks, enhanced water retention and groundwater recharge is a desirable objective. Hence, locating the structure in those sections in the drainage line, where the

upstream slope is flatter may be advantageous. The flatter the upstream slope, the greater would be the storage per unit height of the structure.

Layout: On each drainage line there will be a series of boulder checks. The minimum vertical interval between two successive checks on a drainage line should be equal to the height of the structure, so that the water temporarily stored in one check will reach the toe of the another check upstream. Any interval below this limit would mean under-utilization of the capacity of the downstream boulder check. What interval we keep above this limit would require a balance to be struck between cost considerations and volume of water to be stopped. Once this vertical interval is fixed, the horizontal interval between two successive checks would depend on the bed slope of the drainage line; for instance, with a constant vertical interval of 1m, the boulder checks would be spaced at a horizontal interval of 20 m on a 5% slope and 10 m on a 10% slope. In general the relationship can be expressed as follows:

H.I. = V.I. / S

Where, H.I. = horizontal interval; V.I. = vertical interval and S = slope (%)

However, one must not follow this rule blindly without taking into account the catchment area that each boulder check has to handle. For example, on high slopes one may end up making too many checks even though there is very little water which each checks needs to handle. In practice, one must fix the maximum and minimum horizontal interval between two successive boulder checks.

- On high slopes, boulder checks should be spaced close but not closer than 10 m
- As the slope decreases, boulder checks must be spaced farther, but not farther than 50 m

Planning: Identify the drainage line to be treated by the checks. Start from the top. Fix the location of the topmost boulder check. Walk 5 m downstream. This gives the downstream bottom edge of the first boulder check. We have decided that the minimum horizontal distance between 2 boulder checks has to be 10 m. Measure the slope of the nala bed over the 10 m stretch, beginning with the bottom edge of the first boulder check.

If the slope is 10% or more, keep the horizontal distance between two boulder checks as 10 m. In case the slope is less than 10%, then increase the distance between the boulder checks, depending on the flatness of the slope. Thus, for instance, if the slope is 5%, the distance should be 20 m; if slope is 2%, the distance should be 50 m. Even if the slope is less than 2%, do not increase the distance beyond 50 m, which is the maximum distance we have fixed. Thus, along the length of the drain, the location of the checks is marked.

Drainage line treatment with Gabion structure:

Gabion structures are rock and wire dams constructed across the drainage lines with a catchment area of 30-150 ha. They are also constructed to reinforce highly erodable stream embankments. In this module, we will first describe Gabions across drainage lines in great detail. In the end, we provide a short note on Gabions built along embankments.

(A) Gabion structure across drainage line:

Objectives: The main aim of constructing gabion structures is to reduce the velocity of water flowing through the drainage line. By reducing the velocity of runoff, gabion structures help in;

- Reduction in soil erosion;
- Trapping silt, which reduces the rate of siltation in water harvesting structures in the lower reaches of the watershed.
- Creating a hydraulic head locally which enhances infiltration of surface runoff into the groundwater system; and
- Increasing the duration of flow in the drainage line. Therefore, the capacity of the water harvesting structures created downstream on the drainage line is utilized more fully as they get many more refills.

Location: The minimum independent catchment area for a gabion structure is 5 ha. For a catchment area smaller than this even a loose boulder check may suffice. The precise location of a gabion structure depends on the following factors:

- Stability of the embankments is the primary consideration. The less stable and more erodable the material on the embankments is the weaker the structure is likely to be. In such a situation, making the structure stronger would render it too expensive.
- The elevation of side embankments from the bed of the stream at the least must equal the sum of the depth of peak flow in the stream and the designed height of the structure. For example, if the height of the embankments is 6 m and the depth of peak flow is 4 m, then the height of the gabion must not exceed 2 m to prevent the water from jumping over the sides. Hence, observation of the peak flows is imperative before a gabion structure is planned.
- For maximizing storage in the structure, the bed slope of the upstream portion should be low. The flatter the upstream slope, the greater will be the temporary storage per unit height of the structure.
- The material composing the bed of the drainage line upstream of the structure should not be completely impermeable, because what we are looking for is temporary storage followed by groundwater recharge.

(B) Gabion structure along Embankments:

These structures are built to cushion the impact of water, preventing it from eroding the banks. On very high slopes as in the Himalayas, such structures are built along the contour lines to prevent landslides. These should be located in those stretches where embankments are prone to severe erosion by the stream. Normally this happens where the stream turns sharply and its flows are directed towards the embankments. The length of the embankment to be strengthened has to be determined. Along this length the rectangular boxes have to be placed as a straight wall with a vertical face. The wall width could be a standard 1m while the length and height both are dependent on the local conditions. The height of this wall should be at least 1 m above the peak flood levels of the stream. The upstream end of the gabion wall should be well embedded into the embankment so that the stream is not able to cut a path behind the structure. Care must

be taken that the gap between the structure and the embankment is filled with rammed earth while raising the rectangular structure.

Drainage line treatment with earthen water harvesting:

For Forest areas the commonly built earthen water harvesting structures are Percolation tanks.

Objectives of Percolation Structures: Percolation structure is an earthen dam constructed to impound water flowing in a small drain or a medium drain for the primary purpose of increasing the rate of groundwater recharge. A percolation structure augments flows in the groundwater system by controlling the volume and velocity of surface water flow, thereby allowing water a greater time for percolation into the aquifer. This replenishment of groundwater benefits the irrigation wells situated downstream in the catchment. Enhanced groundwater recharge helps lengthen the life of the seasonal streams through regenerative base flows after the end of the rainy season. Depending on the capacity of the structure and duration of water storage, the pond can have secondary benefits (such as pisciculture) that are vital for the livelihood security of local communities.

Location: The location of earthen structures is determined on the basis of the following considerations:

- **Effective Storage:** The site for an earthen structure should be selected at a point where the total runoff is adequate to fill the structure to its full capacity, *i.e.,* the total runoff should be at least greater than or equal to the 'effective' storage of the structure.
    - Effective storage = Storage capacity + Volume of water percolating from it during one season + Evaporation + Water used for protective irrigation.
    - Hence, an estimation of runoff from the catchment and the effective storage of the structure are essential to decide its location. On the other hand, it must also be ensured that the total runoff is not too large in relation to the effective storage of the structure, *i.e*., the structure should be able to hold most of the water flowing into it. A common mistake is to

locate earthen structures in such a place where the catchment area of the stream is very large so that the inflow of water is much higher than structure capacity. Such a structure would necessarily have to let most of its inflow out through a waste weir, which literally means that we end up leaving the entire nala. Therefore given the cost constraints no structure should be constructed where its effective storage is less than 50% of total runoff. Thus matching runoff and storage entails a knowledge about the topography of the catchment and the geology of the bed of the structure.

