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REPORT

ON

INVENTORY OF FOREST RESOURCES

OF

WARDHA DISTRICT

OF

MAHARASHTRA STATE

FOREST SURVEY OF INDIA
CENTRAL ZONE
NAGPUR
1997

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Conter

PREFACE

Forest Survey of India, Central Zone, Nagpur undertook the project of Inventory of Forest Resources of Wardha district during the year 1993 to have the qualitative and quantitative assessment of forest resources of the district. The report gives details regarding area inventoried, methodology, data processing and findings with regard to the forest resources of the district.

Findings of the survey reveal that the Wardha district contains 575.63 km^2 of moderately dense forest with crown density 30-70%, 106.9 km^2 of open forest and 49.34 km^2 scrub forests. The total number of stems is 18.87 million with an average of 263.79 stems per ha. Total standing volume is the tune of 2.15 million cubic metre with an average of 30 cubic metre per ha. Main species contributing the growing stock are Tectona grandis, Chloroxylon swietenia, Anogeissus latifolia, Terminalia crenulata, Butea monosperma, Lagerstroemia parviflora and Acacia catechu. 46% of the growing stock is comprised of pole crop, big timber is absent in the forest. Regeneration is inadequate in majority of the forest area. The report gives the comprehensive account of state of forest of the district.

The field work was carried out by the field parties led by S/Shri S.K.Bajpai, J.S.Kumbhkar, R.P.Sao, all Junior Technical Assistants and N.P.Singh, Dy.Ranger under the direct supervision of S/Shri M.D.Singh and B.R.Pandey, Senior Technical Assistants. The above work was carried out in overall direction and supervision of Shri S.B.Elkunchwar,IFS, Deputy Director and Shri P.V.Savant,IFS, Joint Director. The data processing was done by S/Shri K.S.Gaharwar, Asstt.Director, H.K.Tripathi,JSA, Bhajan Singh, DEO(C), R.K.Napit,DEO(A) and Balbir Singh Bist, DEO(A) of Forest Survey of India, Dehradun under the supervision of Shri S.K.Chakravarty, Deputy Director. The report has been prepared by Shri Devendra Kumar,IFS, Joint Director. Maps and diagrams of the report have been prepared by Shri D.S.Gulkari and Shri C.B.Murty, Draftsman. The report has been typed by Smt.Gressamma Varghese,Steno.

The report is the outcome of hard work done by the field staff of the Forest Survey of India, Central Zone, Nagpur.

We thankfully acknowledge the cooperation extended by the Officers and staff of Maharashtra Forest Department, which was extremely helpful in timely completion of the field work.

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It is hoped that this report will be useful for Foresters and State Planners in planning developmental activities in the district. It will also be helpful in serving the purpose of forest conservation.

Director
Forest Survey of India
Dehradun 248 195.

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FOREST SURVEY OF INDIA
CENTRAL ZONE, NAGPUR

ACKNOWLEDGEMENT

This organisation expresses its gratitude and sincere thanks to Conservator of Forests, Nagpur, Deputy Conservator of Forests, Wardha and their field staff who provided their valuable co-operation to the field parties of our organisation during the survey work without which it was not possible for them to complete the survey work in stipulated time.

Devendra Kumar
Joint Director

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SUMMARY

Inventory of Forest Resources of Wardha district of Maharashtra was carried out by Forest Survey of India, Central Zone, Nagpur in the year 1993. The field work was carried out during the months between October to November, 1993. The salient features of the survey can be summarized as under:

(I) The dense forest is absent in the district. The district contains 575.63 km^2 of moderately dense forest with a crown density of 30% to 70%, 106.9 km^2 open forest and 49.34 km^2 scrub forests.

(ii) The forests of the district can be classified into two strata viz; Teak and Miscellaneous. Teak forest which contains percentage of teak as 57.74% occupies the area of 559.184 km^2 whereas Miscellaneous forest is contained in 156.243 km^2 of area.

(iii) 50.6% of the vegetation exists in hilly terrain predominantly on lower slope of less than 10%.

(iv) 44% of Teak forests and 42% of Miscellaneous forests are in form of Pole crop which contributes 46% of the growing stock of the forests.

(v) Big timber class is absent in the forest of Wardha district.

(vi) Regeneration is inadequate in 60% of the forest area.

(vii) There is a considerable biotic pressure on the forests. 34% of the forests are subjected to injury due to girdling and illicit felling and fire incidence was noticed in 38% of the forest area. About 70% of the forest area is subjected to grazing of different intensities out of which 20.39% of the area is heavily grazed.

(viii) The district has a plantation potential of 164 km^2 which forms 19.42% of the forest area.

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(ix) Total number of stems in the forest of the district is about 18.87 million with an average of 263.79 stems per ha.

(x) Total standing volume of forest area is about 2.15 million cubic metre with an average of 30 cubic metre per hectare. The important species whose contribution to growing stock is significant are Tectona grandis(52.71%), Cloroxylon swietenia (8.82%), Anogeissus latifolia (8.54%), Terminalia crenulata (4.95%), Butea monosperma (4.20%), Lagerstroemia parviflora (2.34%) and Acacia catechu (1.67%).

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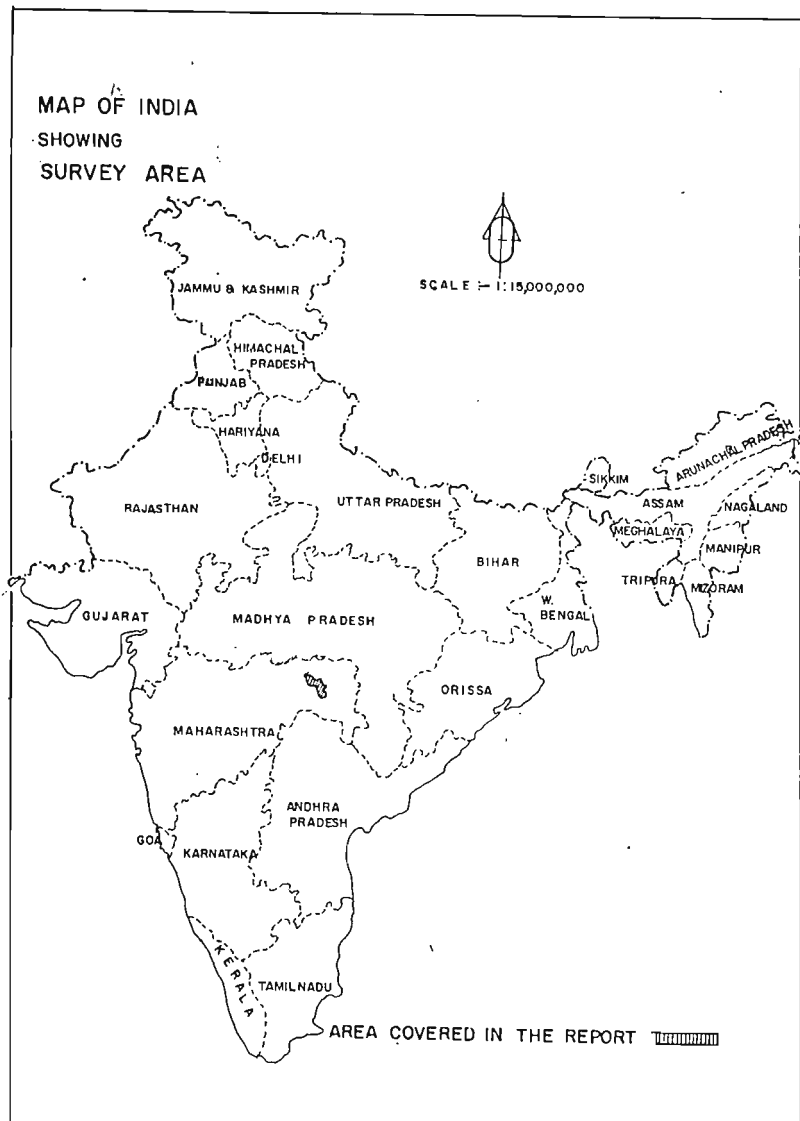
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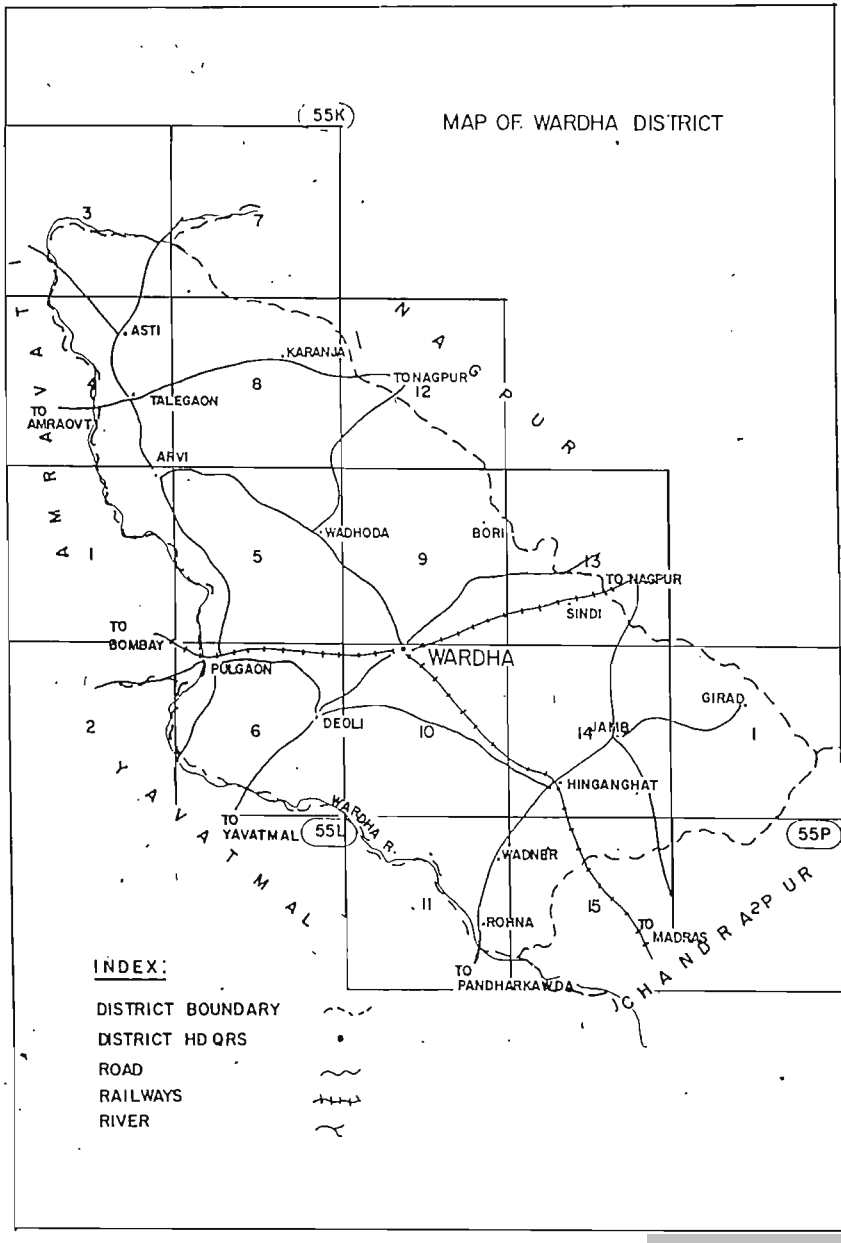
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CHAPTER 1

BACKGROUND INFORMATION

1.0 In order to collect qualitative and quantitative data pertaining to various forestry parameters from the forest areas of Wardha district so that these data could be useful in district and State level planning, the project of forest inventory was undertaken in Wardha district of Maharashtra State by the Forest Survey of India, Central Zone, Nagpur in the year 1993. Under this proejct data pertaining to soil and tree cover such as soil depth, crop composition, tree height, intensity of regeneration etc were collected and analysed. The total growing stock both in terms of stand and standing volumes were assessed. The field work was started in October, 1993 and was completed in November, 1993.

