

EXECUTIVE SUMMARY OF MANAGEMENT PLAN

- Formation of Markhanda Forest Project Division- 1974
- Headquarter at Ballarshah.

1. General : -

- Area allotted vide M.D's letter No. DM /PLAN/ RO/19/ 1632, Nagpur dated 28/06/1995.- **26835.752 ha.**
- Area taken over from Forest Department vide G.R. No. FDC-2013/94/F-5, Dated 28.4.2014. – **7423.680 ha.**
- The total area of the Management Plan is **34259.432 ha.**
- Period of Plan 2016-17 to 2025-26.

2. The total area of the Management Plan is 34259.432 ha.

- Total Area Covered : 34259.432 ha.
- Period of plan : 2016-17 to 2025-26
- Total No. of Ranges : 4
- Total No. of Compartments : 141

3. Boundaries

- Area of this Division lies between latitudes **19°26'23"N to 19°49'24"N** and longitudes **79°48'47"E to 80°11'19"E.**
- The total area of this Division is **34259.432 ha.** which is spread over **141** compartments
- Area is distributed in Markhanda, Konsari, Elgoor and Tondel ranges.
- The Forests of Markhanda F.P.D. are spread in Chamorshi, Aheri and Mulchera Tahasils of Gadchiroli District.

The boundaries of this Division are

North – Vainganga River and Chandrapur District

South – Forest area of Allapalli Division and Pranhita Forest Project Division

East – Forest area of Allapalli Forest Division and Bhamragadh Forest Division

West – Vainganga River

4. Objectives of Management Plan

The National Forest policy of 1988 will be the guiding principal to decide the general objects of management and these are mentioned here under.

- To preserve forest cover on steep hill slopes, along the nala banks and water courses and to prevent soil erosion.
- To enrich the growing stock in the natural forests and to restock all the under stocked and degraded forests, to achieve normality of growing stock in shortest possible time.
- To increase the productivity of forests by using improved technology and to maintain the same on sustained yield basis.

- (iv) To meet the requirement of small timber, fuel wood, fodder and minor forest produce of the rural and tribal population on top priority.
- (v) To increase the production of minor forest produce and to manage the same scientifically to utilize the potential to the maximum possible extent on sustained basis.
- (vi) To conserve and protect wildlife.

5. The Forest

- According to the classification of forest types by Sir H.G. Champion and Shri S.K. Seth, the Forest dealt with this Management Plan belongs to sub group **Southern Indian Tropical moist deciduous forest “3B/C1b”** and **“5A” Southern Tropical dry deciduous forest**.

❖ Sub types-

- Group 3 Southern Tropical moist deciduous forests
 - 3B/c 1b South Indian moist deciduous Teak forest
(Elgoor and Tondel Ranges)
 - 3B/c2 Southern moist mixed forest
(Elgoor and Tondel Ranges)
- Group 5A Southern Tropical dry deciduous forests
 - 5A/c1b Southern Tropical dry deciduous Teak forest
(Markhanda and Konsari Ranges)
 - 5A/c3 Southern Tropical dry mix deciduous forest
(Markhanda and Konsari Ranges)

Predominant Species - Teak, Ain, Bija, Dhawada, Lendia, Garadi, Tendu, Salai, Mowai, Moha, Kalam, Khair, Bamboo etc.

Forest Composition –

Floristic Composition –

- Top Canopy – Teak, Ain, Dhaora, Tendu, Mahua, Bija and Kalam
- Second Story - Garadi, Khair, Bherra, Lendia, Char, Amaltas, Palas.
- Shrubs, Herbs– Bharati , kuda , Jilbilin , Muradseng, Tarota
- Climbers – Palas bel ,Chilati, Kukut, ranzi, Eroni
- Grasses - Bhurbhusi, Kusal, Sumbha

Faunal Biodiversity

- Carnivore- Hyena, Wild dog, Wolf, Jackal, Fox and Jungle cat.
- Herbivore- Sambar, Cheetal, Nilgai, Wild boar, Sloth bear, Black buck, and Chinkara.
- Rodents- Flying squirrel, three striped palm squirrel, Porcupine and hare.
- Birds- Painted sand grouse, Common sand grouse, peafowl, Grey jungle fowl, Jungle bush quail, Red spur fowl, spotted bill duck, Pigeon, Cotton teal and Whistling teal.

6. Status of Regeneration

Natural Regeneration

Moderate regeneration of Bija, Ain, Kalam, Teak, Lendia, Dhaora, and Tendu. Regeneration of Garadi is abundant

Area Affected by Forest Fire

For preventing forest fire following activities are done by corresponding Ranges

- Maintenance of fire lines,
- Control burning,
- Cleaning,
- Regular patrolling

Area damaged by Natural Calamities

- Negligible area is damaged by natural calamities

Area Infested by Invasive Weed species in forest

- Garadi and Kukat-ranzi are observed
- Cleaning operations
- Intensive weeding upto three years after plantation

Incidences of Pest and Diseases

- Teak-skeletonizer and Teak-defoliator
- Damage caused by pest and diseases are moderate.

7. Conservation and Maintenance of Soil Resources

Area Treated Under Soil and Moisture Conservation Measures

Objectives

- To prevent land degradation.
- Improvement of land capability and moisture regime.
- Promotion of land use to match land capability.
- Prevention of soil loss to reduce siltation down below

- Peoples' involvement.
- Up gradation of skills in planning and execution

□ **Types of Interventions**

- Contour trenching
- Nalla bunding Gully plugging
- Check dam
- Brushwood dams
- Cement bandharas

As per requirement of soil erosion in the forest areas.

□ **Waterhole Development and Protection Measures**

- ❖ Water is a major limiting factor during the summers in these forests. Thus all the perennial and ephemeral water holes will be identified, recorded and marked on Divisional/Range maps. De-silting, if required shall be carried out.
- ❖ Small nalla bunds, underground bunds and other technically sound small water harvesting structures may be constructed across the streams to create water holes and habitat development.
- ❖ The tract of this Division drains into tributaries of Wainganga, Dina, Pranhita and Bandia River.