- **Embankments:** At the point of location, the drainage line must have well defined embankments to, which the structures can be anchored. Since the structure is embedded into them, these embankments should be strong and not made of loose material like sand.
    - Slope of the Upstream Nala Bed: The bed slope should be relatively low (not more than 5%) upstream of the site selected for the earthen structure, in order to maximize storage capacity.
    - Width of the Nala: At the site the embankment should be narrow and vertical. But as we move upstream, the nala should ideally widen so as to contain maximum storage within its banks.
- **Geology:** Since the primary objective of structure is water storage, the geology of the structure must be favourable for water storage, *i.e.*, percolation losses must be minimal up to reasonable depths. In cases where percolation losses are high and the storage structure makes sense only as a groundwater recharge structure, it is advisable to dig intake wells on the downstream to collect the percolating water. If the percolation losses are high but the strata, which can be tapped by dug wells, yield very little water, the site should be abandoned since a structure here will neither store surface runoff nor recharge wells. In the case of the percolation structure, however, the primary consideration is groundwater recharge. Therefore, we would ideally like the bed of the structure to be made up

of relatively pervious material. In both cases, the geology of the waste weir site should preferably be a hard rock so that it does not erode very easily.

- **Availability of Materials:** Even if all other factors are favourable and if the requisite materials are not easily available, one may be compelled to abandon the site.

Type of earthen structures: Depending on the construction materials used, two types of structures can be constructed:

1) **Structure made of Homogenous Material:** In places with an impervious foundation where availability of clay is virtually nil, structures can be made from a relatively more pervious material either by increasing the area of cross section, ramming the material to a greater extent or by providing a narrow clay blanket on the upstream side in order to control seepage.
2) **Core Wall Type:** Where both the pervious and the impervious materials are available, the structure wall can be partitioned between these according to their relative abundance. Where the availability of impervious clayey soil is limited, one can choose to economize on clay by puddling. In the core wall type structure, there is a narrow, impermeable wall, extending from embankment to embankment and made of puddled clay that forms the core of the structure. To support and protect this, the outer flanks of the structure are made of dry or wet rammed coarser soils, which are arranged by grade. The finest particles being placed inside and the coarsest material is placed in graduating way towards outside. The final shelter is provided by pitching, which involves giving a layer of boulders on the upstream face of the structure.

Forest Pond:

It is a water harvesting structure suitable for the plain area. Main purpose of the structure is to ensure water availability to wildlife.

Site selection criteria: Following are the criteria for the site selection of a dugout pond:

- Catchment area of the pond should be within 2 - 20 hectares.

- Soil strata up to 3 m depths should not be in the form of disintegrated rock or hard rock.
- If any well is there, then the farm pond should be on the upstream side of the well.
- Soil of the dugout should be impermeable so that water can be stored for a longer period.
- One thousand cubic meter (20 m x 20 m x 2.5 m) storage capacity of forest pond required for the protective irrigation of one hectare of the land. Five percent land is required for serving the said requirement. Beneficiaries should be selected as per the requirement of the land for the construction of forest pond.
- At least three to four hectares catchment area is required for storing 1000 cubic meter water in a forest pond.

Types of forest ponds:

1) **Dugout type:** Where the slope of the field is relatively low and there are no well-defined drainage channels, the pond will have to be created by excavation. The storage capacity will be confined to this excavated portion. Because of the low slope, there will be little storage above the ground level. Such ponds are best located in the lowermost portion. The runoff has to be directed into the pond through bunds or channels.
    a) **Trapezium type dugout pond:** Size of the tank depends on the requirement of water to be stored. Depth of dug out pond depends on the soil strata. Side slope of the dug-out pond depends on the angle of repose, generally 1:1 side slope is provided in cutting section.
    b) **Stepped dugout pond:** It is preferred in that location where community may use the pond for their daily work.
2) **Dugout cum Embankment type:** Where there is no well-defined channel and the slope of the land is medium, farm pond should be of the dugout cum embankment variety. Here, the mud excavated should be used to form an embankment all around the pond except at the inlet. At the full reservoir level, the water level will

be higher than the ground level and the embankment will serve as a retaining wall. Therefore, even while the dugout portion will be a significant part of the total storage volume, there will be some storage above the dugout portion retained by the embankments.

The main difference between the embankment and dugout types of farm ponds is that the dugout variety can be made in virtually any topographic situation without reference to the drainage line. As for the design, the freeboard in a dugout pond refers to the difference between the base of the waste weir and the top of the dugout portion of the structure. The freeboard is given mainly to prevent water from flowing into nearby fields during flash floods. Since the main storage is not through the bund, most of the discussion regarding bund parameters becomes redundant. But a certain degree of care has to be exercised in order to protect the pond from erosion by the intense rainfall and the sloughing action of the receding water. Here, the same considerations apply as in determining the slope of the dugout area. If the pond face is made of a material, which has a low angle of repose, it should be cut at an appropriate angle to form a series of steps. The resultant reduction in the pond capacity is to be balanced against the considerations of stability. Pitching should also be done where required. Where percolation losses are high, it may be advisable to allow a layer of transported soil to get deposited on the pond bed during the initial year. By acting as a clay blanket, this layer would reduce percolation losses. In subsequent years, a silt trap can be made in the inlet channel. The inlet channel should be lined with boulders to make it safe against erosion. Before the channel reaches the pond, a silt trap should be placed either by digging a trench or through constructing a boulder check.

Precautions:

- Catchment area should be treated for the soil conservation interventions otherwise pond will silt up.
- It should be constructed on small drain or the first order drain
- If the dugout pond is used for meeting daily water requirements then stepped type dugout should be preferred.

- Select the deep pond instead of a shallow pond. Exit of a dug out pond should be at the ground level and side of the embankment should be protected with stone pitching.
- Dugout soil should be stacked in the form of embankment with a one-meter burm.

Cement Nala Bunds:

This is a permanent structure having long life sustainability. The work of cement nala bunding is being done for raising ground water level and prevention of soil erosion.

Check dams are constructed across small streams having gentle slope and are feasible both in hard rock as well as alluvial formations. The site selected for check dam should have sufficient thickness of permeable bed or weathered formation to facilitate recharge of stored water within short span of time. The water stored in these structures is mostly confined to stream course and the height is normally less than 2 m. These are designed based on stream width and excess water is allowed to flow over the wall. In order to avoid scouring from excess run off, water cushions are provided at downstream side. To harness the maximum run off in the stream, series of such check dams can be constructed to have recharge on regional scale.

A series of small bunds or weirs are made across selected nala sections such that the flow of surface water in the stream channel is impeded and water is retained on pervious soil/ rock surface for longer body. Nala bunds are constructed across bigger streams of second order in areas having gentler slopes. A nala bund acts like a mini percolation tank.

Site Characteristic and Design Guidelines: For selecting a site for Check Dams/ Nala Bunds the following conditions may be observed:

- The total catchment of the nala should normally be between 40 to 100 hectares though the local situations can be guiding factor in this.
- The rainfall in the catchment should be less than 1000 mm/annum.
- The width of nala bed should be atleast 5m and not exceed 15m and the depth should not be less than 1 metre.