1.1 LOCATION OF THE AREA

The survey area consists of entire forest area of the Wardha district which have been depicted as Green wash area in Survey of India toposheets. The wardha district lies towards eastern side of Maharashtra between 20^{o} 18' and 21^{o} 21' north latitude and 78^{o} 05' and 79^{o} 15' east longitude. It is bounded in the west and north by Amravati district, in the east by Nagpur district, south east by Chandrapur district and in the south by Yavatmal district.

1.2 TOPOGRAPHY, RELIEF AND DRAINAGE

Offshoot of the Satpuda range is the only system of hills in this district. A spur of the Satpuda range enters the north of the district and covers most of the Arvi Tahsil. The hill ranges and intervening valleys run generally in south-easternly direction. The central cluster of hills forms the watershed on the district.

The slope of the district is from north west to South east.

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The area is drained by Wardha river and its tributaries namely Dham and Wunna rivers carrying water almost throughout the year. The other rivers get dried up in hot months. The Satpuda hill ranges form the catchment areas of Wardha, Dham, Bor and Wunna rivers.

1.3 AREA AND POPULATION

The total geographical area of the district is 6310 km^2 which has been divided into 8 administrative Talukas - Wardha, Seloo, Deoli, Arvi, Karanja, Ashti, Hinganghat and Samudrapur. As per 1991 Census the total population of the district is 1067357 out of which 73.44% is rural. The population density is 169 with literacy rate at 59.44%. Out of total population 14.05% are Scheduled Caste and 15.59% are Scheduled Tribe. 42.20% of the population are workers out of which 76% are primary workers engaged in agricultural and allied activities.

1.4 FOREST AREA

Total forest area of the district is 874.70 km^2 which forms 14% of the total geographical areas. Out of it 527.88 km^2 is reserved forests, 319.03 km^2 is Protected Forest and 27.79 km^2 is Unclassed forests. The 847 km^2 forest area comprising of reserved forests and the Protected forests are under the management of Forest Department whereas unclassed forests are in the charge of Revenue Department. The management of forest area in charge of Forest Department is looked after by Deputy Conservator of Forests, Wardha with Head quarter at Wardha.

1.5 CLIMATE AND RAINFALL

The climate of the district is characterised by a hot summer and general dryness throughout the year except during the monsoon. The monsoon sets in the middle of June and continue till the end of October. Winter lasts from November till the end of February followed by summer till the middle of June. The temperature varies between the extremes. Even on the same day the variations are considerable and the scorching heat of the day followed by cold nights is

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remarkable in the summer months. May is the hottest month with maximum temperature 45 ^{o}c and January is the coldest month of the year in which minimum temperature goes down to 9 to 11^{o}c.

The district receives rains from the south-west monsoon and the intensity of rainfall is the greatest in August. The average annual rainfall varies between 900 to 1400 mm.

1.6 LAND USE PATTERN

The land use pattern of the district is as follows:

S.No.	Land use	Area in km^2
	Geographical area	6310.00
i.	Area covered under Forest (as per vill.papers)	700.00
ii.	Area not available for cultivation	320.00
iii.	Barren land	230.00
iv.	Pasture land	480.00
v.	Area under scrub growth	60.00
vi.	Barren land fit for agriculture purpose	260.00
vii.	Area under agricultural crop	4260.00
	Total	6310.00

(Source. Social and Economical survey of Wardha district 1994-95, Directorate of Economics and statistics Maharashtra Govt., Mumbai).

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1.7 SOCIO-ECONOMIC FEATURES

The Wardha district though smallest in the State is agriculturally very productive and its prosperity is mainly based on agricultural income. Agriculture is the main source of livelihood. Jowar and wheat are main staple food. Cotton and sugar cane are the main cash crops. A lot of agro-based industries are located in the district. Apart from the cotton ginning factories in the district there are about five cotton textile mills and number of oil mills.

Various articles which are manufactured in the district are Ayurvedic medicines, textile cloth, handloom sarees, sweet and lin seed oil. The district, however exports ginned cotton, tur, butter, ghee, handloom cloth, hides and skin etc.

Wardha is well known for its long association with Mahatma Gandhi Sevagram village, about 8 km from Wardha town was used as headquarter by Mahatma Gandhi for his social service work. Pavnar ashram which is related to Acharya Vinobhaji Bhave, the Sarvodoya leader is also located in the district about 8 km from Wardha town.

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CHAPTER II

THE FORESTS

2.0 As per the records of the State Forest Department the total forest area of the Wardha district is 874.20 sq.km. which consists of 527.88 km^2 of Reserved Forests, 319.03 km^2 of Protected Forests and 27.79 of Unclassed Forests. The unclassed forests are under the possession of Revenue Department whereas Reserved Forests and Protected Forests are being looked after by Forest Department. The forest area in charge of the Forest Department is managed scientifically and working plans are in operation in these areas. Latest working plan written by Dr. Nandkishore, IFS covers the period from 1992-93 to 2001-2002. The Govt. has already issued order to transfer the unclassed forest in charge of Revenue Department of entire State to Forest Department for scientific management but still these areas are to be transferred to the Forest Department.

2.1 FOREST TYPES

The forests of the district belong to the sub-group 5-A, Southern tropical dry deciduous forests as per the revised classification of forest types of India by Champion and Seth. Within this main type considerable local variations occur depending mainly upon edaphic factors, topography etc. Major sub-types are:

1. Dry teak bearing forest : 5A/C1
2. Southern dry mixed deciduous forest : 5A/C3
3. Dry deciduous scrub : 5/ DSI
4. Boswellia forest : 5/E2
5. Butea forest : 5/E5
6. Dry tropical reverian forest : 5/1SI

Contents

1. Dry teak bearing forest (5A/C1).

These forest are found in Arvi, Ashti, Karanja and Hingni ranges and Bor sanctuary of the area. These are very open forests of very poor quality on stony, infertile and shallow soils with percentage of teak between 40 to 80%. The floristics is as below:

I. Tectona grandis, Anogeissus latifolia, Chloroxylon swietenia, Diospyros melanoxylon, Boswellia serrata, Mitragyna parviflora, Terminalia alata, Sterculia Urens, Dalbergia latifolia, Lannea coromandelica, Madhuca latifolia, Lagerstroemia parviflora.

II. Butea monosperma, Buchanania lanzan, Phyllanthus emblica, Acacia catechu, Ziziphus mauritiana, Casea fistula, Aegle marmelos, Maytenus emargineta, Nyctanthes arbortristis and Gardenia spp.

III. Ziziphus glaberrima, Helicters isora, Wood fordia fructicose, Nyctanthes arbortristis.

IV. Cassia tora, Hyptis suaveolens, Indigofera tinctoria, Hyptis sauveolens, heteropogon controtus, Ergrastis tenalla, Themeda quadrivalvis, Chrysopogon fulbus, Ischaemium pilosum, Iseilema laxum, Dichanthium annulatum.

V Ziziphus oenoplia, Abrus precatorius, Bauhinia vahli, Butea superba, Mismosa, havate.

2. Southern dry mixed deciduous forest (5A/C3).

These forests are found in the Western part of Arvi and Ashti ranges, Bor sanctuary and Girad area and differs from the dry teak forest mainly floristically. Thorny plants occur and tend to increase in proportion with the heavy grazing and fires. The floristics is as below:

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I/II. Chloroxylon swietenia, Terminlia alata, Tectona grandis, Anogeissus latiflia, Boswellia serrata, Lagerstroemia parviflora, Diospyros melanoxylon, Lannea coromandelica, Soymida febrifuga, Ougenia oojenensis, Schrebera swieteniodes, Madhuca longifolia, Dalbergia latifolia, Buchanania lanzan, Aegle marmelos, Mitragyna parviflora.

III. Ziziphus spp., Nyctanthes arbortristis, Helicteres isora, Vitex negundo, Grewia spp, Woodfordia fruticosa, Holarrhena puberscens, Lantana camara.

IV. Cassia tora, Hyptia suaveolens, Themeda quadrivalvis, Dichanthium, annulatumol, Iseilema laxmem, Heteropogon contortes.

V. Butea superba, Bauhimia Vahli.

3. Dry deciduous scrub: 5/DS1

These are found in isolated patches of Protectd Forests on lower broken soil cover and contain shruby growth of 3 to 6 m height including some tree species. The floristics is as under:

I/II Chloroxylon swietenia, Acacia catechu, Butea monosperma, Lannea coromandelica, Boswellia serrata, Ziziphus spp., Gardenia spp.

III. Holarrhera pubescens, Nyctanthes arbortristis.

IV. Cassia tora, Hyptis suaveolens.

4. Boswellia forests: 5/E2

These are the open forests in which Boswellia serrata forms an overwood to stunted trees. Such forests are found in small patches within the mixed forest and are mainly found in Ashti range. The floristics is:

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I. Boswellia serrata, Tectona grandis, Lannea coromandelica, Terminalia alata, Anogeissus latifolia.

II. Acacia catechu, Butea monosperma.

III. Nyctanthea arbortristis.

IV. Cassia tora, Hyptis suaveolens, Themeda quadrivalvia, Heteropogon contortus.

5. Butea forest : 5/E5

These forests are found on flat ground or lower slopes with scattered and stunted and malformed trees. Butea monosperma is almost pure in patches with Diospyros melanoxylon and Acacia leucophloea.

6. Dry tropical reverian forest : 5/IS1

This type consists of irregular overwood of greater height than the dry deciduous forest. The trees are often of larger size and forming patches and strips with varying amount of smaller trees and shruby undergrowth. They are confined to narrow strips along the major nalas in all forest ranges. The floristics is as below:

I. Terminalia arjuna, Terminalia alata, Mitragyna parviflora, Syzygium cumini, Ficus racemosa.

II. Pongania pinnata, Diospyros melanoxylon Butea monosperma.

III. Helicteres isora, Ficus hispida, Vitex negundo

IV. Parthenicum hysteropnorus.

2.2 WILD LIFE.

The district is not very rich in wild life. The major tree species in the forest of Wardha district is Teak, therefore, there is not enough food for herbivore to make the area rich in wild life. Most of the wild life is confined to the compact block of forest of Hingni, Karanja, Arvi and Ashti forest ranges and Bore wild life sanctuary.

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Important animals found are Tiger, Panther (Panthera pardus), Hyaena, Wild dog (Cuon alpinus), Leopard cat (Felis bengalensis), Jungle cat (Felischaus), Nilgai (Boselaphus tragocamelus), Sambhar (Cervus unicolo), Cheetal(Axis axis), Barking deer (Muntiaces muntjak), Wild boar(Suscristalas), Sloath bear (Melursees ursinus), Four horned antelope (Tetraceros quadricornis) and Langur (Presbytis entellus).

Among birds Sand grouse, quails, Patridges, Pea fowl, Jungle fowl, Pigeon and dove are common.

2.3 FOREST PRODUCE

The main forest produce of the district are Timber, firewood, bamboo, grasses, Tendu leaves, Mohuwa flowers, Charoli, honey, wax etc. Teak is the most valuable timber of the district. Timber is used for construction of houses, furniture and other articles. Other tree species used for this purpose are Ain, (Terminlia crenulata), Dhaora (Anogeissus latifolia), Lendia(Lagerstroemia parviflora), Kalam (Mitragyna parviflora), Dhaman (Grewia tiliaefolia) and bamboos.

There are good number of furniture shops in rural and urban areas which use timber from the forest area. There are 75 saw mills located in Wardha district which depend on the supply of timber from the forest as well as non-forest areas.

The burads make baskets, mats, dholis etc from bamboos and sell them locally.

Tendu leaves are used for preparing bidis. This industry is carried on in a small scale in the district.

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The poor class of villagers collect Mohua flowers and fruit , charoli, gum, honey, wax, bark, roots, leaves etc. from forest and sell them locally to supplement their meagre income. Fuel wood and grass is also collected from the forest by these people for local selling.

2.4 FOREST MANAGEMENT PRACTICES

Working plan to manage the forest of Wardha district is in vogue. The latest working plan, written by Dr.Nandkishore,IFS is in operation from the year 1992-93 to 2001-2002 A.D. The forests have been put under the following Working Circles.