8. Optimization of Forest Resource Utilization

□ **Demand & Supply of Timber & Non-Timber Forest Produce-**

- **Timber** - Teak, Bija, Haldu, Ain, Dhaora, Bherra, Garadi, Lendia and Khair used for timber purposes
- **Firewood** - Used for cooking as well as for keeping warmth in house during winter.
- **Bamboo** - Preparation of mats, baskets, edibal & construction of huts
- **Tendu Leaves** Tendu leave is nationalized since 1970-71 collected through Government agency
- **Other Produce** Fruit & flowers of Mahua, fruits of Tendu, Char, Khirni, Jamun, Karwanda, Ber & Hirda, Fibres & bark, gums, thorns, leaves
- **Medicinal Plants** Awala, Behada, Hirda, Arjun, Bael, Shatawari, Jamun, Bija, Amaltas, Murud Sheng, Salai, Kuda

❑ **Market**

- For timber, main market is Ballarshah whereas Second quality timber, poles, fuel beats are sold at Nagepalli and Markhanda depots.
- The fuel beats are sold at Mulchera, Markhanda and Nagepalli depots.
- Nistar material is supplied from range or round headquarters of Forest Department.
- Tendu leaves, which are important from revenue aspect are marketed by Forest Division.

9. Maintenance and Enhancement of Social, Economic, Cultural and Spiritual Benefits

❑ **Population and Per Capita Income**

- Population of Gadchiroli District is 10,72,942 out of which 5,41,328 are males and 5,31,614 are females.
- Scheduled Casts population constitute 11.3 percent of total population where as Scheduled Tribes constitute 38.7 percent.
- Per Capita Income for Gadchiroli District is Rs 58,603.00 per annum where as state average is Rs.1,17,901.00 and National average is Rs. 80,388.

❑ **Social customs of Communities**

- **Gond**- large population, mostly depend on the farming, rear domestic animals, engaged in forestry works
- **Pardhan**- well developed amongst the tribal, depends on farming
- **Naik**- for the bursting of traditional instruments in the festivals, marriages ceremonies, etc, engaged in the forestry works
- **Madia**- small in numbers, depend on NTFP collection, forestry works, hunting etc

❑ **Dependency of people on NTFP**

- The tribal communities of the Division fulfill their daily needs and earn additional income by collecting the NTFP from forest.
- Tendu patta collection favours the employment, which generates income.
- The Mahua flowers have medicinal properties. The community peoples uses the Mahua flowers as medicine and for selling in the market.
- The gums and other NTFP are used for daily needs by community peoples.
- The collection of NTFP improves their livelihood and generates employment.

❑ **Labor Welfare**

- The villages around area of the Division are moderately populated. Konsari, Markhanda Ranges are having enough labor supply whereas Elgoor and Tondel ranges are sparsely populated.
- In July-August local laborers are engaged in the various operations of the Plantation work. From October to March local laborers are engaged in the various harvesting operations.
- Laborers get substantial employment through forestry operations carried out in the areas of this Division.

- About 2600 laborers are enrolled for UIN scheme of EPFO.

10. Past System of Management

The first regular plan was prepared for the Markhanda Forest Project Division by Mr. Donald in the year 1913 and it was revised by Mr. Hussein in the year 1937, Mr. Hussein's Plan was revised by Sri Dashputre in the year 1954 Previous Management Plan was written by Shri R.S. Kadam then Divisional Manager for the period of 2006-07 to 2015-16. Total area of 26835.752.

S.N.	Name of Name of Working Circle	Area Allotted (in ha)
1	Teak Plantation Management Working Circle	12326.799
2	Teak Plantation and Reboisement Working Circle	6881.731
3	Improvement Working Circle	5275.558
4	Protection Working Circle	1631.743
5	Miscellaneous Working Circle	719.921
	Total	26835.752
6	Bamboo Production (Overlapping) Working Circle	5855.440
7	Wild life (Overlapping) Working Circle	26835.752

❑ Teak Plantation Management Working Circle

- The plan prescribed mainly thinning of Teak plantations with specific thinning cycle.
- Tending operations such as cleaning and thinning were carried out in established plantations raised after removal of over- wood.
- This had resulted in improvement in the growth of the established regeneration.
- The objective of management has been fulfilled to a great extent. Annual series of even aged Teak plantations formed top canopy.
- The crop thinned has responded well to the thinning regime. The total area under this Working Circle was 12326.799 ha.

Special objects of Management.

- To carry out tending operations to produce good quality and big size teak timber.
- To get intermediate yield and revenue.
- To carry out thinning as per the yield table on the basis of age and site quality.
- To improve the crop by carrying out required silvicultural operations so as to achieve growth parameters comparable to those in the yield table.
- To obtain maximum sustained yield of teak timber of commercial value.

Results :- This Working Circle included successful Teak Plantations raised by FDCM from 1975 to 1987, Teak Plantations raised by Forest Department from 1932 to 1982. Tending operations

like thinning and cleaning were carried as per schedule. The crop thinned has responded well to the thinning regime. Shifting of teak from lower girth classes to higher girth classes has taken place considerably resulting in substantial increase in growing stock and hence the Working Circle has been retained as Teak Plantations Management Working Circle.

□ **Teak Plantation & Reboisement Working Circle**

- In Teak Plantations Working Circle mostly un-tackled forest areas of good site quality and which were fit for Teak were included.
- The main objective under this Working Circle was to convert low value uneven aged mixed forests to uniform even aged stands of Teak by using genetically superior planting stock.
- Removal of over wood and planting the area with Teak was the main prescription.
- About 40 middle aged miscellaneous and fruit trees were retained.
- Plantations where Teak has been planted after removal of over wood has been highly successful.
- The plantations raised during the last fourteen years, have been very successful.
- The total area under this Working Circle was 6881.731 ha.

Results :- This Working Circle included un-tackled forest areas of good site quality and which were fit for Teak. The forest area comprised of misc. species like Ain, Dhawara, Mowai, Garadi, Rohan etc. Removal of over wood and planting the area with Teak was main prescription. The results of plantations where Teak has been planted after removal of over wood has been highly successful.