- The soil downstream of the bund should not be prone to water logging and should have pH of 6.5 to 8.
- The nala bunds should be preferably located in area where contour or graded bunding of lands have been carried out.
- The rock strata exposed in the pond area should be adequately permeable to cause ground water recharge through pond water.
- Nala bund is generally a small earthen dam with a cut-off core wall of brick work, though masonry and concrete bunds/ plugs are now prevalent.
- For the foundation for core wall a trench is dug 0.6m wide in hard rock or 1.m in soft rock of impervious nature. A core cement concrete wall is created 0.6 m wide to stand atleast 2.5m above nala bed and the remaining portion of trench is back filled on upstream side by impervious clay. The core wall is buttressed on both sides by a bund made up of local clays and on the upstream face, stone pitching is done.
- Normally the final dimensions of the nala bund are: length 10 to 15m, height 2 to 3m and width 1 to 3m, generally constructed in a trapezoidal form. If the bedrock is highly fractured, cement grouting is done to make the foundation leakage free.
- Dams should be built at sites that can produce a relatively high depth to surface area so as to minimise evaporation losses.
- Rocky surfaces should not be fractured or cracked, which may cause the water to leak away to deeper zones or beneath the dam.
- Dam foundation must be of solid impermeable rock with no soil pockets or fracture lines.
- Dams should be sited along the edges of depressions or directly across the lower ends of deep gullies into the rock.

13.17: ENCROACHMENT: The problem of encroachment is common in almost all the areas specially the forest areas located adjoining to habitations. The problem of encroachment is because of lack of appropriate survey and demarcation on the ground, the greed of the people and the apathy of local people towards Government lands. There

have been large scale clearances of the forests in the past for encroachment with a view to obtain agricultural crops. The state government has issued orders in 1978 and 1979 to regularize all encroachments on forest lands done during the period from 01.04.1972 to 31.03.1978. This increased in the tendency of people to encroach upon the forest land with a hope that in future also such encroached lands will be regularized by the Government. The enactment of the FRA 2006 has also further fragmented the forest land. The forest area of 54.30 ha. is found under encroachment. (Marwadi Range : 0.37 ha.; Kali (D) Range : 38.07 ha.; and Umarkhed Range : 15.86 ha.) in Pusad Division. In the GIS cell, Nagpur, by using Sentinel II data *prima facia* encroachment was seen upon forest area in Pusad Forest Division. Principal Chief Conservator of Forest (Information, Technelogy & Planning) has sent compartment wise .kml files to Chief Conservator of Forest (T) Yavatmal for field inspection to verify encroachment. Deputy Conservator of Forest, Pusad has verified these .kml files through field inspection and *prima facia* 428.98 Ha. encroachment was found, which according to him need to be surveyed and verified in detail. The details of findings through field inspection are mentioned in **Appendix-X (B).** Encroachment anywhere irrespective of size should be removed as per law. In order to mitigate the problem, it is essential to take up survey and demarcation works on top priority. Precast pillars of 1st and 2nd class type shall be erected after the survey is over which can be completed in a phase manner. The existing cairns shall be repaired and maintained under 1/5th boundary demarcation scheme. The powers that were entrusted to the officers of Assistant Conservator of Forests and above rank under Sec. 53 and 54 of Land Revenue Code will effectively be utilized. The encroachment, if any, can be tried summarily and evicted as early as possible. The following instructions shall be followed regarding encroachments.

(1) Special care shall be taken to ensure protection of such patches from encroachment. The civil powers of eviction are entrusted to ACF and DCF. The procedure laid out in the Land Revenue Code shall be followed before the execution of eviction. Habitual encroachers shall be prosecuted as per Indian Forest Act.

(2) All external boundaries shall be demarcated with concrete pillars. All sensitive and important boundaries and wherever disputes are there, be surveyed and concrete pillars be laid immediately.

(3) All encroachments shall be listed with their names, age, residence, profession whether belongs to SC, ST, OBC/NT, extent of encroachment, s.no. and location of encroachment, village/block.

(4) A detailed report of the case be prepared for each encroacher and submitted to ACF to obtain summary eviction orders in a time bound programme.

(5) After the completion of due procedure of Land Revenue Code and after giving a reasonable opportunity of being heard to the encroacher, ACF shall pass a summary eviction order if he satisfies so quoting the findings.

(6) The concerned RFO shall execute the eviction order.

(7) If the encroachments in a village are more in number, police protection be obtained for the operation. Use of Cr. P.C. provisions like section 106 and 110 be used to smoothen the eviction operations as well as to prevent the tendency of future encroachments.

(8) For the encroachments on the un-classed forests (though 7/12 shows clear possession of the department) FIR shall be lodged in the concerned police station for the prosecution.

(9) Regularisation of the encroachments made earlier to 1980 be settled as early as possible and necessary proposals be submitted to Government.

(10) After the listing of all encroachments, sample verification shall be carried out by all supervisory officers to detect unregistered encroachments.

(11) In the month of May, a drive for encroachment prevention be taken up in all the sensitive areas by taking meetings in the villages, distribution of leaflets and posters.

(12) Keep a watch on all the sites meant for debris cleaning, ploughing etc., in the month of May, so that encroachments are removed even before the sowings.

(13) Deputy Conservator of Forest (T) Pusad shall prepare detail encroachment removal plan for 428.98 Ha. encroachment on forest area as mentioned in **Appendix-X (B)**. After surveying, demarcation and verification in detail, this encroachment shall be removed as per law within working plan period or before working plan period. Deputy Conservator of Forest (T) Pusad will submit action taken report about removal of encroachment on monthly basis to Chief Conservator of Forest (T) Yavatmal and Working Plan Division, Yavatmal in prescribed proforma as per **Appendix-X (C)** for necessary information.

In the recent past the tendency for encroaching forest land for cultivation has increased. The eligible encroacher's encroachment is under enquiry by the District Magistrate Committee in relation to regulation of the Schedule Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 and Act 2008. The causes of forest encroachments shall be examined thoroughly and corrective measures be taken. All necessary support should be extended to evict the encroachments as early as possible. The boundary management and standard administrative guidelines will help to control the encroachment. RFO must inspect at least 50% of the boundary demarcation, ACF at least 10% of the boundary demarcation, DCF at least 2% of the boundary demarcation. RFO Mobile Squad shall check 2 % of the boundary demarcation.

13.18: GRAZING: Fire and grazing hamper the success of regeneration of forest to a great extent. To control grazing, grazing units are formed in the division. The number of cattle heads is fixed as per the carrying capacity of the area. In Pusad forest division heavy cattle population pressure has degraded the forests. The number of villages in this division is 471 whereas the number of compartments is 300, which means there is more than one village in each compartment. The 'C' class Reserve Forests are excessively grazed; therefore, these forests are mostly open or scrub type. The Government of Maharashtra formulated the grazing policy vide its resolution no. MFP-1365/1322-Y, Dt. 6/12/1968 and the grazing rules were framed vide its G.R. no. MFP/137/237035-Z, Dt. 3/11/1973.