1.	Coppice-with-Reserve Working Circle	- 425 sq.km
2.	Improvement Working cirlce	- 211.09 sq.km
3.	Fuel wood, Fodder and Pasture working circle	- 169.57 sq.km
4.	Miscellaneous Working Circle	- 6.39 sq.km.
5.	Wild life and Nature Conservation Working Circle	- 40.33 sq.km.

There are no rights in Reserved Forests except right to way and access to water. There is no commutation of Nistar or paidawar in the Reserved forest. Only concessions of (i) Grazing of cattle belonging to the agriculturists of certain villages in accordance with the grazing rules in force (ii) taking certain quantity of poles and firewood for their bonafide domestic use at concessional rates from worked coups are given.

However, Nistar zones have been created in protected forests of the district.

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CHAPTER - III

METHODOLOGY OF SURVEY

3.0 Methodology used in survey was stratified random sampling. The 2 1/2' x 2 1/2' grids of 1:50,000 Survey of India toposheets were taken as basic sampling units. The survey work was carried out as per manual of inventory prepared by Forest Survey of India, Dehradun and various parameters used and quantified are as defined in that manual.

3.1 AREA CONSIDERED FOR SURVEY:

In order to decide forest areas, the recent Survey of India toposheets, preferably of 1:50,000 scale and in their non-availability, 1" = 1 mile toposheets were used as base map. All those areas which were demarcated by double dotted forest boundaries on these toposheets and were having green wash within or outside such boundaries, were taken as forest areas for undertaking this inventory.

3.2 INVENTORY DESIGN:

A common inventory design for the whole organisation was evolved in consultation with the Central Statistical Organisation (Govt. of India) for undertaking inventory work in various parts of the country. The design envisaged the collection of data in two randomly selected plots each of 0.1 ha area in each grid of 2 1/2'x 2 1/2' (latitudes and longitudes) on the toposheet of 1:50,000 or 1:63,360 scale. A grid bounded by 2 1/2'x2 1/2' latitudes and longitudes covers about 20 km^2 area in which 0.2 ha area (2 plots of 0.1 each) is actually sampled. Thus the sampling intensity of the survey comes to 0.01%. The method of marking the plot centre on the map within grid is as follows :-

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Two sides (X - axis and Y - axis) of a grid were measured in millimeters. The length of the side of the square plot (which comes nearly .6324 mm on 1:50,000 map sheet), was substracted from the above measurements and the balance so obtained were read in three digits after removing the decimal mark. Two random nos (one for x and other for y axis in three digits) were taken from table of random numbers. If the random numbers taken were less than the corresponding number obtained for length of the grid (x, y axis) the same were retained. Further half of the length of the side of plot (0.3 mm) were added in the last digit of the random number and a decimal mark placed before this digit. The figures were further rounded off to nearest millimetre and these becomes coordinate of first plot by taking S-W corner of grid as origin. In case any random number was greater, then the corresponding numbers obtained for x and y axis were substracted from such random numbers and the balance were taken for obtaining coordinates of the plot 1 in the manner explained above. Number one plot of all the grids were marked on the map taking South West corner of respective grid as origin. The distance along x axis was measured towards East and along Y axis it was measured towards north. Thus the centre of plot 1 was marked on the map at the crossing of these two coordinates.

For marking the centre of second plot of each grid, the plot centre of 1st plot and centre of 2 1/2'x2 1/2' grid were joined and the line extended in opposite direction to the same distance beyond grid centre. The point so obtained is the plot centre of the second plot. The location of second plot is thus linked with the first plot. The layout of 2 1/2'x 2 1/2' grid and the plots are shown in diagrams 1, 2, and 3 on the preceding page. All such plots were marked on the toposheets and examined whether they fall in green wash/RF/PF areas. Only those plots were taken for field survey which were falling in forest areas i.e. the area covered by green wash or by double dotted forest boundaries RF/PF etc. on 1:50,000 scale or 1:63,360 scale mapsheets.

Contents

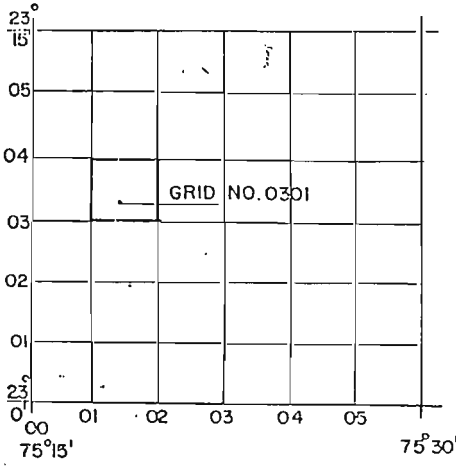
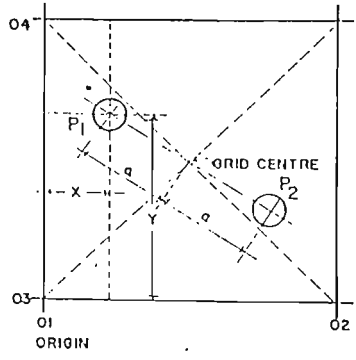


DIAGRAM-1
DIAGRAM SHOWING
IDENTIFICATION OF GRIDS
ON 1:50,000 OR 1:63,360
SCALE TOPOSHEETS

DIAGRAM-2
DIAGRAM SHOWING LAY-OUT
OF PLOT IN 2 1/2'X 2 1/2' GRID

'X' & 'Y' ARE THE DISTANCES ALONG
'X' & 'Y' AXES WITH SW CORNER AS
THE ORIGIN



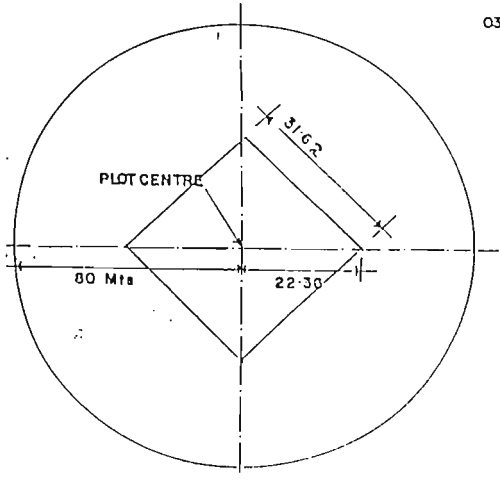


DIAGRAM-3
DIAGRAM SHOWING
LAY-OUT OF PLOT

Contents

3.3 LOCATION OF PLOT ON THE GROUND

As stated earlier, the survey was confined to the forest areas only as decided on the basis of forest boundaries and green wash shown on the toposheets. The plot has to be visited when it falls in some forest area. All the forested plots of the survey area falling in Wardha district of Maharashtra State and duly marked on toposheets, were allotted to various crews. The crews had drawn up their programme of halts at some convenient places in order to tackle maximum plots from those camps. The plots marked on the toposheet had to be exactly located on the ground with the help of some conspicuous features which could be identified on the map as well as on the ground. Usually the following features were selected for this purpose:

1. Bench Mark.
2. Triangulation point.
3. Village or road trijunction.
4. Old bridges and culverts.
5. Old temples, mosques and churches.
6. Crossing of rail tracks with roads, streams, rivers etc.
7. Junctions of rivers or streams and junction of roads.
8. Prominent bends in roads, rivers or streams.
9. Old ponds and wells.
10. Springs.
11. Prominent topographical features in hilly region such as spurs, knolls etc.
12. Mile stones or kilometer stones on the road side.
13. Pillars of international,inter state or inter-district boundaries and those forest areas etc. 14. Prominent bends of boundary etc.

After locating one of the above reference points on the ground as well as on the map, the bearing and distance from reference point to the plot centre were marked. This distance has to be traversed on the bearing calculated for the plot using Silva Compass and distance measured with a nylon rope/tape/chain etc. While using compass the magnetic declination as indicated on the concerned toposheet was also taken into account. This was essential as the location of the plot centre of the sample plot was shown on the toposheet which was

Contents

according to the position of the true North and South. Thus, for example when a toposheet of 1975 was used in 1992, having magnetic variation of say $1^{o}30'$ west from the true north (noted on top right hand corner of toposheet) and decreasing by 1' every year, first 17' were deducted from 1^{o} 30'. Hence in 1992 magnetic variation for that toposheet would be 1^{o} 13' west from true North. If on the map, bearing of the plot centre from reference point was , say, 73^{o}, then while using the magnetic compass to go to the plot centre, from the reference point, $1^{o}13'$ were added to 73^{o} and since the compass doesn't show 13', bearing on the compass was set to 74^{o}. If the variation were to the east then one degree would be substracted. Similarly, for distance measurement the slope correction was applied to cover the actual horizontal distance of the plot measured from the map.

On reaching the plot centre, a square plot was laid out by taking distance of 22.36 m. in all the four directions (north, south, east and west) from the plot centre. Thus an exact plot of 0.1 ha. area (having each side of 31.62 m. and diagonal of 44.72 m.) was laid out horizontally after making corrections for the slopes measured with the help of Blumleiss hypsometer along 4 semidiagonals (north, south, east, west) from the plot centre.

3.4 FORMAT FOR DATA COLLECTION

After laying out the plots in the field, various data were collected in the following field forms in codified manner (except in Plot Approach Form wherein information was collected in descriptive manner) as described in the field manual issued to the crews for the purpose of data collection. This facilitated the transfer of data on disk/ tapes, consistency checking of data and finally in procesing the data on electronic computer at a later stage. Various field forms used in this survey were:-

1. Plot Approach form.

2. Plot Description form,

3. Plot Enumeration form.

4. Sample Tree form.

Contents

5. Bamboo Enumeration-Cum-Clump Analysis form.

6. Bamboo Weight form.

1. Plot Approach form.

This form is a record of approach to the plot centre from the field camp of a crew. It was filled in by the Crew Leader as he proceeded from his camp to some conspicuous feature called reference point near the plot. The distance and bearing from this well defined reference point to the plot centre were also recorded on it. The exact location of plot centre i.e. bearing and distance from two trees to the plot centre was also mentioned along with the time of departure from camp, time taken in various studies and time of arrival in the camp. This form helps the check crew or any other person to relocate the plot easily when required. The data on this form are recorded in descriptive manner with a neatly drawn sketch showing the location of reference point and the plot centre.

2. Plot Description form.

This form is used for recording qualitative description in and around 2 ha of plot centre. The information regarding administrative units, legal status,land use, topography, soil, vegetation, bamboo regeneration, biotic influence, accessibility and plantation potential etc. were recorded. The data were recorded in codified manner. The stratification of area and classification of growing stock was done on the basis of these descriptions only.

3. Plot Enumeration form.

In this form, all the trees with dia 10 cm. and above and all the bamboo clumps occurring in all 0.1 ha sample plots were recorded by species. This was meant for computing total growing stock existing in the survey area.

This form helps in assessing the growing stock in terms of stems and volume of different species in different diameter and forest type classes.

Contents

4. Sample Tree form.

Detailed information regarding the species, diameter, height of tree, clear bole, bark thickness, dominance, longitudinal, sectional and defects etc. of all the trees occurring in north west quadrant of all the plots, were recorded in this form. Details are used in generating local volume equations of various species found in the forest area of the district.

5. Bamboo Enumeration-Cum-Clump Analysis form.

In this form, the data of individual culms occurring in the selected clumps bearing S.No. 1,9,17,25,33 ..... etc. (i.e. the first and every eighth clump) appearing in Plot enumeration form were recorded. Thus, the information about age, soundness, size and condition etc. of the culms of the above clumps was obtained and analysed in various columns of this form.

This information gives the position of total bamboo stock by clump sizes occurring under various age groups, diameter classes and conditions.

6. Bamboo Weight form.

This form has been designed for collecting data to determine the green weight of bamboos of different species and sizes and further for establishing relationship between green weight and dry weight of bamboo culms. The data were recorded in respect of two selected culms from each dia. class i.e. 2 to 5 cm, 5 to 8 cm and 8 cm and above and the green weight of these culms upto 1 cm dia and was recorded in the form. The air dry weight of the culms was taken to be 60% of the green weight. This form helps in computing the total green bamboo stock and the corresponding dry bamboo stock as existing in the forest of the District.