□ **Improvement Working Circle**

- In the Improvement Working Circle, the areas of linear strips retained as natural surrounds of the earlier plantations,
- Areas with steep slopes, compartment lines, areas along the Nallah beds
- Areas with middle aged crop of miscellaneous trees were included which needed proper tending.
- Improvement felling were prescribed by removing dead, dying and diseased trees without creation of permanent gap.
- The crop has responded well to the improvement felling and tending operations. The total area under this Working Circle was 5275.558 ha.

Results :- The areas of linear strips of natural forests retained as natural surround of earlier plantations, some failure plantations of teak and miscellaneous species where failure was a result of habitat factors were allotted to this working circle. In tackled and failure areas young coppice regeneration of miscellaneous species was noticed. In natural strips of plantations, over wood consists of middle-aged miscellaneous tree species and few mature trees were noticed.

□ **Protection Working Circle**

- The forest areas allocated to this Working Circle are rocky and refractory type.
- It consists of degraded blanks of rocky patches as well as under stocked areas with low density and having stunted growth of Bhirra, Rohan, Arjun, Garari, Khair, Lendia and shrubby growth.
- The forests of this Working Circle are mostly of site quality IV-b and composed of species like khair, rohan scattered over the area. Tree growth is stunted and badly formed.
- The areas are mostly under stocked with overall density below 0.4. The total area under this Working Circle was 1631.743 ha.

Results :- Areas have been protected from fire and grazing. Area remained protected. Efforts have been made to protect the area from new encroachment. The Working Circle is retained.

□ **Miscellaneous Working Circle**

- The areas which could not be covered in any Working Circles, since the areas were used to other activities such as (a) Water bodies (b) Roads (c) Buildings (d) Depot were included in this Working Circle.
- This Working Circle also included areas of nurseries fit for raising Teak and other plants
- The existing seed producing areas and seed stands.
- Teak nurseries in this working circle produced excellent planting stock.
- The total area under this Working Circle was 719.921 ha.

Results: -

- Buildings, Roads, Culverts, Jungle and sale depots were maintained as and when required depending upon the availability of funds.
- The quality teak seed was collected from the seed production areas and seed stands existing in this Division by the seed unit of F.D.C.M.Ltd. Nagpur.
- Quality Teak Stumps were produced in Elgoor Nursery of this Division to cater the internal requirement and for sale to other departments.

□ **Bamboo Production (Over lapping) Working Circle**

- Bamboo Production (overlapping) Working Circle included areas having natural bamboo as well as successful bamboo plantation fit for bamboo production.
- The objectives of management of this Working Circle were to enhance productivity of natural stands of bamboo to meet local demand of farmers and to meet the commercial demand of bamboo.
- Areas with established clumps were proposed to be managed by removing congestion by working on a three year cutting cycle.
- It has given satisfactory results in terms of growth and revenue. The crop has responded well to the silvicultural operations.
- The area under this working circle was 5855.440 ha.

❑ **Wild Life Management (Over lapping) Working Circle**

- The objectives of this Working Circle were to ensure wildlife protection and conservation of wildlife in the forests of the Division.
- Some prescriptions are given in the Working Circle

❖ **Future Management Discussed and Prescribed**

11. Basis of Proposals

- The National forest Policy of 1988 will be the guiding principle to decide the general objects of management of the new management plan.
- The new policy has emphasized the need for environmental stability as the prime objective.
- The general objects of management will be on the basis of the principles laid down in the National Forest Policy and the functions which forests have to perform as per State Government's Orders, the objects of scientific management, the depletion of growing stock due to heavy grazing and illicit cutting.
- Based on the results and analysis of Past Systems of Management, the following Working Circles have been proposed in the present Management Plan for Markhanda Forest Project Division as given in the following table.

Working Circle wise Allocation of Area

Distribution of Forest Area in Working Circles

S.N.	Name of the Working Circle.	Area (in ha)
1	Teak Plantation Management Working Circle	14078.914
2	Teak Plantation Working Circle	8113.081
3	Improvement Working Circle.	7497.437
4	Planting Stock Improvement Working Circle	965.842
5	Protection Working Circle	2327.213
6	Encroachment Area Management Working Circle	229.264
7	Miscellaneous Working Circle.	1047.581
	Total	34259.432
8	Bamboo production (Overlapping) Working Circle	6252.830
9	Wildlife Management (Overlapping) Working Circle.	34259.432
10	Non Timber Forest Produce (Overlapping) Working Circle	34259.432
11	Soil and Water Resource Management (Overlapping) Working Circle	34259.432

Range wise and Working Circle wise Distribution of Area

Name of Working Circle	Markhanda (ha.)	Konsari (ha.)	Elgoor (ha.)	Tondel (ha.)	Total (ha.)
Teak Plantation Management W.C.	2330.733	2384.960	4097.914	5265.307	14078.914
Teak Plantation W.C.	3668.007	1836.555	2366.319	242.200	8113.081
Improvement W.C.	2787.959	1932.004	1535.030	1242.404	7497.437
Planting Stock Improvement W.C.	585.308	254.89	114.644	11.000	965.842
Protection W.C.	641.248	749.584	865.462	71.019	2327.213
Incroachment Area Management W.C.	47.856	0	78.100	103.308	229.264
Miscellaneous W.C.	569.476	178.523	220.592	78.990	1047.581
Total	10630.587	7336.556	9278.061	7014.228	34259.432
Bamboo (Overlapping) W.C.	50.440	75.000	1415.000	4712.390	6252.830
Wildlife Management (Overlapping) W.C.	12344.133	7336.556	7564.515	7014.228	34259.432
Non Timber Forest Produce (overlapping) W.C.	12344.133	7336.556	7564.515	7014.228	34259.432
Soil and Water Resource Management (overlapping) W.C.	12344.133	7336.556	7564.515	7014.228	34259.432

12. Teak Plantation Management Working Circle

- Successful Teak plantations raised by Forest Department & F.D.C.M. Ltd. upto 2014 which are fit for thinning are allotted to this Working Circle.
- Total area allotted of this Working Circle is 14078.914ha.
- This includes about 193.989 ha area which has completed 80 years and is due for final felling during this plan period.
- Density varies from 0.6 to 0.8 and site quality varies from II, to III and rarely IV in some areas.
- The crop is mostly young crop and in patches miscellaneous species & Bamboo are dominant over Teak.

The distributions of the areas of this working circle into various ranges are as under.