The main felling coupes of all working circles will remain closed for a period of 10 years from the main felling as felling cycle is fixed at 20 years *i.e.* $1/4^{th}$ area of the felling series will remain closed for grazing at any time. All the forests are not possible to open for grazing at a time and as the cattle population is not uniformly distributed therefore, it is prescribed the cattle exceeding carrying capacity of an area open for grazing should not be allowed to enter into the forest. The excess cattle units can be managed through fodder development activity on common community lands and waste lands. The villagers shall be persuaded to go for stall feeding of some of their cattle which are more than carrying capacity of the forest adjoining to them and local people shall be educated and made aware of ill-effects of excessive grazing on forests growth. Apart from this the forest staff should open a dialogue with the local villagers to discuss regarding grazing

policy, carrying capacity of forests and the area available to graze their cattle in the adjoining forests. The DCF should consider all the factors and prepare a consolidated plan based on area, cattle units, carrying capacity, rotational grazing and avenue for excess cattle units.

The above cannot be achieved without the active participation of the people. The role of JFMCs and the rapport of the field officers/staff is very important for the success of containing grazing. Closing of the area of natural regeneration from grazing should be strictly followed.

13.19: MAINTENANCE OF THE FOREST LAND RECORDS:

Maintenance of the land records and forest maps: The forestland records and the forest maps will be maintained properly and updated periodically. A certificate to this affect will be recorded annually in the Form No 1- Register during the month of June.

Forest notification: 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 Act 1927.

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 Pusad forest division to mark completion of the process.

Along with the reconciliation, the details of land grants (patta) issued on the forestland will also be made available to the division office.

Management of Preservation Plots/Research Plots:

The Preservation Plots / Research Plots which are in existence are to be maintained as per the objectives of the ongoing studies and should not be interfered with during regular coupe working.

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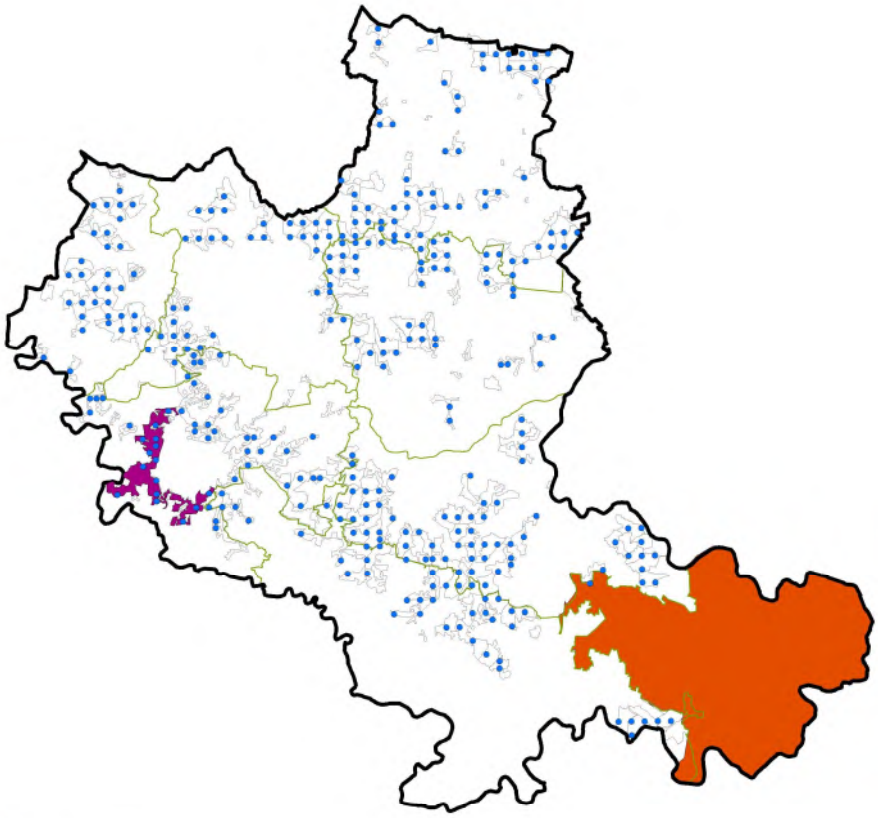
PUSAD FOREST DIVISION
SOFR Sample plots

N
W E
S

1:150,000



Legend

- Division boundary
- Range boundary
- SOFR sample plots
- Cmp_PUSAD
- Isapur_WLS
- Painganga WLS

0 2.5 5 10 15 20 25
Kilometers

CHAPTER 14

SCIENCE AND RESEARCH

During the process of writing of this Plan various papers, articles, reports and documents were referred from these sources and used for the writing of the Plan.

- Annual administration report of Maharashtra Forest Department, 2017-18
- Carbon Statistics of India
- Control Ground Water Board (CGWB)
- Geological Survey of India (GSI)
- Ground water survey and Development Agency (GSDA)
- Indian Forester
- Indian Institute of Forest Management, Bhopal (IIFM)
- Maharashtra Remote Sensing Application Centre (MRSAC)
- National Bureau of Soil Survey and Land use Planning (NBSSLUP)
- Social Forestry, Agriculture, Animal husbandry, Water resources departments, Yavatmal
- State of Forest Report 2005, 2009, 2017
- Supreme Court Orders
- Survey of Forest Resources (SOFR), Amravati
- Twelfth Five year plan document under Environment, Forestry and Wildlife 2009
- Maharashtra Forest manual

RESEARCH GAPS:

During the preparation of working plan various research gaps have been noticed. Forests in Yavatmal district and Pusad division in specific were managed on scientific lines since long. But modern concepts in forest management have changed the way forests are being managed. Working plan requires specific inputs on various topics. As per the new working plan code 2014 many new chapter have been added for which information was not available with the division. There is a lack of research works/paper related to Pusad forest division. The research gap is in almost every aspect of the Working Plan as

previous plans has not looked into the new aspects. Various aspects like carbon stock, carbon sequestration, sacred grooves, biodiversity, climate change, NTFP research, indigenous knowledge, trees outside forests, social and cultural aspects of forests, ecosystem Services etc. were found to be wanting in information.

14.1: PRESERVATION PLOTS:

Preservation plots, the miniature nature reserves, are demarcated forest areas set aside for the preservation of the forest in perpetuity permitting only such human interference as is necessary for their protection and maintenance. Following the recommendations of the 3rd All India Silvicultural Conference, preservation plots in the representative areas of Chief Forest Types were marked. By 1939, about 112 preservation plots were established throughout the country, when concept of preservation of both climatic and seral types was generated. In 1961, during the 10th All India Silvicultural Conference emphasis was laid on preservation of fine specimens of forests i.e. groups of out-standing trees, rare types of forests of botanical curiosity and patches of relict vegetation, specimens of managed forests (stable sub-climax stages) and climax forests.

Preservation plots in Maharashtra have been established as early as 1955 and as of 1993, there are 23 preservation plots in Maharashtra covering an area of 517.32 ha. There are no preservation plots in Pusad forest division. The following points are recommended for creation of preservation plots.

1) The division should be surveyed to identify the area under specific forest types to be made as preservation plot. The plot size shall be of not less than 4.0 ha and to a maximum of 20 ha.
2) The plot should be well-demarcated on the ground, geo-referenced and plotted on a GIS-based map. The trees on the border should be demarcated with such demarcation as were marked in the other preservation plots in the country/state.
3) These plots shall be spared from all human interference including harvesting operations, if prescribed in the Plan. Activities shall be limited to those that would ensure protection and maintenance.