The sample of above field forms has been given in annexure V.

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3.5 FIELD WORK

The field work in Wardha District of Maharashtra was completed during the period from October,1993 to November, 1993. In all, six parties each consisting of a Jr. Technical Assistant, a Dy.Ranger and two Fieldmen were deployed in this survey area. The work was supervised by Senior Technical Assistants and Deputy Director.

3.6 MAPS AND PLOTS

The details of the Survey of India toposheets used for survey work is given in annexure II.

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CHAPTER - IV

DATA PROCESSING

4.0 CONSISTENCY CHECKING AND FORWARDING OF FIELD FORMS TO DATA PROCESSING UNIT

After completion of field work, the field forms pertaining to inventory were manually checked in the zonal office as per field manual and coding instructions meant for the purpose. Inconsistencies noticed in these forms were removed after discussing the specific point with the concerned Crew Leaders. The checked field forms were sent to the Data Processing Unit (MDMU) of Forest Survey of India, Dehradun for computer analysis and getting information in desired format.

4.1 SAMPLING DESIGN:

In the case of Wardha district of Maharashtra Existing design and methodology, developed by Forest Survey of India, was used to carry out forest inventory surveys. For this purpose, Survey of India toposheets in the scale of 1:50,000 were selected for the area to be surveyed and in each of these toposheets, grids at an interval of 2.5 latitude by 2.5 longitude were marked. Two centres of sample plots of 0.1 ha each were marked in each of these grids. The first plot centre was marked by random method and the second was selected in the opposite quadrant at an equal distance of the first plot centre from the grid centre. The plot centres marked on the toposheets were laid on the ground by the field parties and the data was collected in the prescribed field forms.

4.2 FIELD DATA:

The basic data of the inventory survey were collected in Plot description forms, Plot enumeration forms, Sample tree forms, Bamboo enumeration forms etc. The field forms containing field data were precoded so that the data could easily be transferred to the floppy/tape/disk directly. There were 288 field forms which required data entry of the following number of records in each card design of Wardha district.

Contents

	Card design	No.of records
1.	Plot description forms	103
2.	Plot enumeration forms	308
3.	Sample tree forms	591
4.	Bamboo enumeration forms	4
5.	Bamboo weight forms	1
		1007

4.3 PLOT DETAILS IN WARDHA DISTRICT:

There were 103 plots in Wardha district giving weightage to each plot of 8.223 sq.km. There were two forest strata only i.e. Teak and Miscellaneous type of forest present in this district.

4.4 DATA PROCESSING

The data processing involved the following step:-

i) Manual processing

The field forms received in the Machine Data Management Unit (MDMU), were checked with the list supplied by the zonal office. Entries of the field forms were made in the register, regarding the number of field forms relating to each map-sheet, grid and plot. The total number of records required to be entered under each card design was also counted and indicated in the register for future references.

Job numbers, Card design and left hand zeros, wher ever missing, were filled up in the field forms to avoid mistakes during data entry on to the floppy or disk. Each entry in the field form was checked for consistency in the data. The maximum and minimum value of the codes were checked. The data was loaded on to the floppy/disk and verified. Then the listings were taken and checked manually.

Contents

Sample statistics were calculated and checked with the computer output results. The programmes were developed according to the requirement of the data processing. Final computer output results were checked for consistency and relevance of results. Area tables were also prepared by using the weightage of each plot.

ii) Processing on electronic computer.

The data were loaded on floppy/disk through direct data entry operations and verified. The listings of loaded data were taken to check the data. As described in the chapter of volume estimation, volume of each tree was estimated with the help of the local volume equations developed by MDMU by using General volume equations of Melghat survey of Maharashtra.

After taking into consideration, contribution of the volume of each enumerated tree, per hectare volume was calculated and was stored in a tree/plot volume file created for further processing. Using the tree/plot volume file, growing stock tables by species and diameter class under each crop composition were prepared and standard error of the estimated growing stock was calculated.

The data of this survey was processed on system - VAX 11/780 at Dehradun.

4.5 AREA

Following area figures were supplied by the zonal office, Nagpur.

Geographical area	- 6310 km^2
Forest area	- 847 km^2
Weightage per plot	- 8.223 km^2

For Wardha district, weightage of each plot was calculated by dividing the total forest area by the total number of sample plots. The areas under different parameters were estimated by multiplying the number of sample plots occuring in that class by the area weightage of each sample plot.

Contents

The total forested area was calculated on the above basis and was classified by land use classes. The actual tree forest area was further classified by different parameters such as soil depth, soil texture, soil erosion, grazing incidence, fire incidence, plantation potential etc.

4.6 VOLUME ESTIMATION

Felled tree data for developing general volume equations was not collected during the inventory, because of ban on felling of trees. Following General volume equations for different species were thus borrowed from the earlier report of Melghat survey of Maharashtra state.

General volume equations

Species code	Species name and General Volume equation
1. 072	Anogeissus latifolia V=-0.001064+ 0.46127 D*D*H
2. 505	Lagerstroemia parviflora V =-0.002101+0.393065 D*D*H
3. 858	Tectona grandis V = -0.001384 +0.363126 D*D*H
4. 866	Terminalia crenulata V = - 0.001546 + 0.377718 D*D*H
5. 944	Miscellaneous species V = 0.000114 + 0.357503 D*D*H

By using above mentioned General Volume Equations and the data recorded in the sample tree form, following local volume equations were derived after applying various statistical checks:

Contents

Local volume equations

Species Code	Name of species and local volume equation
1. 066	Acacia catechu $V = -0.04345 + 0.54129D + 0.22727 D*D$
2. 072	Anogeissus latifolia(73) $V = -0.04788 - 0.22165 D + 7.62582 D*D$
3. 146	Butea monosperma $\sqrt{V} = -0.41130 - 0.58922 D + 1.89083 \sqrt{D}$
4. 206	Chloroxylon swietenia $\sqrt{V} = -0.009687 + 2.44337 D$
5. 505	Lagerstroemia parviflora (23) $V = 0.13771 - 2.37376 D + 12.84784 D*D$
6. 858	Tectona grandis (286) $V = 0.01611 - 0.57977 D + 6.72276 D*D$
7. 866	Terminalia crenulata (99) $V = 0.62489 - 5.56936 D + 14.39811 D*D$
8. 944	Miscellaneous species (521) $\sqrt{V} = -0.10787 + 2.29309 D$

4.7 ENUMERATED TREE VOLUME:

The volume of each enumerated tree of a species was calculated by substituting its breast height overbark diameter in a local volume equation of that species. The enumerated tree volumes were converted to per hectare volumes and stored in a tree/plot volume file together with species code, diameter of trees, parameters of plot description form, per hectare volume/stems and total volume of that plot. The elements of information stored in the above files were utilised to classify the tree by species and diameter classes. Estimates of number of the stems and volume per hectare and total stems/volume by species and diameter classes were obtained for different strata viz; district, crop compositions etc.

Contents

4.8 PLOT VOLUME

The estimated volume of each enumerated tree in a plot when added up over the whole plot provided the plot volume. It was converted to per hectare volume and also stored in the tree/plot volume file. The per hectare plot volumes were used to estimate volume under different classes of desired parameters. The plot volumes were also used to estimate the sampling error of the growing stock for each crop composition.

4.9 STAND TABLES

The elements of tree/plot volume file were utilised to classify the trees by species, diameter, crop composition etc. Estimates of the number of stems per hectare and total stems by species and diameter classes were obtained for two major strata i.e. for Teak and Miscellaneous crop compositions were also derived.

4.10 STOCK TABLES

Estimates of volume per hectare and total volume by species and diameter classes were obtained for each crop composition from the tree/plot volume file.

4.11 SAMPLING ERROR

The sample was considered as a systematic cluster sample having two sample plots in each cluster. In order to estimate the sampling error the sample was considered to constitute simple random sample of unequal clusters because in many cases only one plot was enumerated from a grid. As such, the ratio method of estimate was used and the sampling error was estimated as follows:

Let n = total no. of clusters (grids) in the sample

y_i = sum of per hectare volumes in i th grid

x_i = number of plots in the i th grid

Contents

$$\bar{X} = \frac{1}{n} \sum x_i$$ = Average number of plots per grid

$$\hat{R} = \frac{\frac{1}{n} \sum Y_i}{\frac{1}{n} \sum X_i}$$ = estimate of average volume per hectare over all grids.

Estimate of variance of $\hat{R}$ is

$$V(\hat{R}) = \frac{N - n}{N n \bar{x}^2} \sum \frac{(y_i - \hat{R} x_i)^2}{n - 1}$$

(Ignoring $\frac{N - n}{N}$ the finite population correction factor)

$$\text{Var}(\hat{R}) = \frac{1}{n (n-1) \bar{X}^2} \sum Y_i^2 - 2 \hat{R} \sum Y_i X_i + \hat{R}^2 \sum x_i^2$$

Estimate of the Standard Error (SE) of R is

$$SE = \sqrt{V(\hat{R})}$$

$$SE\% = \frac{SE}{\hat{R}} \times 100$$

Standard errors have been estimated for the growing stock in each forest type and over the entire area irrespective of the strata.

.....

Contents

CHAPTER V

INVENTORY RESULTS : AREA

5.0 The data collected in 103 sample plots scattered over entire forest area of the Wardha district were analysed. The information about different land use pattern in the forest area, distribution of area in various topography, slope, soil depth, top height classes were obtained. Intensity of regeneration were also assessed. Information regarding incident of fire and grazing were also obtained by analysing the collected data. The inventory results are given in the succeeding paragraphs.

5.1 LAND USE PATTERN

The dense forest with crown density 70% and above is absent in the Wardha district. Out of 847 km^2 of forest area 68% contains moderately dense forest with crown density between 30% to 70%. 107 km^2 of area has open forest (crown density 5% - 30%) and 49.37 km^2 area contains scrub forest, Table 5.1T gives the distribution of forest area under different categories of forest land uses.

Table 5.1T

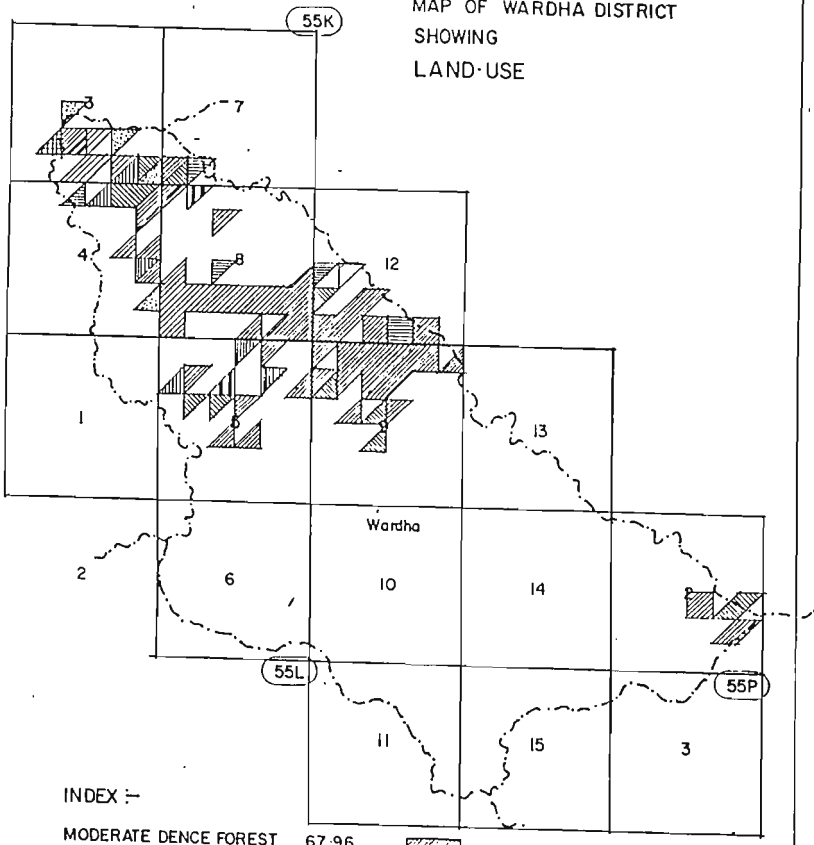
LAND USE PATTERN OF FOREST AREA OF WARDHA DISTRICT

Sl. No.	Forest land use class	No. of plots	Area (sq.km.)	Percentage
1.	Tree forest	70	575.63	67.96
2.	Plantation	4	32.893	3.88
3.	Open forest	13	106.903	12.62
4.	Scrub	6	49.34	5.83

Contents

No. 5.1M

MAP OF WARDHA DISTRICT
SHOWING
LAND-USE



INDEX :-

MODERATE DENCE FOREST	67·96	.
OPEN FOREST	12·75	.
SCRUB FOREST	5·83	.
YOUNG PLANTATION	3·88	.
GOVT. GRASS & BARRAN LAND	1·94	.
SHIFTING CULTIVATION	5·83	.
WATER BODY	0·97	.
AGRI. LAND	0·97	.