S.N.	Name of The Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	2330.733	10630.587	17	6.80
2	Konsari	2384.960	7336.556	17	6.96
3	Elgoor	4097.914	9278.061	29	11.96
4	Tondel	5265.307	7014.228	37	15.37
	Total	14078.914	34259.432		

Special objects of Management

- To carry out tending operations to produce good quality Teak timber.
- To get intermittent yield and revenue.
- To carry out thinning as per the stand table on the basis of age and site quality.
- To improve the crop by carrying out required silvicultural operations so as to achieve growth parameters comparable to those in the yield table.
- To obtain maximum sustained yield of Teak timber of commercial value.
- To meet the market demand of poles, small timber and firewood.

Method of Treatment.

- First thinning will be carried out in 10th year of planting.
- Second and subsequent thinning in Teak plantation will be carried out as per the revised instructions for thinning in Teak Plantation
- Third and subsequent thinning will be carried out at an interval of 5 years.
- Cleaning operations which includes removal of under growth and undesirable tolerant species like Garadi shall be felled.
- Superior Misc. trees, fruit trees and tree species and climbers of medicinal use shall be retained.
- Climber cutting work will be done prior to every thinning.
- In the teak plantations which have completed its rotation of 80 years , final felling will be carried out. It will be followed by teak plantation. Prescriptions of Teak Plantation Working Circle will be followed for felling in these areas.

Rotation.

The rotation period of Teak in F.D.C.M. Ltd is fixed at 80 years vide Managing Director's Letters No.PLN/11/2004-05/984, Nagpur, dated 2.06.2004.

❑ Subsidiary Cultural Operations.

- ✓ Worked area will be protected from fire.
- ✓ Felling of badly damaged or broken trees.
- ✓ Cutting back of malformed advance growth of Teak.

13. Teak Plantation Working Circle

General Constitution

- Un-tackled portion of natural Standing crop that is suitable for raising Teak plantations after removal of over wood.
- The forest area allocated to this Working Circle belongs to southern tropical moist as well as dry deciduous Teak & Misc. Forest.
- These areas have site quality II & III. Site Quality IV rarely occurs.
- The crop is matured to too old and huge trees are also occurring with crop density varying from 0.5 to 0.8.
- Total Area included in this Working Circle is 8113.081 ha. The distributions of areas allotted to this Working Circle into various ranges are as under.

S.N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	3668.007	10630.587	45	10.71
2	Konsari	1836.555	7336.556	23	5.36
3	Elgoor	2366.319	9278.061	29	6.91
4	Tondel	242.200	7014.228	3	0.71
	Total	8113.081	34259.432		

❑ Special Objects of Management

- To enhance productivity of the area by converting less valuable forest into valuable Teak stand by following improved technology.
- To convert existing uneven aged forest to even aged Teak forest.
- To provide employment to the local people in remote areas.

Method of Treatment

- The Silvicultural system of “Conversion to uniform system with supplemental artificial regeneration of genetically superior Stock” as suggested by Government of India shall be adopted.
- The broad prescriptions for over wood removal for raising Teak plantation which are as under in consonance with the guidelines of Government of India shall be followed.
- All young to middle aged fruit bearing Trees up to 20 Trees per ha will be retained.

- Young to middle aged trees of Semal, Khair, Rosewood and other superior miscellaneous species having medicinal values up to 20 trees per ha uniformly spread over the areas will be retained.
- No felling will be done on either side of Nallas, Streams, and River banks up to a distance of 20 meters.
- The section size at a place should not exceed 20 ha.
- 20 meter wide strip of natural forest will be retained around a section called section line.
- Effective measures will be adopted to protect the plantation from fires for all times to come.
- Improved Planting stock will be used in order to increase the productivity of the area.

Demarcation of Coupe :- The Coupe will be demarcated by cutting and cleaning bushy under growth in a 3 meter wide strip and by erecting pillars at suitable intervals. Selected trees at suitable interval standing on the periphery of coupe will be given two coal-tar bands and a Geru band in between.

Preparation of Grids :-

By laying out a base line, the coupe area will be divided into grids of size 100m x 100m (1 ha.) In each grid, height of dominant tree will be measured to decide site quality and those trees will be given one lime band at breast height. The grid wise information will be recorded in the grid register.

Unworkable Area :- Following type of area will be excluded from working.

- | | |
|----------------------------|--|
| 1) Area of site quality IV | 2) Water logged area |
| 3) Rocky area | 4) Eroded area |
| 5) Steep slopes | 6) Areas having crop girth less than CCG |

Enumeration :-

In workable area 100% trees above 15 cm girth will be enumerated. Enumeration data excluding advance growth will be put in the given proforma to decide fit/ unfit areas for working based on crop girth and given critical crop girth.

Basal Area: - Basal Area in each grid will be measured by using wedge prism of suitable BAF (Basal Area Factor) or computed by summing up the cross sectional area of the individual trees based on over bark girth measurements.

Crop Girth: - Crop girth for each grid will be calculated by using formula given below.

$$\text{Crop girth} = 2 \times \text{square root of } (\pi \times B/N)$$

$$\text{Crop girth in cm} = 250 \times \text{square root of } (B/N)$$

Where B = Basal Area, N = Number of trees in each grid (1 ha.)

If crop girth is above critical crop girth, then the area will be treated as suitable for over wood removal.

❑ Method of Planting

After removal of over wood, the unwanted growth will be cut and burned. The area will be planted by improved planting stock of Teak. Planting will be done either by Teak stump or Teak root trainer seedlings at the spacing of 2 x 2 m. Teak stumps will be planted in crowbar holes while Root trainer Teak seedlings will be planted in pits of size 30 cm x 30 cm x 30cm.

Three weedings with two soil workings in first year, two weedings with one soil working in second year and one weeding in third year will be carried out. Casualty replacement in first year and 2nd year will be carried out by stumps / root trainer seedlings.

❑ Subsidiary Silvicultural Operations

- Cleaning operations will be carried out during 4th and 7th year as per the standard instructions.

❑ Other Regulations

- ✓ Fire protection measures will be carried out in plantations.
- ✓ The area planted will be closed for grazing for 5 years period.