4) A total enumeration of the plot shall be taken up taking into account all the tree species of the forests (Species, age-class distribution, height, etc.)
5) The forests shall also be described in a proper manner as to its species composition, condition of the crop, health and vitality, presence of pests etc.
6) The shrubs and herbs present in the plot should be well-documented. This shall include the lower life-forms.
7) The fauna available in the area should also be surveyed and documented.

14.2: SAMPLE PLOTS:

For forest resource assessment in the working plan, sample plots are systematically laid out in the forest area which is indicated on the Survey of India toposheet on the scale of 1:50000. The statistical sampling method namely "Systematic line plot sampling with random start was used. The plot size of 50"x50" (50 seconds x 50 seconds) representing approximately 225 ha on the ground was laid. The complete enumeration of trees, natural regeneration, grass and medicinal species was carried out. Similarly qualitative measurements were also carried out. These are distributed in different Working Circles under different ranges and are well-distributed throughout the division. A total of 350 sample plots were laid down. The details are given in **Appendix - XXXVIII.** These plots shall be monitored and data collected on a yearly basis. The normal prescriptions that are prescribed in the Plan area allowed to be carried out in these plots and the impact of the implementation of such prescriptions should be recorded and monitored.

14.3: REGENERATION PLOTS:

Selection of Plots: The sample Plots have been surveyed and in 3 x 3 m sub-plots, information was recorded for regeneration. In these plots regeneration will also be studied during the plan period. This will make the monitoring and data collection easier as well.

Data to be collected: Regeneration plots are established to study the regeneration status of important species.

- Data should be collected on population dynamics of seedlings, saplings and young trees.
- Each seedling and sapling should be marked individually
- The marked seedlings should be measured and monitored periodically
- The status of growth, their health and conditions should be measured in detail.
- The conditions of soil (depth, humus content etc), presence of litter, the canopy opening level, should be recorded properly
- The incidences of pest should be recorded.
- Any threat and outside interference like fire, grazing etc should be removed.
- The monitoring should be done periodically, the period of which should be decided in consultation with the SOFR unit and the Research wing.

14.4: NTFP PLOTS:

There are no specific NTFP plots in Pusad forest division. The details regarding NTF were collected during enumeration in the sample plots laid.

14.5: OTHER RESEARCH AND EXPERIMENTAL PLOT:

There are no seed orchards, clonal seed orchards established in the division till date.

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CHAPTER -15

SUMMARY OF PRESCRIPTIONS

15.1: INTRODUCTION:

Pusad Forest division is one of the four forest divisions in Yavatmal circle, in Yavatmal District of Maharashtra. Pusad Forest division is located in the South West of Yavatmal district. Pusad forest division comprises of Pusad, Digras, Shembalpimpri, Mahagaon, Kali, Umarkhed and Marwadi ranges. Area of the division lies in Pusad, Digras, Mahagaon and Umarkhed talukas of Yavatmal district. The district headquarters is at Yavatmal while the division headquarters is at Pusad. The area consists of masses of hilly country broken by broad valleys and partially surrounded by plains. Painganga river gives a strip of plain in many parts of its course along the border of the division. Most of the tract lies on a high level plateau at an average elevation of 350m to 450m above mean sea level and edge of plateau facing Painganga is more rugged as it has high elevation, ranges from 600 to 700 m above mean sea level. The forest type belongs to the Sub group Southern Tropical Dry Deciduous Forest. The forests of this division lies between longitude 77°18'' to 78°12'' East and latitude 19°26'' to 20°15'' North. The boundaries of the division are as follows.

North	: Darwha taluka of Yavatmal district
South	: Hadgaon taluka of Nanded district and Painganga river.
East	: Kinwat taluka of Nanded district and Painganga river.
West	: Washim taluka of Washim district.

The total geographical area of the division is 4,45,840 ha and the forest area is 1,12,782.92 ha which is about 25.29% of the total geographical area of the division. The total forest area of Pusad forest division is 69035.94 ha out of which 68,549.79 ha is Reserved Forests, 231.07 ha is Protected Forests and 255.08 ha is Un-classed Forests. A total of 69035.94 ha area is dealt with in this working plan. This Plan replaces the working plan written by D. K. Tyagi and G. R. K. Rao.

15.2: DISTRIBUTION OF AREA: For Administrative convenience the ranges, rounds and Beats were reorganized in year 2013 and the entire division has been divided into 7 ranges, 25 rounds and 117 beats.

Table No. 15.1: Rangewise distribution of the forest area (ha)

Sr. No.	Range	No. of Compts.	Total Area	RF		PF	Un-classed Forest
				A-Class	C-Class		
1	Digras	57	12864.43	7191.25	5673.18	0.00	0.00
2	Pusad	34	7798.06	7274.54	523.52	0.00	0.00
3	Shembalpimpri	42	7533.15	4369.04	3164.11	0.00	0.00
4	Umarkhed	49	10240.54	9818.98	361.67	0.00	59.89
5	Mahagaon	51	14100.49	12359.66	1556.83	0.00	184.00
6	Kali (D)	36	8934.78	6564.24	2139.47	231.07	0.00
7	Marwadi	31	7564.49	7112.68	440.62	0.00	11.19
	Total	**300**	**69035.94**	**54690.39**	**13859.40**	**231.07**	**255.08**

15.3: DISTRIBUTION OF AREA TO VARIOUS WORKING CIRCLES: The allocation of forest areas under various working circles of the proposed working plan is given below.

Table No. 15.2: Area allocation to different working circles

Sr. No.	Working Circle	Area in (ha)	Percentage
1	Selection-Cum-Improvement WC	35984.18	52.12%
2	Catchment Area Treatment WC	16414.79	23.78%
3	Afforestation WC	13679.82	19.82%
4	Fodder Improvement WC	1307.27	1.89%
5	Miscellaneous WC	1649.88	2.39%
Total		69035.94	100%

15.4: WORKING CIRCLE WISE SUMMARY OF PRESCRIPTIONS:

1. Selection-Cum-Improvement Working Circle:

Coupe demarcation and treatment Map:

1. Demarcation and Marking: One year in advance
2. Treatment map to be prepared as prescribed
3. A type: Protection area
4. B-type: Understocked and Blank areas (density <0.4)

a. B1-Area with rootstock and natural regeneration
b. B2-Area without natural regeneration

5. C-type: Pole crop and plantations
6. D-type: Well stocked areas (density >0.4)

Marking:

1. A type area: No marking
2. B type: Dead and diseased trees, live high stumps
3. C type: Marking for thinning
4. D type: Enumeration of all trees. Trees above selection girth dead and malformed trees, live high stumps are to be marked.

Silvicultural System:

1. Selection-cum-Improvement system
2. Trees above selection girth are prescribed for felling as per principle of safeguarding future yield.
3. Openings created by felled trees would promote natural regeneration of light demander species
4. Removal of dead, malformed, live high stumps will improve the existing crop.