Contents

5.	barren lands	2	16.447	1.94
6.	Agricultural land without trees in surround	4	32.893	3.88
7.	Agricultural land with trees in surround	2	16.447	1.94
8.	Water bodies	2	16.447	1.94
	Total ..	103	847	100

5.2 AREA BY CROP COMPOSITION

To assess the distribution of vegetated area under different parameters such as crop composition, topography, slope, soil depth and size classes etc only the sample plots containing actual tree cover have been taken into account. The total vegetated area i.e. tree forest area of the district is 715.427 km^2. The distribution of which under various crop composition is indicated in table 5.2T. 78% of the tree forest area is teak forest in which percentage of teak tree is more than 20%. Rest of the area is covered by Miscellaneous forest.

Table 5.2T

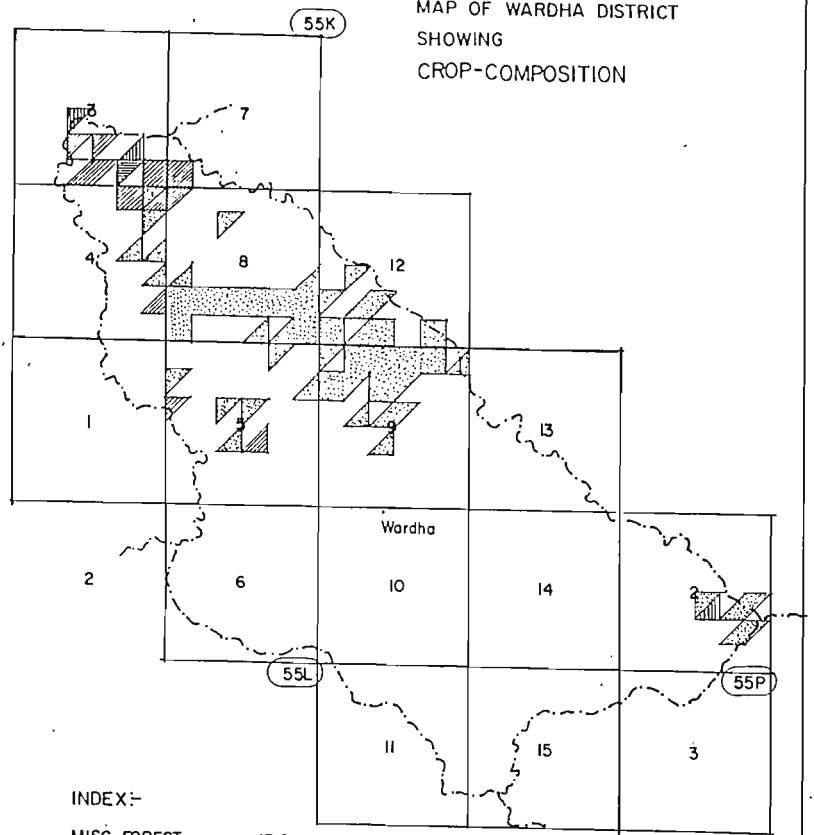
CROP COMPOSITION IN TREE FORESTS OF WARDHA DISTRICT.

Sl. No.	Forest Types	No.of sample plots	Area (km^2)	Percentage
1	Teak	68	559.184	78.16
2	Misc.	19	156.243	21.84
	Total	87	715.427	100

Contents

No: 5.2 M

MAP OF WARDHA DISTRICT
SHOWING
CROP-COMPOSITION



INDEX:-

MISC FOREST	-	17·24	-
TEAK FOREST	-	78·16	-
KHAIR FOREST	-	3·45	-
SALAI FOREST	-	1·15	-

Contents

Map 5.2M gives the location of two main forest types.

5.3 AREA BY CROP COMPOSITION AND TOPOGRAPHY

50.6% of the vegetation exists in hilly terrain. Both Teak and Miscellaneous forests predominantly exist in hilly topography followed by terrain with gently rolling topography. Table 5.3T gives the distribution of area in various topography classes.

Table 5.3T

TOPOGRAPHY IN FOREST AREA OF WARDHA DISTRICT.

Sl No.	Topography Classification	Teak			Miscellaneous		
		No. of plots	Area	Percentage	No.of plots	Area	percentage
1.	Flat	8	65.786	11.76	1	8.223	5.26
2.	Gently rolling	27	222.029	39.71	7	57.563	36.84
3.	Hilly	33	271.369	48.53	11	90.457	57.9
4.	Very hilly	-	-	-	-	-	-
	Total	68	559.184	100	19	156.243	100

Map No. 5.3M indicates the location of forest in different topography classes.

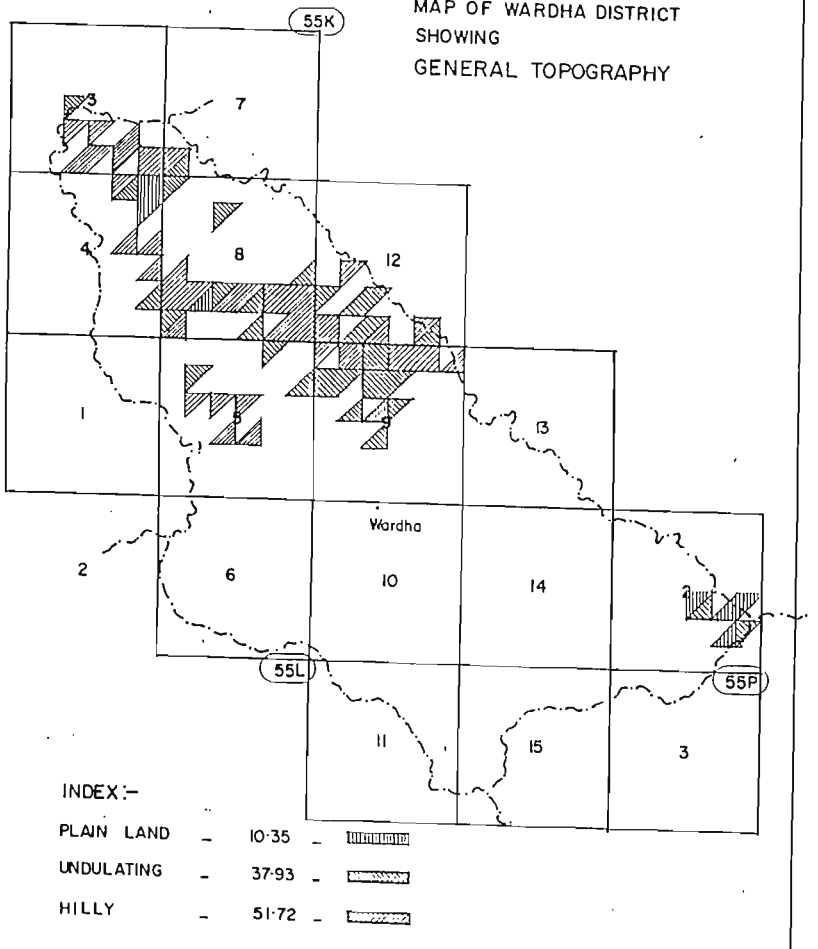
5.4 AREA BY CROP COMPOSITION AND SLOPE CLASSES

The distribution of vegetated area by forest types and slope classes is indicated in table 5.4T. 50.6% of vegetation exists on gentle slope of less than 10%. 50% of Teak crop and 52.6% of Miscellaneous crop exist on gentle slope below 10%. Rest of the vegetation exists on the slope 10-60%.

Contents

No: 5.3M

MAP OF WARDHA DISTRICT
SHOWING
GENERAL TOPOGRAPHY



Contents

Table 5.4T

AREA BY CROP COMPOSITION AND SLOPE CLASSES IN WARDHA DISTRICT

Sl. No.	Slope class	Teak			Miscellaneous		
		No. of plots	Area (km^2)	Percentage	No. of plots	Area (Km^2)	Percentage
1	0-9	34	279.592	50	10	82.23	52.631
2	10-59	32	263.146	47.06	9	74.01	47.369
3	60-99	-	-	-	-	-	-
4	N.R.	2	16.446	2.94			
	Total	68	559.184	100	19	156.24	100

Map 5.4M shows location of forest crop in different slope classes.

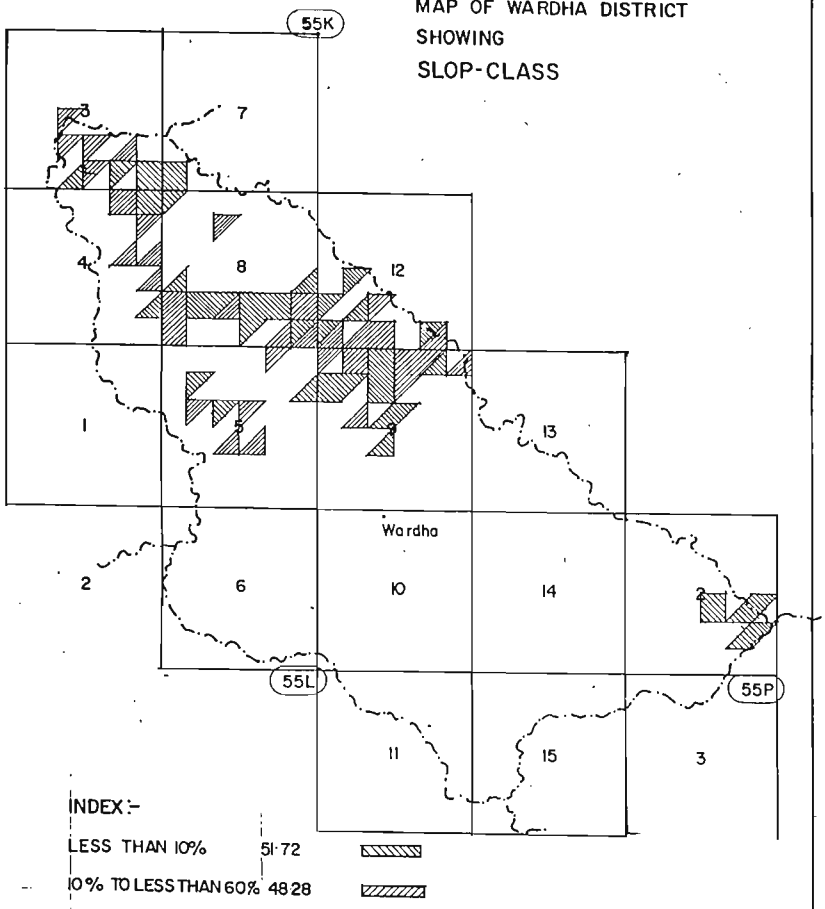
5.5 AREA BY CROP COMPOSITION AND SOIL DEPTH CLASSES

Majority of the forest area of the district, which includes 75% of teak forest and 26.32% of Miscellaneous forest contain soil layer of medium depth. 73.68% Miscellaneous forest exists on shallow depth soil (10 cm - 30 cm). Table 5.5T gives the distribution of crop in various soil depth classes and location map 5.5M indicates their locations in the district.