14. Improvement Working Circle

❑ General Constitution:-

- Area of linear strips retained as natural surround of earlier plantation and un- worked areas not suitable for teak plantation but which needs proper tending. Density varying from 0.4 to 0.6 and crop is mainly of miscellaneous species.

- Partially successful areas tackled after 1987, as under planting of Teak, without removal of over wood and where growth of the established Teak plants will be encouraged by removing over wood tree cover and areas planted by teak after 1975 but due to poor growth and survival are not suitable to be included under Teak Plantation Management Working Circle.

- Area of linear strip near Nalla boundary that need proper tending. Crop is mainly of miscellaneous species.

- Naturally growing areas which are not suitable for teak.

Total area allotted to this Working Circle is 7497.437 ha.

S.N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	2787.959	10630.587	37	8.14
2	Konsari	1932.044	7336.556	26	5.64
3	Elgoor	1535.030	9278.061	20	4.48
4	Tondel	1242.404	7014.228	17	3.63
	Total	7497.437	34259.432		

General Characters of the Vegetation.

Area allocated to this Working Circle are mainly linear strips surrounding Teak plantation having density between 0.4 to 0.6 with all India site Quality varying from II, II/III, & III/IV and partly under stocked. Most of the areas consist of miscellaneous crop with density above 0.4. Predominant species are, Teak, Bija, Ain, Haldu, Dhawada, Kullu, Mowai, Shisham, Khair, Arjun, Garadi, Bherra, (Lendia) etc. along with sparse Teak

In successful and partial successful Teak plantations, along with Teak, Ain, Dhaora, Arjun, Bherra, Garadi, Surya, Sehana, Mowai species also exist as secondary growth. The density of the crop varies between 0.4 to 0.6 and all India site quality varies from III to IV.

Crop is near to maturity and the regeneration of principal species is adequate but is suppressed due to mature top tree canopy. The forests allotted to this Working Circle are in a degraded stage and require improvement.

Object of Management

- To improve the forest in terms of composition and density.
- To promote natural regeneration of various species.
- To maintain biodiversity.
- To remove dead, dying and diseased trees with a view to facilitate establishment of natural regeneration of important species.
- To raise plantation of Bamboo, Misc. trees including teak wherever necessary.

Method of Treatment

- **Type A Area :-** Protection Areas No marking will be done in such areas. However seed sowing of Neem, Maharukh etc. will be carried out.
- **Type B Area :-** Under stocked areas.
 - i) Removal of dead, dying, diseased and crooked trees.
 - ii) All high live stumps shall be cut back.
 - iii) Enrichment of sizable gap with plantation of Teak, Khair, fast growing species like subabul, and other medicinal plant species etc. or any other suitable species feasible. The plantation of *Bamboosa balcooa* shall be taken where irrigation facility is available.
- **Type C Area :-**
 - i) The advance growth upto the extent of 0.50 ha. and above will be demarcated and thinning will be carried out to a spacing of one third of the top height of healthy poles, intended to be retained.
 - ii) Removal of dead, dying, deceased and crooked trees.
- All high live stumps shall be cut back.
- Subsidiary cultural operations such as cut back operation, cleaning etc.

➤ **Type D Area**

These are well stocked areas with miscellaneous species. Where valuable misc. trees occur. 50% of the trees with girth more than harvestable girth prescribed in Management Plan will be marked for felling.

Method of Executing Felling/Working

- i) **Demarcation of coupes & preparation of treatment map:** - Demarcation will be carried out one year in advance and site wise species treatment map will be prepared.
- ii) **Marking Technique:** - Marking will be done as per the standard demarcation and marking rules indicated in chapter XIII of miscellaneous regulations.
- iii) **Felling:** - Felling of all dead dying, deceased and crooked trees will be carried out. The care will be taken that no permanent gaps are created.

Subsidiary Silvicultural Operations

These operations will be carried out in the year following the main felling.

- i) All climbers except having the medicinal value will be cut. Inferior growth interfering with regeneration of Teak or other important miscellaneous species will be cut back.
- ii) All left over high stumps marked for felling will be felled.
- iii) The worked area will be closed for grazing for five years period where plantations are taken up.
- iv) Soil and moisture conservation works will be carried out as per site requirement soil breaking works should not be done on slopes above 25°.
- v) Effective fire protection measure will be adopted in areas where plantations are done.

15. Planting Stock Improvement Working Circle

General Constitution –

- This Working Circle includes Seed Stands, Seed Production Areas of Teak and Teak Stumps and Root Trainer Nursery at Elgoor.

➤ **Seed Stand: (SS)**

The seed stand is a crop of vigorously growing, middle aged trees of good quality. It is the crop from seed origin & not from coppice origin. Markhanda FPD has a total area of 862.742 ha. Seed Stand located at 20 sites.

➤ **Seed Production Area: (SPA)**

Seed stands are gradually converted into SPA by removing inferior trees and retaining best superior trees. 150 to 200 seed bearers per ha. are generally retained in fully converted SPA. Seed stand is converted into SPA in 2 to 3 stages of roughing (Culling/thinning). Markhanda FPD has a total area of 74.00 ha. SPAs located at 7 sites.

➤ **Teak Nursery:**

This Working Circle includes Teak Nursery at Elgoor established on 29.100 ha of area of Comp. No. 177(P) where Teak Stumps and Teak Root Trainer plants are prepared from

genetically superior certified seed received from Seed Unit, Nagpur. Teak Stumps and Teak Root Trainer plants are used for meeting internal and external demands.

Rangewise Distribution of Area in Planting Stock Improvement Working Circle

Sr. No.	Name of the Range	Area in ha	% Area to the W.C.
1	Markhanda	585.308	60.60
2	Konsari	254.89	26.39
3	Elgoor	114.644	11.87
4	Tondel	11	1.14
	Total	965.842	

General Characters of the Vegetation

The selection of seed area has been done as per the technical guidance of the experts. The SS & SPA are selected from phenotypically superior old plantations / natural forests in order to collect the superior quality seeds. Orchards are the clonal progenies of plus trees. Seeds obtained from orchard are supposed to be genetically 180 superior as compared to SS & SPA. The crop in this Working Circle is predominantly of Teak.