Regeneration:

1. Natural Regeneration of seed origin of valuable species to be preferred and managed through cultural operations in D areas and B1 areas.
2. Artificial Regeneration in B2 type area if site is suitable.
3. Strict protection from fire and grazing
4. Tending of natural regeneration of valuable species in B type area.

SMC Works: To be done on watershed basis.

1. SMC works as prescribed in the chapter of miscellaneous regulations shall be taken up.
2. SMC works will be along with marking operation and completed before onset of monsoon.
3. SMC Works are to be based on the requirement of site.

Subsidiary Operation:

1. CBO works: Subsequent year of main felling
2. CBO works like cutting left over marked trees, removal of damaged trees, singling of multiple coppices shoots, etc.
3. NR or ANR should compulsorily be carried out immediately after CBO in the same year in D areas. This is necessary to regenerate the area felled.
4. Cleaning operations: 6th Year

2. Catchment area treatment Working Circle:

Coupe demarcation and treatment Map:

1. Demarcation and marking: One year in advance
2. Treatment map to be prepared
3. A type: Protection area (Steep slopes, 20m wide strips along streams, excessively erosion prone areas)
4. B-type: Understocked areas (density <0.4)
5. C-type: Congested Pole crop
6. D-type: Well stocked areas (density >0.4)

Marking:

1. A type area: No marking
2. B type: All dead trees, live high stumps
3. C type: The congested pole crop shall be marked for thinning.
4. D type: All fruit bearing species shall be reserved.
5. All dead and malformed trees retaining 2 tress/ha and all live high stumps shall be marked for felling.

Regeneration:

1. Natural Regeneration of seed origin of valuable species to be preferred and managed through cultural operations.
2. Strict protection from fire and grazing.
3. Tending operation for natural regeneration in the 'D' type area and root stock management in the 'B' type shall be taken up.

SMC Works:

SMC works, as described in the chapter of Miscellaneous Regulations are prescribed in A and B type area.

3. Afforestation Working Circle:

Coupe demarcation and treatment map:

1. Demarcation and treatment map will be prepared one year in advance.
2. Treatment map would show A,B,C, D areas
3. A type: Protection area (Steep slopes, 30 m wide strips on both side of streams).
4. B-type: Understocked areas (density <0.4)
5. C-type: Congested Pole crop
6. D-type: Well stocked areas (density >0.4)

Silvicultural System:

1. Restorative phase – one year and productive phase – 5years
2. Removal of dead, live high stumps.
3. Plantation work in A, B type areas.
4. JFMCs to be actively involved.

Regeneration:

1. Tending of natural regeneration and existing root stock is prescribed to be given preference over plantation.

SMC Works:

1. SMC works will be done as prescribed in miscellaneous regulations.

4. Fodder Improvement Working Circle:

Coupe Demarcation:

The coupe due for closure to grazing will be demarcated one year in advance.

Treatment:

1. Removal of invasive weeds.
2. SMC work as per site requirement.

3. In suitable blank areas, regeneration of grass through seed broadcasting, area closure through enclosures is prescribed.
4. JFMCs to be actively involved.

5. Joint Forest Management:

Prescriptions:

1. JFM micro plans are to be dovetailed with broad prescriptions of approved working plan.
2. Maintenance of forest boundary, removal of encroachments, control over illicit cutting, illegal grazing, fire and wildlife offences shall receive priority apart from regularly undertaken SMC works and plantations.
3. Villages which have not received funds should also be accorded importance.

6. Wildlife management:

Prescriptions:

1. Standing Order of PCCF (WL) to be scrupulously implemented.
2. Habitat improvement works like waterhole development, meadow development to be taken up in suitable areas.
3. Creation of database of riparian zones, saltlicks, natural wallows, resting places etc to be created.
4. Vaccination of livestock to be monitored
5. Intelligence gathering to check wildlife trade
6. Secret service fund to be effectively used.
7. Regular sensitization of staff
8. During marking, at least 2 dead trees per ha is to be kept as snags.
9. No fruit tree to be marked.
10. Compensation as per Government orders to be dispersed immediately and transparently.
11. Effective control on forest fires.
12. Eco-development works to be started either through JFMCs in wildlife rich areas

13. Massive awareness creation in village communities, schools, colleges, public representatives etc.

7. Non-Timber Forest Produce management:

Prescription:

1. Documentation of NTFP collection.
2. JFMCs to be actively involved in NTFP collection and processing.
3. Scientific method for Gum tapping as suggested by FRI to be used.
4. Regular trainings for JFMCs to be conducted for capacity building in NTFP collection and processing.

8. Miscellaneous Regulations:

1. Boundary demarcation of all un-demarcated areas (non forest land taken over for C.A., forests adjoining private areas) to be accomplished.
2. Demarcation, marking and subsidiary silvicultural operations.
3. Soil moisture conservation works.
4. Maintenance of land records.
5. Encroachment and grazing regulations.

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CHAPTER-16

TREES OUTSIDE FOREST

16.1: INTRODUCTION:

An accurate assessment of forest and tree resources in the country is essential for formulating sound strategy for forestry sector. Precise data and latest information on forest cover and volume of growing stock of forests/trees and trends of changes therein are basic ingredients for policy and planning purposes. Generally, extensive tree wealth exists outside continuous forested areas in every country. Termed as 'Trees Outside Forests" (TOF), these are in the form of small woodlots and block plantations, trees along linear features, such as roads, canals bunds, etc. and scattered trees on farmlands, homesteads, community lands and urban areas. Traditionally, these were not inventoried and little quantitative information existed about TOF. However, lately a lot of interest has been generated worldwide on TOF. Besides providing support to rural economy, these trees are now a source of substantial forest produce in every country. Tree population along avenues has been taken up extensively since early 1950s mainly along roads, railway tracks, bunds, canals, riverbanks, in parks, in blocks and other blank areas. Farm forestry, agro-forestry and wasteland afforestation activities have subsequently increased the tree wealth of the state.

TOF Area: All lands (rural and urban) outside the Recorded Forest Area.

TOF Area (rural): The TOF area includes all areas outside the traditional /notified Reserved and Protected Forests but excludes areas of Municipality, Corporation, Cantonment Board or a notified area Committee etc. which has population more than 5000 and more than 75% male working population are engaged in non-agricultural occupation.

Trees outside forest (urban) Area: The definition of urban area followed in this survey is same as followed in the decennial Population Census of Urban areas in 1991 Census and consist of:

I. All places with a Municipality, Corporation, and Cantonment Board or Notified Town area Committee etc

II. All other places which satisfy the following criteria: A minimum population of 5000 At least 75% of male working population being engaged in non-agricultural (and allied) activities; and, A population density of at least 400 persons per sq.km (or 1,000 per sq.mile)

III. Places having distinct urban characteristics such as major project colonies, areas of intensive industrial development, railway colonies, important tourist centres - even though such places may not strictly satisfy the criteria of (a) & (b) under (ii).

The total geographical area of the division is 4,45,840 ha and the forest area is 1,12,782.92 ha. which is about 25.29% of the total geographical area of the division. This is way below the targeted 33% forest cover as per the National Forest Policy.