Contents

No: 5.4M

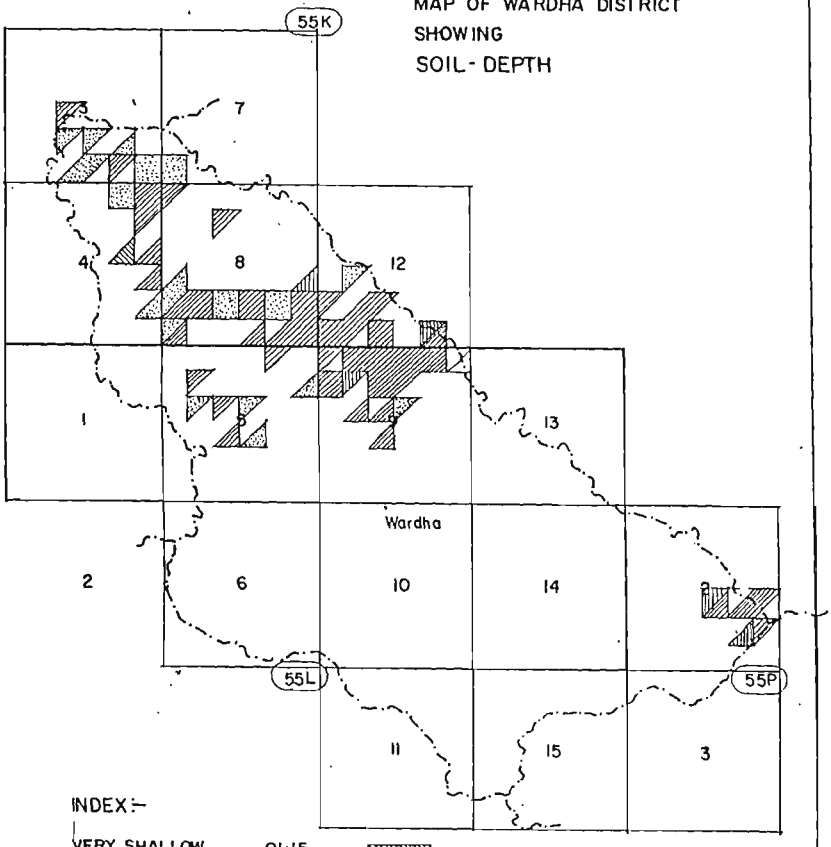
MAP OF WARDHA DISTRICT
SHOWING
SLOP-CLASS



Contents

No: 5.5 M

MAP OF WARDHA DISTRICT
SHOWING
SOIL - DEPTH



INDEX :-

VERY SHALLOW	-	01·15	-
SHALLOW	-	28·74	-
MEDIUM	-	64·37	-
DEEP	-	05·74	-

Contents

Table 5.5T

SOIL DEPTH IN FOREST AREA OF WARDHA DISTRICT

Sl. No.	Soil depth clasification	Teak			Miscellaneous		
		No.of plots	Area (km^2)	Percen-tage	No. of plots	Area (Km^2)	%
1	No soil	-	-	-	-	-	-
2	Very shallow(<10cm)	1	8.223	1.47			
3	Shallow(10<30cm)	11	90.456	16.18	14	115.126	73.68
4	Medium(30<90cm)	51	419.388	75	5	41.117	26.32
5	Deep(90 & above)	5	41.117	7.35			
	Total	68	559.184	100	19	156.243	100

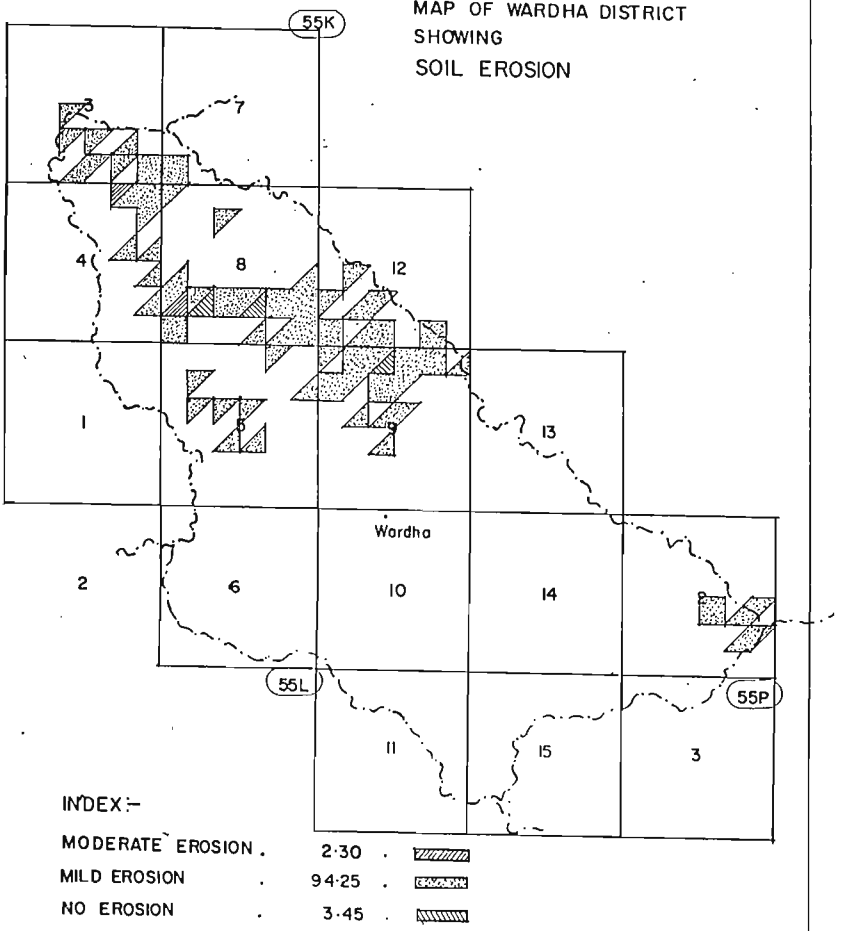
5.6 SOIL EROSION

The forest of the district is heavily eroded and 75% of the top soil is removed due to erosion. 96% of teak forest and 94.74% of Miscellaneous one contain soil which are heavily eroded. The table 5.6T gives the status of soil erosion in forest area of the districts.

Contents

No. 5.6M

MAP OF WARDHA DISTRICT
SHOWING
SOIL EROSION



Contents

Table 5.6T

SOIL EROSION STATUS IN FOREST AREA OF WARDHA DISTRICT.

Sl. No.	Soil Erosion classification	Teak			Miscellaneous		
		No.of plots	Area (km^2)	%	No. of plots	Area (Km^2)	%
1	Mild erosion	-	-	-	-	-	-
2	Moderate erosion	-	-	-	1	8.223	5.26
3	Heavy erosion	65	534.514	95.6	18	148.02	94.74
4	No Erosion	3	24.67	4.4			
	Total	68	559.184	100	19	156.243	100

5.7 CANOPY LAYER

81% of Teak forest is two storeyed forest whereas only 68.72% of Miscellaneous one comes under this category. The table 5.7T gives the distribution of forest area in different canopy classes.

Contents

Table 5.7T

CANOPY LAYER IN THE FOREST AREA OF WARDHA DISTRICT

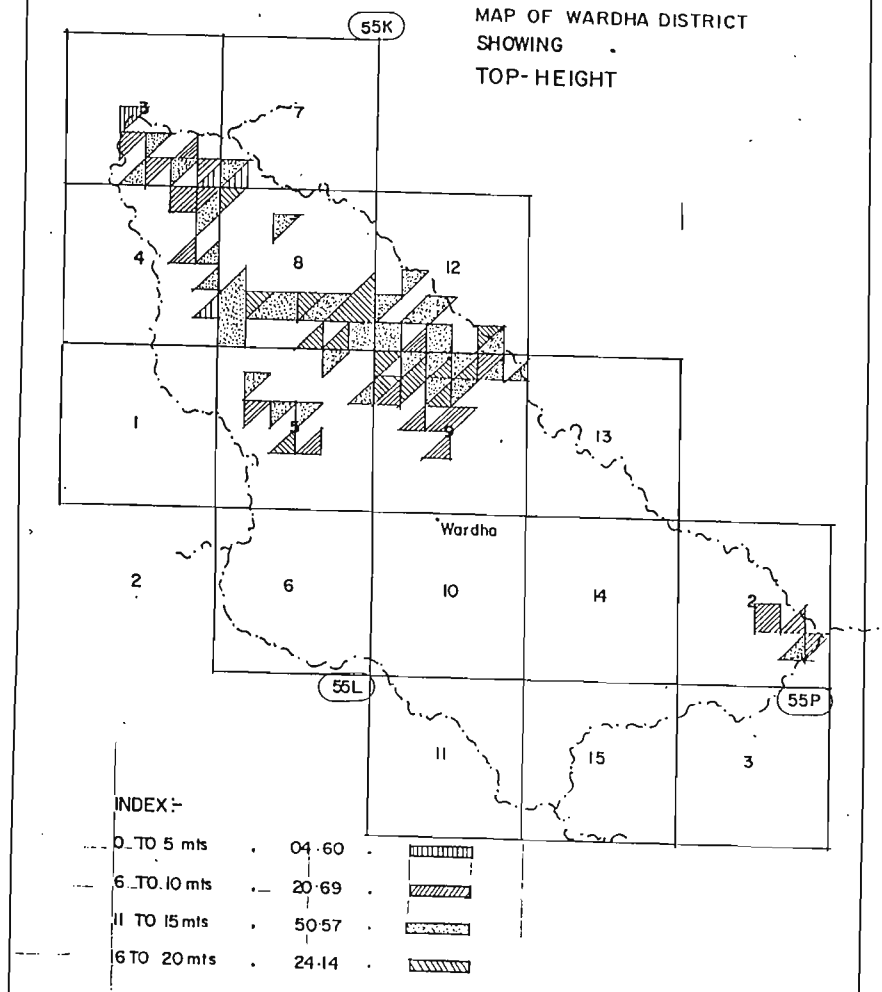
Sl. No.	Canopy layer	Teak			Miscellaneous		
		No.of plots	Area (km^2)	%	No. of plots	Area (Km^2)	%
1	No storey forests	-	-	-	1	8.223	5.26
2	One storeyed forests	13	106.903	19.12	5	41.117	26.32
3	Two storeyed forests	55	452.281	80.88	13	106.903	68.42
4	Three or more storeyed forest	-	-	-	-	-	-
	Total	68	559.184	100	19	156.243	100

5.8 AREA BY CROP COMPOSITIONS AND TOP HEIGHT CLASSES

Table 5.8T gives the details of distribution of vegetated area by crop composition and top height classes. Teak forest predominantly occurs in top height classes 10-15 m and Miscellaneous forest occurs in 5-10 m.

Contents

No: 5.8M



Contents

Table 5.8T

TOP HEIGHT IN FOREST AREA OF WARDHA DISTRICT

Sl. No.	Top height classes	Teak			Miscellaneous		
		No.of plots	Area (km^2)	%	No. of plots	Area (Km^2)	Percentage
1	0 - 5 m	-	-	-	4	32.893	21.05
2	6 - 10 m	10	82.233	14.71	9	74.01	47.37
3	11 - 15 m	39	320.708	57.35	4	32.893	21.05
4	16 - 20 m	19	156.243	27.94	2	16.447	10.53
5	21 - 25 m	-	-	-	-	-	-
	Total	68	559.184	100	19	156.243	100

Map No. 5.6M gives the location of vegetation pertaining to different top height classes in the district.

5.9 AREA BY CROP COMPOSITION AND SIZE CLASSES

While collecting data in sample plot the crop was classified into the following size classes depending upon the use to which the tree crop of stand can be put.

1. Regeneration crop - Crop below 10 cm diameter predominating.

2. Pole crop - Crop between 10-20 cm diameter predominating

3. Small timber - Crop between 20 to under 30 cm diameter predominating

Contents

4. Big timber - Trees with diameter 30 cm and above predominating

5. Mixed size class - Tree crop with no marked domination of any size class

Table 5.9T gives the distribution of forest crop under different size classes. 44% of teak forest and 42% of Miscellaneous forest are in form of Pole crop. Big timber is absent in the Wardha forest. Again about 33 km^2 of Miscellaneous forest is in the form of regeneration crop.