Special Objects of Management

The primary object of management of this area is to supply quality seeds for the plantation activities in the forestry sector. The main objective of teak improvement programme is to produce seed for superior timber quality, fast growth & higher disease resistance by selection and breeding technology.

Method of Treatment

- Demarcation of areas of seed stands including Pollen diluting zone. (In SS and SPA)
- Fixing of sign Board at the site. (In SS, SPA).
- Cleaning - Cutting of unwanted coppice, bushes, climbers etc and removal of the same before harvesting of seed. (In SS, SPA).
- Affixing numbered, triangular metal labels to seed bearers, once in 5 years, if required. (In SS, SPA).
- Application of Bordeaux mixture to seed bearers.
- Green manuring, sowing of sun-hemp seed in three rows on mounds of C.C.T., once in five years in SPA .
- Fire protection works, cutting and burning of fire lines. (in SS,SPA).
- Thinning of seed area every five years as per thinning schedule prescribed for this Working Circle and as per prescriptions of Teak Plantation Management Working Circle of this Management Plan. This will be done in consultation with seed unit Nagpur.
- Dead, dying, diseased trees to be removed.
- All miscellaneous species, Inferior seed bearers, Inferior clones as inferred from progeny trials.
- Marking for thinning and felling shall be done in consultation with Nagpur Seed Unit.

Collection of Seed

Seed collection is carried out after ripening & seed fall. Generally the seed fall is in the period January - June. The seed is collected only from the selected plots & record of its source is to be maintained throughout. In orchard area, seed is to be collected clone-wise. The collected seed will be transported to seed godown at Nagpur seed unit, where it is to be treated by technical staff. During treatment mesocarp is removed, seed is graded, tested, certified & then packed in bags as per the standard practice in force from time to time. The certified seed is stored in seed storage godown till its disposal.

16. Protection Working Circle

General Constitution of the Working Circle.

General Constitution

- Unworkable areas on account of reasons such as steep slopes, rocky and refractory sites.
- Nalla banks, river banks & encroachments etc are included in this Working Circle.
- The areas on the banks of Nalla and river etc are all moist type having site quality varying from I, II to III with density varying from 0.6 to 0.8 with a good growth of Teak, Ain, Bija, Kalam, Haldu, Arjun, Khair, Garari etc. can be seen. These areas need protection and hygienic cleaning.
- Stunted growth of Bhirra, Rohan, Arjun, Garari, Khair, Lendia and shrub
- This Working Circle includes mostly the areas of refractory sites, scattered and dwarf tree growth or blanks, areas of inferior site quality unfit to sustain good tree growth which need protection from further deterioration of the site.
- The total area of this Working Circle is 2327.313 ha

The distribution of the areas of this working circle into various Ranges are as under.

S.N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	641.248	10630.569	28	1.87
2	Konsari	749.584	7336.556	32	2.19
3	Elgoor	865.462	9278.079	37	2.53
4	Tondel	71.019	7014.228	3	0.21
	Total	2327.313	34259.432		

General Characters of the Vegetation

The forest areas allocated to this Working Circle are rocky and refractory type. It consists of degraded blanks of rocky patches as well as under stocked areas with low density and having stunted growth of Bhirra, Rohan, Arjun, Garari, Khair, Lendia and shrub by growth. Area needs soil and moisture conservation works supplemented by direct seed sowing. The forests of this Working Circle are mostly of site quality IV-b and composed of species like Khair, Rohan scattered over the area. Tree growth is stunted and badly formed. The areas are mostly under-stocked with overall density below 0.4.

The forest areas on the banks of Nalla and river etc are all moist type having site quality varying from I, II to III with density varying from 0.6 to 0.8 with a good growth of Teak, Ain, Bija, Kalam, Haldu, Arjun, Khair, Garari etc. can be seen. These areas need protection and hygienic cleaning.

Special Objects of Management

- To protect the available crop from any further deterioration.
- To reclaim this area by adequate soil and moisture conservation works along with seed sowing.
- To protect vegetative cover along the Nalla and river banks and to minimize further erosion and to keep forest belt intact around water bodies.

Method of Treatment

- Soil and moisture conservation works, i.e. C.C.T., Nalla bunding as per requirement of site will be taken up with the approval of competent authority.
- Seeds of Neem, Khair and Maharukh will be sown on mound of trenches.
- This area allocated to this Working Circle is divided into ten coupes and a schedule of working has been prepared
- Soil and moisture conservation work will be carried out as per requirement.
- Effective fire protection measures will be adopted in plantation.
- The worked area will be closed for grazing for a period of five years.
- Regular maintenance of boundary line pillars is to be done to check encroachment.

Subsidiary Silvicultural Operation

Following operations will be carried out as per requirement.

- (i) All tending operations in plantations taken up for reclaiming encroachment areas.
- (ii) Soil and moisture conservation work will be carried out as per requirement.
- (iii) Effective fire protection measures will be adopted in plantation.
- (iv) The worked area will be closed for grazing for a period of five years.
- (v) Regular maintenance of boundary line pillars is to be done to check encroachment.

17. Encroachment Area Management Working Circle

General Constitution

- This Working Circle comprises of all the encroachment areas of the Markhanda Forest Project Division.

- There was no encroachment in the forest areas of Markhanda Forest project Division which were with FDCM from the beginning.
- There is an encroachment on the area which was recently handed over to FDCM. This area is scattered over three compartments. The entire encroachment areas are under cultivation.
- The areas under encroachments are devoid of any tree growth. The reported area of this encroachment is 229.264 ha.
- Total area of this Working Circle is 229.264 ha.

S.N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	47.856	10630.569	21	0.14
2	Konsari	0	7336.556	0	0.00
3	Elgoor	78.100	9278.079	34	0.23
4	Tondel	103.308	7014.228	45	0.30
	Total	229.264	34259.432		

Special Objectives of the Management

- The forest areas under encroachments are the best cultivable area of the compartments. The areas were put to cultivation and raising of crops of mainly rice. Since the soil depth is good.
- These areas are either to be restored or after proceedings under Forest Right Act 2006 be evicted and rehabilitated.
- ✓ To survey and demarcate the area which has been approved by the competent authority as eligible for regularization, and hand over the same to eligible encroachers;
- ✓ To identify and pursue the pending cases of under Forest Right Act, 2006, for handing over of area to them after survey and demarcation;
- ✓ To evict the ineligible encroachments and demarcate the area permanently on ground;
- ✓ To rehabilitate the area by afforestation and soil moisture conservation works;
- ✓ To protect the area from encroachment and all biotic pressures with the help of local villagers.