Forest Survey of India (FSI), an organization under Ministry of Environment and Forests and Climate Change (Government of India), is one of the few organizations in Asia that has been carrying out TOF assessments. This assessment was not carried out for Yavatmal district. Social Forestry Department (SFD) of the State has the mandate for the forestry outside forest area. Since the early 1980s the SFD has carried innumerable plantation and plantation-drives across the state. It has not only conducted such plantations but has backed-up with good awareness and extension efforts which have borne fruits in many ways. The SFD has been carrying out plantations in the private areas since 1982 in which include block plantations, agricultural bund planting and road-side plantations which form a substantial quantity and forest cover in the areas outside forest.

From 2008-09 to 2017-18, Social forestry Yavatmal division has done roadside plantation of 211 kms and block plantation of 30 hectares.

16.2: TO INCREASE FOREST/TREE COVER:

In tune with the objectives of our National Forest Policy 1988 we have to achieve a national target of bringing 33% of landmass of our country under forest and tree cover for ensuring ecological security and environmental balance. However, forest cover and tree cover in India has over the years stabilized at around 23 % of geographical area and

Pusad forest division has about 25% of the total geographical area under forest cover. The area under forest and forest land is difficult to increase.

The only way left for the increase of forest cover and tree cover has to be through afforestation activities in non-forest areas. The areas outside forests comprises mainly of private farm forestry, canal bank areas, road side strips, railway line side strip, blank and degraded land, wasteland etc. Apart from increasing the tree cover, extension of forestry in non forest areas especially as agro-forestry and farm forestry has tremendous potential to increase production of timber and other wood products and reduce the pressure on natural forests. The options for increasing Trees outside Forest have been mentioned below.

16.3: AGROFORESTRY:

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry can also be defined as a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. In particular, agroforestry is crucial to smallholder farmers and other rural people because it can enhance their food supply, income and health. Agroforestry is a low-input system which combines trees with crops in various combinations or sequences.

Agroforestry also has the potential to reduce risk through diversification of a variety of products, including food, fuel wood and animal fodder. Agroforestry combines agriculture and forestry technologies to create more integrated, diverse, productive, profitable, healthy and sustainable land-use systems Agroforestry systems are multifunctional systems that can provide a wide range of economic, socio-cultural, and environmental benefits. The three main types of agroforestry systems are -

Agrisilvicultural system is a combination of crops and trees, such as alley cropping or home gardens.

Silvopastoral system combines forestry and grazing of domesticated animals on pastures, rangelands or on-farm.

Agrosylvopastoral system includes an integrated approach of trees, animals and crops.

16.4: ROADSIDE/ CANAL-SIDE PLANTATIONS: This is an important component of the work of Social Forestry Department. During the past ten years Social forestry Yavatmal division has done 211 kms of roadside plantations.

16.5: BLOCK PLANTATIONS: During the past ten years Social forestry Yavatmal division has done 30 hectares of block plantation.

16.6: OTHER MODELS AND PLANTATIONS: The following types of Agroforestry possibilities should also be explored as per the site conditions and the requirement of the people.

a. Boundary/Bunds Plantation: Trees on boundary + crops
b. Energy plantation: Trees + crops during initial year
c. Alley cropping: Shrubs + crops
d. Agrihorticulture: Fruit trees + crops
e. Agrihortisilviculture: Trees + fruit trees + crops
f. Hortipasture: Fruit trees + pasture/animals
g. Shelterbelts: Trees +/- crops
h. Windbreaks: Trees +/- crops
i. Homesteads: Multiple combination of trees, fruit trees etc.

16.7: SUGGESTIVE STEPS FOR INCREASE IN TREES OUTSIDE FORESTS:

1. Identification of the fallow lands, culturable and unculturable wasteland range/taluka-wise in agricultural land which is available for taking up afforestation should be done at the district level.

2. Drawing up appropriate time specific action plan is essential, which will require the involvement of the Social Forestry Department and the Agriculture Department alongwith the Forest Department
3. Farmers must be encouraged and motivated by way providing them technical assistance and cooperation by forest department and SFD for taking up planting trees
4. Land laws, if any, should be so modified wherever necessary so as to facilitate and motivate individuals and institutions to undertake tree-farming and grow fodder plants, grasses and legumes on their own land.
5. Schemes like “Kanya Van Samruddhi” should be undertaken which promotes planting trees on birth of girl child in lands outside forest area.
6. Wherever possible, degraded lands should be made available for this purpose either on lease or on the basis of a tree-patta scheme. Steps necessary to encourage them to do so must be taken. Appropriate regulations governing the felling of trees on private holding should be appropriately relaxed.
7. High quality planting stock including clonal planting stock supported with improved silvicultural management practices can usher in a second green revolution in India this time in respect of tree crops for timber and fuel-wood / fodder production. This critical requirement of genetically improved high quality planting stock should not be neglected, which will impact productivity and quality improvements.
8. People’s support in forest conservation is to be recognized by the state forest departments. Appropriate extension programmes are to be undertaken to motivate and make them conscious of the value of trees, wildlife and nature in general. This can be achieved through the involvement of educational institutions, Krishi Vigyan Kendras, mass media, audio-visual aids and the extension machinery, Trainers Training Centres to learn agri-silvicultural and silvicultural techniques to ensure optimum use of their land and water resources.
9. The wood based industries have important role to play in development of agroforestry. They should consider making appropriate arrangements with

farmers and play a facilitative role in arranging quality planting material and enter into buy back arrangements.

10. Preferred tree and bamboo species under agro forestry by farmers and not naturally available in neighbouring forests may be exempted from the transit permit and felling regulations.
11. The possibility of a Public-Private Partnership in regenerating the culturable wasteland and barren unculturable wastelands should be explored. This can also be explored for raising the improved planting material for supply to the farmers.

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CHAPTER-17

CONTROL AND RECORDS

17.1: CONTROL AND RECORDS:

The following records will be maintained in the division office.

1. Control forms
2. Compartment History
3. Plantation registers
4. Nursery Registers
5. Divisional Note Book.
6. Boundary registers.

Control forms:

Control forms will be prepared to include each of working plan prescriptions as well as definite suggestions regarding other operations. All activities of harvesting, subsidiary silvicultural operations, cleaning, thinning, regeneration works, boundary demarcation and soil and moisture conservation works carried out shall be recorded in the control forms. The prescribed proforma of the control forms is given in **Appendix - XXXIX.**

Three permanent sets of these control forms will be prepared. One set each in division office, DCF (Working plan) office and CCF (Territorial) office. DCF Pusad will annually make entries in the control forms and send it to the Working Plan Officer by August of every year. All the entries showing the deviation from the prescription of working plan will be underlined in red ink. The Working Plan Officer will scrutinise it and process further.

17.2: COMPARTMENT HISTORIES:

Compartment history is the record of various activities and observations made in the past year. They shall be maintained in forms No. 1 to 5 as given in **Appendix - XL.**

FORM NO. 1: Compartment description written by Working Plan Officer, Yavatmal as per his inspections.

FORM NO. 2: Record of changes in the growing stock and plantations.

FORM NO. 3: Record of operations and out turn.

FORM NO. 4: Record of observations.