Table 5.9T

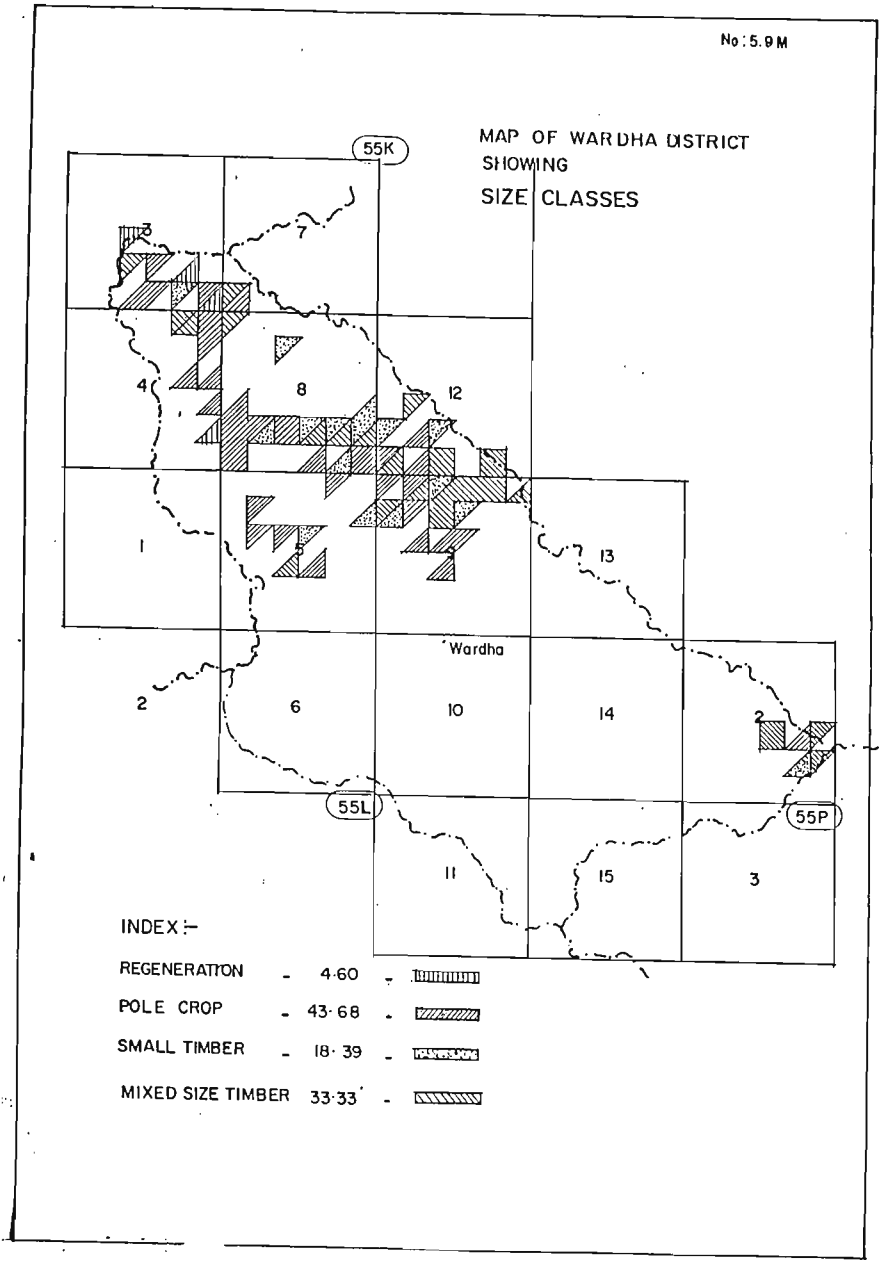
SIZE CLASSES IN TREE FOREST AREA OF WARDHA DISTRICT

Sl. No.	Size classes	Teak			Miscellaneous		
		No.of plots	Area (km^2)	%	No. of plots	Area (Km^2)	%
1	Regeneration crop	-	-	-	4	32.894	21.05
2	Pole crop	30	247	44.12	8	65.786	42.11
3	Small timber	15	123	22.06	1	8.223	5.26
4	Big timber						
5	Mixed size class	23	189	33.82	6	49.34	31.58
	Total	68	559	100	19	156.243	100

Map No. 5.9M indicates the location of the vegetation by its size classes.

Contents

No: 5.9 M



Contents

5.10 INTENSITY OF REGENERATION

The status of regeneration was assessed during the survey work by counting number of established seedlings in 4m x 4m area around the plot centre. The table 5.10T indicates the intensity of regeneration in the forest area. It is evident from the table that regeneration is inadequate in 60% of the forest area.

Table 5.10T

INTENSITY OF REGENERATION IN FOREST AREA OF WARDHA DISTRICT.

Sl. No.	Intensity of Regeneration	No. of plots	Area (km^2)	Percentage
1	Profuse	-	-	-
2	Adequate	31	254.922	30.1
3	Inadequate	62	509.845	60.19
4	Not recorded	10	82.233	9.71
	Total	103	847	100

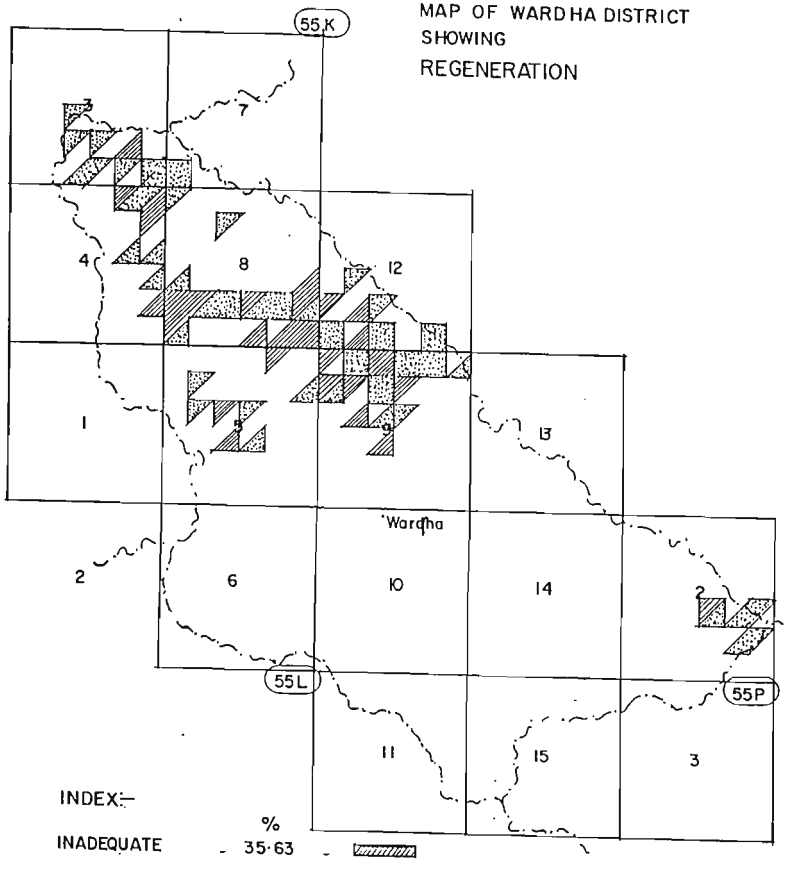
5.11 INJURY TO CROP

Table 5.11T indicates the state of forest subjected to various kinds of injuries. 34% of the forest area is subjected to girdling and illicit fellings of trees.

Contents

No: 5.10 M

MAP OF WARDHA DISTRICT
SHOWING
REGENERATION



INDEX:-

	%	
INADEQUATE	- 35·63	-
ABSENT	- 64·37	-

Contents

Table 5.11T

INJURIES TO CROP IN FOREST AREA OF WARDHA DISTRICT

Sl. No.	Injury to crop	No. of plots	Area (km^2)	Percentage
1	Top drying	2	16.447	1.94
2	Girdling and illicit felling of trees	35	287.816	33.98
3	Lopping for fodder	1	8.223	0.97
4	No injury	50	411.164	48.54
5	Not recorded	15	123.35	14.57
	Total	103	847	100

5.12 AREA AFFECTED BY FIRE INCIDENCE

Occasional fire incidence was noticed in about 38% of the forest area. Table 5.12T gives the distribution of area subjected to different kinds of fire incidence.

Table 5.12T

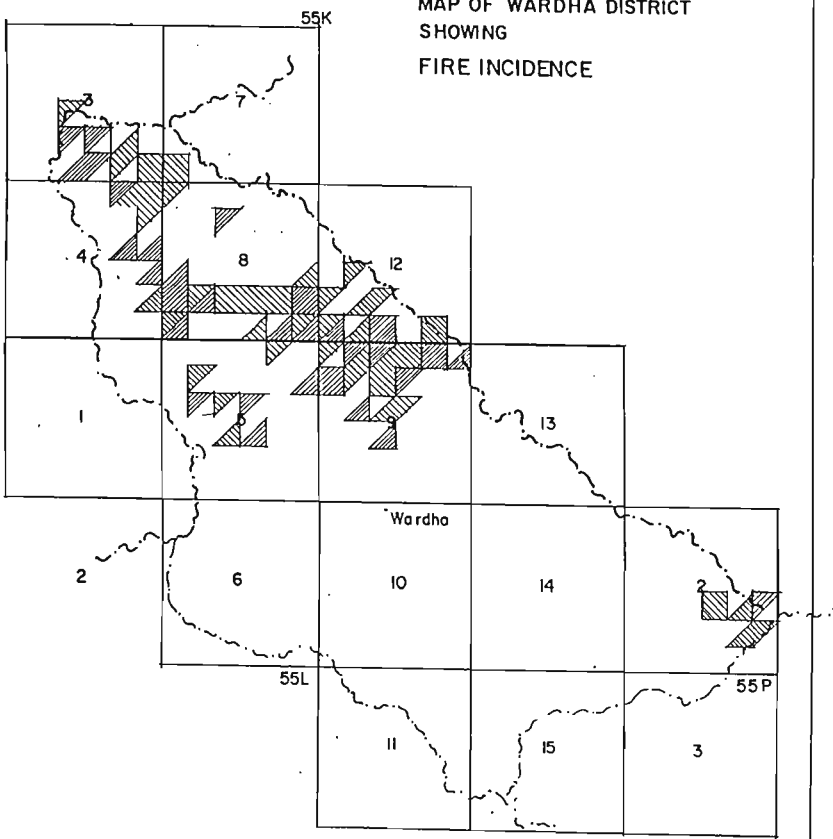
FIRE INCIDENCE IN FOREST AREA OF WARDHA DISTRICT.

Sl. No.	Fire incidence	No. of plots	Area (km^2)	Percentage
1	Occasional	39	320.709	37.86
2	No fire	54	444.058	52.43
3	Not recorded	10	82.233	9.71
	Total	103	847	100

Contents

No : 5.12 M

MAP OF WARDHA DISTRICT
SHOWING
FIRE INCIDENCE



INDEX :-

	%	
OCCASSIONAL	41·38	
NO FIRE	58·62	

Contents

5.13 GRAZING INCIDENCE

Around 70% of the forest area was found to be subjected to grazing incidence of one kind or another. 20.39% of the area was found to be heavily grazed in which regeneration was damaged by trampling of cattle and 50 to 70% of ground cover was lost.

Table No. 5.13T
GRAZING INCIDENCE IN FOREST AREA OF WARDHA DISTRICT

Sl.No.	Grazing incidents	No. of plots	Area in sq.km.	Percentage
1	Heavy grazing	21	172.689	20.39
2	Medium grazing	32	263.146	31.07
3	Light grazing	30	246.699	29.13
4	No grazing	10	82.233	9.71
5	Not recorded	10	82.233	9.71
	Total	103	847	100

Map 5.13 M gives the location of area subjected to various kinds of grazing incidence.