Method of Treatment

(A) Encroachment Regularization

- Reconciliation of Records

(B) Encroachment Eviction Phase

- Eviction Procedure
- Afforestation Phase

Miscellaneous Regulations

- ✓ Protection from Fresh Encroachment
- ✓ Closure to Grazing
- ✓ Fire Protection
- ✓ Boundary Maintenance

18. Miscellaneous Working Circle

General Constitution

- The areas which could not be covered in any Working Circles, since the areas are diverted to other activities such as (a) Water bodies (b) Roads (c) Buildings (d) Depot are included in miscellaneous Working Circle.
- This Working Circle also includes areas of In-situ conservation and Ex-situ cultivation of medicinal plants.
- This working circle includes failure plantations of Misc. species raised in the area of forest department recently handed over to FDCM.
- The total area under this Working Circle is 1047.581 ha.

Distributions of the area of this working circle into various Ranges are as under.

S. N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	569.476	10630.587	54	1.66
2	Konsari	178.523	7336.556	17	0.52
3	Elgoor	220.592	9278.061	21	0.64
4	Tondel	78.990	7014.228	8	0.23
	Total	1047.581	34259.432		

Special Objects of Management

- To maintain existing buildings, roads, sale and Jungle depots.
- The existing depots are maintained and will be expanded as per requirement and demand.
- Roads will be maintained for extraction of forest produce as well as for Intensive patrolling of forest areas for effective protection.
- Culverts and small bridges will be maintained for effective communication.

19. Bamboo Overlapping Working Circle

General Constitution –

- This working circle includes all the areas where bamboo, natural or planted, and silviculturally mature is available for working.
- All natural Bamboo bearing area which are capable of giving marketable bamboo are included in this working circle.
- Dendrocalamus strictus is the species of Bamboo

The distribution of these areas into various Ranges are as under.

S. N.	Name of the Range	Area of the W.C. in ha	Area of the Range	% of the area of the Range	% of the area of the Division
1	Markhanda	50.440	10630.587	1	0.15
2	Konsari	75.000	7336.556	1	0.22
3	Elgoor	1415.000	9278.061	23	4.13
4	Tondel	4712.390	7014.228	75	13.76
	Total	6252.830	34259.432		

General Characters of the Vegetation

- *Dendrocalamus strictus* is the species of Bamboo occurring in the tract.
- Bamboo forms an under-storey in better quality areas.
- Variation in quality, growth of Bamboo and frequency of its occurrence are on account of variation in soil and drainage. Bamboo clumps in these areas are well established and well formed.
- These are capable of giving marketable bamboo if worked in a systematic manner.
- Bamboo mostly occupies hill slopes and is dense particularly along nalas and moist sheltered slopes.

Objectives

- To enhance the productivity of bamboo
- To sustainably harvest bamboo area following established silviculture rule.
- To meet the local market demand by regular harvesting of bamboos.

Cutting Cycle

- Cutting cycle of bamboo is a 3 year felling series divided in three coupes VIZ A, B, C
One coupe will be worked annually.

Bamboo Cutting Rules

- No harvesting works should be permitted between 15th June to 30th September
- No Culm below the age of two years will be cut.
- All dead, decayed and dry bamboo shall be removed.
- Cutting height of Culm will be between 15 cm to 45 cm.
- Digging of rhizomes will be strictly prohibited.
- Use of tender bamboo Culm for bundling will be strictly prohibited.
- Cutting will start from the center of the clump towards the periphery.

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Land Preparation

The land should be ploughed as thoroughly and deeply as possible. Clearing and ploughed should be done at least three weeks ahead of the planting. Addition of organic materials to pits such as compost, green manures and neutralized saw dust helps retain moisture and also provide nutrition to the plants. Provide better drainage system. Bamboo likes water and requires similarly to sugarcane cultivation to do its best, but it does not like to be submerged in water in water or "wet feet" condition.

Pits

Pit sites should be identified before digging the pits, to ensure the desired spacing. Dig the pit 2 x 2 x 2 feet size or make continuous trench at 2 feet depth along the row. Pits should be dug much before the rainy season and the dugout pit exposed to weathering. A few days before planting fill the pit with thoroughly mixed soil and compost.

Planting

In the pit, mix the soil with 2 baskets (20 to 25 Kg) of FYM and 500gms of Neem-cake. If the place is prone to termite, increase the Neem cake to 1 kg as basal application. Carefully cut open the Poly bag having the bamboo plants using sharp blade, to ensure the root ball not disturbed. Place the plant vertically in the pit, ensuring that entire Poly bag soil is placed along with plants. Level the pit or trench with the mixed and enriched soil, be sure to eliminate all air pockets. Mulch the soil around the plants, it will help control weeds and keep the soil moist.

Subsidiary Silvicultural Operation

Climbers interfering with the growth of Bamboo clumps should be cut.

20. Wild Life Management (Overlapping) Working Circle

Comprises of entire forest area covered in this Management plan.

Total area is 34259.432 ha.

Wild Life Found In The Area-

- ✓ **Carnivore** - Panther, Hyena, Wild dog, Wolf, Jackal, Fox and Jungle cat.
- ✓ **Herbivore**- Bison, Sambar, Cheetal, Nilgai, Barking deer, Wild boar, Sloth bear, Black buck, four horned antelope and Chinkara.
- ✓ **Rodents**- Indian giant squirrel, three stripped palm squirrel, Porcupine and Hare.
- ✓ **Birds**- Painted sand grouse, Common sand grouse, peafowl, Grey jungle fowl, Painted partridge, Grey partridge, Jungle bush quall, Black breasted quail, Indian bustard quail, Indian button quail, Red spur fowl, Crane, spotted bill duck, Pigeon, Dove, Cotton teal and Whistling teal.

Legal Position-

- Indian Forest Act 1927
- The wildlife Protection Act 1972.