FORM NO. 5: Record of injuries.

Each compartment or sub compartment must have a separate file. Compartment history must be maintained by the division office and range office as they keep the record of past management practices and their effects on the growing stock. Every year in July the RFO should fill in the necessary information and will send to the DCF who will get them scrutinised by an officer not below the rank of ACF, get them typed and sign them. One copy of the forms will be filled in the divisional compartment history file and another copy will be returned to the RFO. The copies of the compartment history files will be sent to the Working Plan office, Yavatmal annually by the month of August.

17.3: PLANTATION AND NURSERY REGISTERS:

Plantation register will be maintained for all the areas regenerated artificially in the form No. 1 to 9 as given in **Appendix - XLI.**

Nursery registers will be maintained in Form No. 1 to 10 as given in **Appendix - XLII.**

17.4: DIVISIONAL NOTE BOOK:

It is desirable for the DCF to maintain certain journals and records for ready reference. These journals are important for controlling and monitoring of various activities of expenditure. A brief note on the plantation will also be recorded by the DCF under the appropriate heads. The form of Divisional Note Book is given in **Appendix - XLIII.**

17.5: FIRE RECORDS:

They should be maintained as per the latest orders from State Government from time to time.

17.6: OTHER RECORDS:

List of amendments to the working plan and list of area changes will be maintained in prescribed forms **(Appendix – XLIV).**

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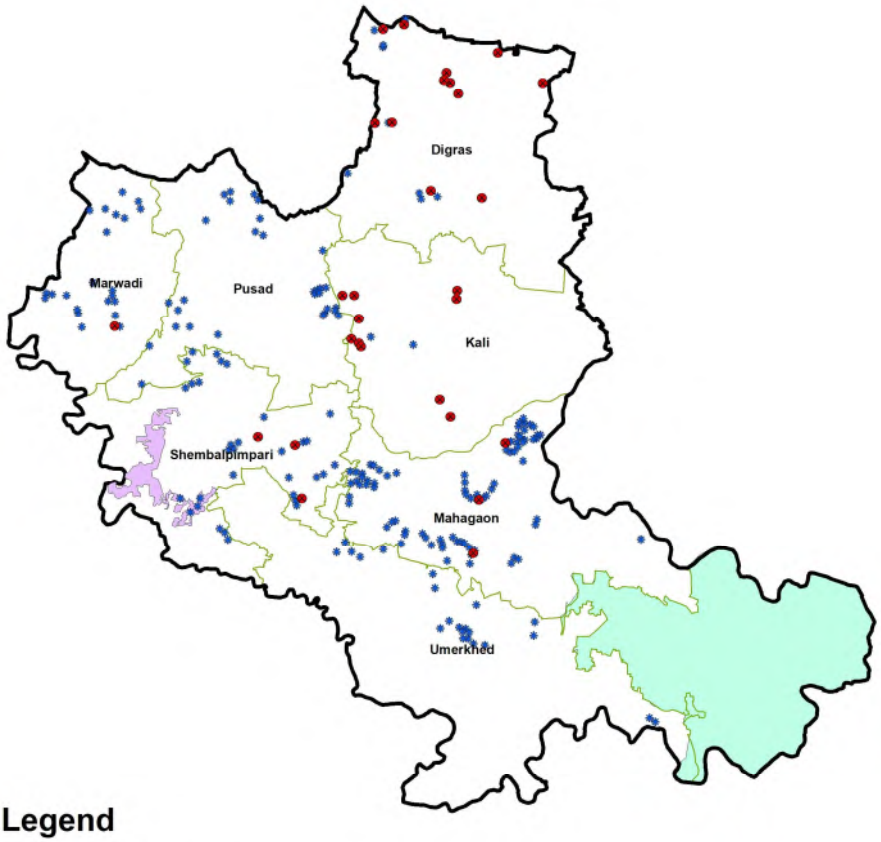
PUSAD FOREST DIVISION
SMC works

1:150,000



Legend

- Division boundary
- Range boundary
- Isapur WLS
- Painganga WLS
- Earthern bandh
- Forest tank

PUSAD FOREST DIVISION
ADMINISTRATIVE UNITS

N
W E
S

1:150,000

Legend

- Division boundary
- Isapur WLS
- Painganga WLS
- Round boundary
- Beat boundary

0 2.5 5 10 15 20 25
Kilometers

PUSAD FOREST DIVISION
SATELLITE IMAGE - NOV 2017

N
W E
S

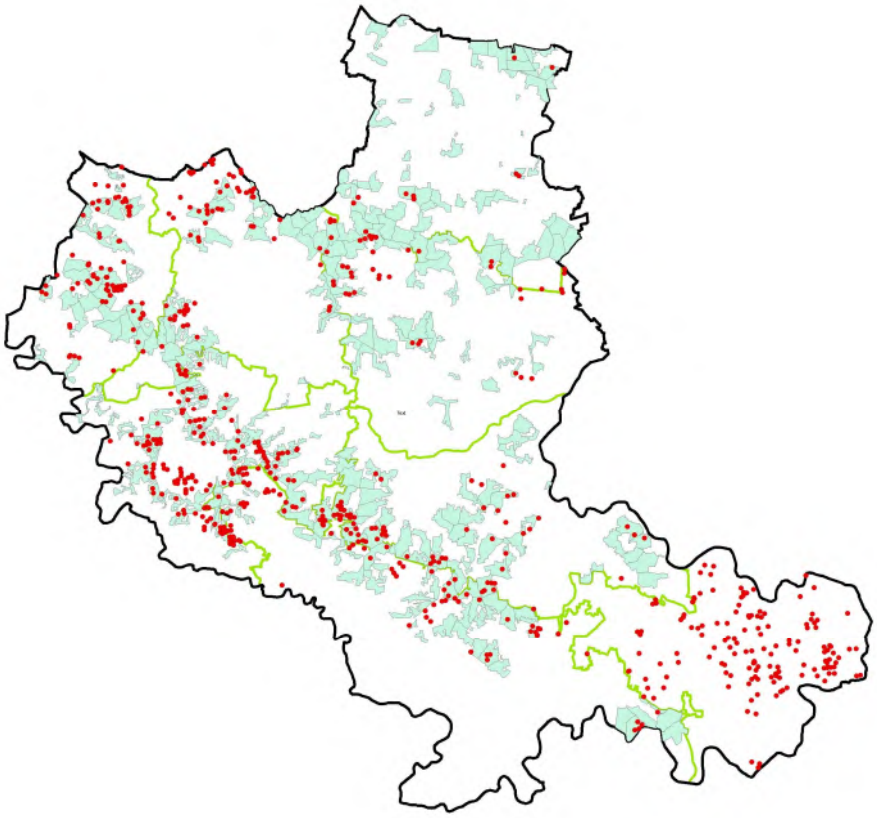
1:125,000

0 2.5 5 10 15 20 25
Kilometers

PUSAD FOREST DIVISION
FIRE MAP

N
W E
S

1:150,000



Legend

- Fire points 2009-18
- Compatrment boundary
- Division boundary
- Range boundary

0 2.5 5 10 15 20 25
Kilometers