Special Object Of Management-

- To conserve the wild life found in the areas and also to improve their habitat.
- To manage, protect and multiply the wild life by providing protection and shelter to them.
- To conserve the biodiversity of the area.
- To bring awareness among the people about wild life prevailing in the area.
- To reduce man animal conflict situations.
- To train the staff and to strengthen the infrastructure to handle wild life emergencies.
- For monitoring wildlife advance technology like Trap Camera suggested.

Method Of Treatment-

- Marking of 2 dead trees / 1 ha. in any felling coupes will be done and reserved.
- Existing water holes will be maintained & new water holes will be created.
- A vigilant watch will be kept on poachers
- Estimation of the wildlife population will be carried out.

General Habitat Management-

- A) **Existing Waterholes (Natural & Artificial)-** Proposed in New Management Plan for Deepening and De-silting every year
- B) **New creation of waterholes-** Hand pump with saucer shaped tank as proposed in different compartments.
- C) **Crop Composition- Grassy land / Meadows-** Open Patches in compartment will be maintained for development of meadows/ Grassy land

Man-Animal Conflict -

While increasing man-animal conflict is an outcome of shrinkage fragmentation and deterioration of habitats, it has caused destruction of wildlife and generated animosity against wild animals and protected areas. This is a management issue, which needs to be addressed through innovative approaches.

Miscellaneous Regulation-

- **Grazing:** The cattle grazing should be strictly prohibited of the selected sites.
- **Compensation:** Some cattle kill incidences are noticed in this division in the past. Compensation should be paid immediately whenever such incidences occur as per Government Resolutions

21. Non-Wood Forest Produce (Overlapping) Working Circle

- This is an over lapping working circle.
- Total area is 34259.432 ha.
- Non-Timber Forest produces (NTFP) include all forest produce other than timber and firewood of both plant and animal origin, occurring naturally or sometimes as augmentation in forests.
- As compared to animal products like honey and wax, plant products natural and man-made are much diversified depending upon the availability of forest types
- Species grown in man-made forests and also the extent of forest in a given area or region.

- NTFP is an output from the forest without disturbing the eco-system.
- Reduction in revenue from timber could be compensated.

Special Objects of Management

- To manage the Non-wood Forest Produce on a sustainable basis.
- To integrate the developmental activities for the welfare of local people to improve their standard of living
- To develop and adopt a package of scientific practices for sustainable extraction and usage of medicinal plants.
- To ensure holistic development and welfare of local people of the region

Non Wood Forest Produce of the Area-

1. Moha flowers.	10. Behada
2. Gum	11. Hirda
3. Myrabolons and Dikamali	12. Achar
4. Honey	13. Amaltas
5. Biba	14. Awala
6. Bel	15. Murud sheng
7. Broom Grass	16. Salai
8. Sabai Grass	17. Siras black
9. Bija	18. Siras white

Method Of Treatment-

- All climber except medicinal valuable species interfering with trees and advance growth would be cut.
- Mature and fruit bearing trees should be freed from over head and lateral shade.
- These species will be planted in regular plantation programme as well as gap filling operations.
- Wherever possible plantation of these species be done to the extent of 5 %.

Miscellaneous Regulation-

- Area will be protected from fire rigidly.
- Plantation area will be closed for grazing for the period of 10 years.
- The existing system of harvesting NTFP is not scientific but destructive at same times.
- Need to provide training to staff and villagers engaged in the harvesting.

22. Soil and Water Resources Management (Overlapping) Working Circle.

General Constitution-

- This is an overlapping working circle covering the entire area of the division.
- Total area is 34259.432 ha.
- This tract represents large number of water tanks available in the division.

Special Objects Of Management-

- To improve the water regime.
- To reduce the soil erosion.

Soil and Moisture Conservation Works-

- It will include two main operations namely, contour trenching and Nalla bunding/ Check dams.
- The soil conservation works like Nalla bunding, gully plugging, Check dam, deep CCT, Brushwood dams, Cement Bandhare etc. should be taken as per requirement of soil erosion in the forest areas.
- soil breaking works should not be done on slopes above 25⁰.

Area of Working

Measures for control of soil erosion are required to be taken in the area where soil erosion is severe, subject to availability of funds.

Factors Affecting Soil Erosion

- ✓ Rainfall
- ✓ Topography
- ✓ Soil surface cover
- ✓ Biological factors

Impact (Negative) of Soil Erosion

- ✓ Loss in productivity
- ✓ Increase of surface runoff and decrease in infiltration
- ✓ Reduction in water holding capacity
- ✓ Loss of nutrients
- ✓ Reduced transport and storage capacity

- ✓ Reduction in water supply
- ✓ Impact on wild life

Method of Treatment

➤ **Preventive measures**

- ✓ Steep slopes and the areas besides river, nallas and natural water sources should have permanent green cover and no felling should be done in such places.
- ✓ Eroded areas should be treated on priority to prevent channel and gully formation to widen and to spread in adjoining areas.
- ✓ Grazing should be controlled in such areas & they must be protected from repeated fire.

➤ **Remedial measures**

- ✓ Planting of grasses for stabilizing bunds :

Grasses prevent soil erosion and improves soil structure. The entire soil mass is penetrated by countless roots and soil aggregate and particles are enmeshed by root system. Grasses should be grown on bunds for checking erosion and providing pasture to wild animals.

- ✓ Loose stone check dams
- ✓ Brushwood check denies
- ✓ Gabian structure division channels
- ✓ Spurs are constructed as per suitability of the area.

23. Miscellaneous Regulations

- Demarcation Of Coupes
 - ✓ Demarcation
 - ✓ Coupes
 - ✓ Selection
 - ✓ Unworkable Area
- Demarcation of Plantation Segments / Section
- Preparation of Treatment MAP
- Marking of Tree
- Harvesting
- Irregular harvesting
- Soil and Water Conservation Measures
- Nursery Technique (Root Trainer, Polytube ,Compost
- Maintenance of Boundaries
- Fire Protection
- Protection Plan
- Survey of MAPS
- Control and Records
- Divisional Note Book/ Journal
- Establishment and Labor
- Labor Supply

CONSTRAINTS FACED DURING WRITING OF THE PLAN

No specialized surveyor was available in the Division. But training provided by FSI to the field staff solved the problem.