5.14 PLANTATION POTENTIAL

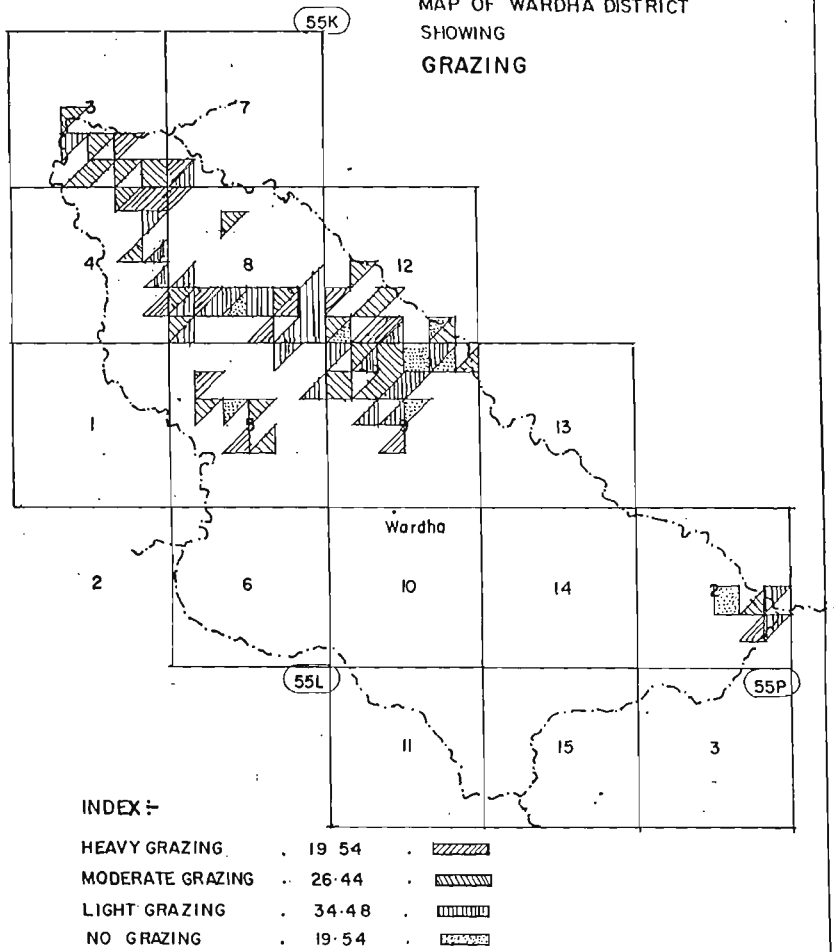
While assessing plantation potential in the forest area due consideration has been given to aspects, soil depth, drainage, crop in the surrounding area, and other biotic and climatic factors, the maximum permissible slope and minimum soil depth upto which plantation can be raised. All those areas where the crown density is 30% or more, plantation potential is not of any significance and therefore such areas have been put in the category of 'not applicable'.

The table 5.14T indicates the plantation potential in forest areas of the district. The total forest area in which plantation can be raised is about 164 km^2 forming 19.42% of the forest area.

Contents

No: 5.13 M

MAP OF WARDHA DISTRICT
SHOWING
GRAZING



INDEX :-

HEAVY GRAZING	19 54	
MODERATE GRAZING	26·44	
LIGHT GRAZING	34·48	
NO GRAZING	19·54	

Contents

Table 5.14T

PLANTATION POTENTIAL IN FOREST AREA OF WARDHA DISTRICT

Sl. No.	Plantation Potential	No.of plots	Area (km^2)	Percentage
1	Plantable	20	164.47	19.42
2	Not applicable	80	657.86	77.67
3	Not recorded	3	24.67	2.91
	Total	103	847	100

5.15 OCCURRENCE OF BAMBOO

Bamboo was found to be almost absent in the forests of Wardha district.

5.16 CRITICAL ASPECTS

(i) Dense forest is totally absent in the district and the forest area is gradually converting into open and scrub forests due to heavy biotic pressure. Heavy grazing and soil erosion have been noticed in considerable area.

(ii) Regeneration is inadequate in 60% of forest area due to biotic interference. Proper steps should be taken to minimise such interference.

(iii) About 40% of the forest crop is pole crop. Big timber is almost absent and only the small sized trees are predominantly occurring in the forests. The crop needs protection so that it could grow well.

(iv) About one fifth forest area requires to be planted/afforested with suitable species to increase the vegetative cover.

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CHAPTER VI

INVENTORY RESULTS : GROWING STOCK

6.0 GROWING STOCK AND STAND

The growing stock of tree forests in terms of total standing volume and growing stands were assessed by method described in Chapter IV. The assessment was also made for each forest type. The forest of Wardha district can be classified into two stratum. Teak and Miscellaneous. In teak forest, the percentage of teak tree in the forest is more than 20%. Miscellaneous forest contains trees of all species intermixed with each other with no particular species predominantly occurring. The distribution of growing stock in each stratum can be summarised in the following table.

Table 6.0T
GROWING STOCK AND STAND IN FOREST AREA OF WARDHA DISTRICT

Stratum	Area in km^2	Percentage & area covered	Total stems	Stem per ha	Percentage distribution of stem	Total standing volume in M^3	Standing volume per ha	Percentage distribution of growing stock.
Teak (68)*	559.184	78.16	16578160	296.47	87.84	1919688	34.33	89.39
Misc (19)	156.243	21.84	2294305	146.84	12.16	227872	14.58	10.61
Total (87)	715.427	100.00	18872465	263.79	100.00	2147560	30.02	100.00

* No. of plots

Thus teak forest which constitutes 78% of the forest area contributes 87.84% of growing stand and 89.39% of total standing volume.

Contents

6.1 STEMS PER HA AND TOTAL STEMS - STRATUM TEAK

The distribution of per hectare stand and total stand by species and diameter classes in Teak stratum has been shown in table 6.1T(a) and 6.1T(b) appended in the report. In this stratum no. of stem/ha is 296 teak contributes 57.74% of the growing stand followed by Butea monosperma (8.23%), Chloroxylon swietenia(7.94%), Anogeissus latifolia (4.56%), Accacia catechu(2.73%), Terminalia crenulata (2.68%) and Lagerstroemia parviflora (2.48%).

Table 6.1T gives the distribution of stems/ha and total stem of different species in Teak forest. 80% of growing stand is comprised of trees with diameter class 10-20 cm.

Table 6.1T

TOTAL STEMS AND STEM PER HA IN TEAK FORESTS

Species	Total stems	Stem/ha	Percentage
1. Tectona grandis	9571914	171.17	57.74
2. Butea monosperma	1365067	24.41	8.23
3. Chloroxylon swietenia	1315727	23.53	7.94
4. Anogeissus latifolia	756543	13.53	4.56
5. Acacia catechu	452281	8.09	2.73
6. Terminalia crenulata	444058	7.94	2.68
7. Lagerstroemia parviflora	411165	7.35	2.48
8. Other species	2261406	40.44	13.64
Total	16578160	296.47	100

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6.2 STEMS PER HA AND TOTAL STEMS - MISC FOREST

The diameter wise distribution of stems per ha and total stems in Miscellaneous forest is given in table 6.2T(a) and 6.2T(b) appended in the report. Miscellaneous stratum contains 146.84 stem per ha and 2294305 no. of stems. The major species found in this forest are Acacia catechu (28.32%), Anogeissus latifolia (17.56%), Chloroxylon swietenia (10.75%), Butea monosperma (8.24%), Terminalia crenulata (5.38%), and Lagerstroemia parviflora (3.58%). The following table gives the total stems and stem/ha of important species in this stratum.

Table 6.2T

TOTAL STEMS AND STEM/HA IN MISCELLANEOUS STRATUM

Species	Total stems	Stem/ha	Percentage
1. Acacia catechu	649642	41.58	28.32
2. Anogeissus latifolia	402943	25.79	17.56
3. Chloroxylon swietenia	246699	15.79	10.75
4. Butea monosperma	189136	12.10	8.24
5. Terminalia crenulata	123350	7.89	5.38
6. Lagerstroemia parviflora	82233	5.26	3.58
7. Tectona grandis	24670	1.58	1.08
8. Other species	575632	36.84	25.09
Total	2294305	146.84	100

Contents

81% of the growing stand is contributed by the trees with diameter 10-20 cm.

6.3 STEMS PER HA AND TOTAL STAND - ALL STRATA COMBINED

Table 6.3T appended in the report gives the distribution of stems in different diameter classes of entire tree forest area of the district. Total number of stems has been found to be 18.87 million with an average of about 264 stems per ha. The important species which are contributing more than 2% of growing stand are Tectona gradis (50.85%), Chloroxylon swietenia (8.28%), Butea monosperma (8.23%), Anogeissus latifolia (6.14%), Acacia catechu (5.84%), Terminlia crenulata(3.0%) and Lagerstroemia parviflora (2.61%). The 80% of the growing stand is comprised of trees with diameter 10 to 20 cm.

6.4 PER HA VOLUME AND TOTAL VOLUME - STRATUM TEAK

The per hectare volume has been worked out on the basis of the volume computed for all sample plots. Total volume for each stratum has been worked out by multiplying the volume per ha by area under each stratum. Total growing stock in terms of volume in Teak forest having an area of 559.18 km^2 has been assessed to be around 1.92 million cubic metre with an average of 34.33 cubic metre per ha. The distribution of growing stock in terms of species and diameter classes has been given in table 6.4T(a) and 6.4T(b) appended in the report. Teak contributes about 59% of the growing stock in this stratum followed by Anogeissus latifolia (7.9%), Chloroxylon swietenia (7.33%), Terminlia crenulata (4.46%) and Butea monosperma (4.2%). The contribution of volume by important species in Teak stratum is indicated below:

Contents

Table 6.4T

GROWING STOCK IN TEAK STRATUM

S.No.	Species	Total volume m^3	Volume/ ha m^3	Percentage
1.	Tectona grandis	1130116	20.21	58.87
2.	Anogeissus latifolia	151753	2.71	7.91
3.	Chloroxylon swietenia	140729	2.52	7.33
4.	Terminalia crenulata	85696	1.53	4.46
5.	Butea monosperma	80663	1.44	4.20
6.	Lagerstroemia parviflora	42081	0.75	2.19
7.	Acacia catechu	16410	0.29	0.85
8.	Other species	272239	4.87	14.19
	Total	1919688	34.33	100

47% of the growing stock is contributed by trees having diameter between 10-20 cm.

6.5 PER HA VOLUME AND TOTAL VOLUME - STRATUM MISCELLANEOUS

Total standing volume of Miscellaneous forests of the district is around 2.28 lac cubic metre per ha. Table 6.5T(a) and 6.5T(b) appended in the report gives the specieswise distribution of growing stock under various diametre classes. The leading species which contribute the growing stock in this stratum are mentioned below:

Contents

Table 6.5T
GROWING STOCK IN MISCELLANEOUS STRATUM

S.No.	Species	Total volume M^3	Volum M^3 per ha	Percentage
1.	Chloroxylon swietenia	48741	3.12	21.39
2.	Anogeissus latifolia	31786	2.03	13.95
3.	Terminlia crenulata	20579	1.32	9.03
4.	Acacia catechu	19485	1.25	8.55
5.	Butea monosperma	9620	0.62	4.22
6.	Lagerstroemia parviflora	8191	0.52	3.59
7.	Tectona grandis	1858	0.12	0.82
8.	Other species	87614	5.61	38.45
	Total	227872	14.58	100.00

38% of the growing stock is comprised of the trees having diametre between 10 cm to 20 cm.

6.6 PER HA VOLUME AND TOTAL VOLUME - ALL STRATA COMBINED

Table 6.6T appended in the report gives the specieswise distribution of total growing stock of Wardha district under different diameter classes. Total standing volume of the forest of the district is around 2.15 million cubic metre with an average of 30.02 cubic metre per ha. The main species whose contribution of growing stock is significant are Tectona grandis (52.71%), Chloroxylon swietenia (8.82%), Anogeissus latifolia (8.54%), Terminalia crenulata (4.95%), Butea monosperma (4.20%), Lagerstroemia parviflora (2.34%) and Acacia catechu (1.67%). About 46% of the growing stock is comprised of Pole crop i.e. tree between diameter classes 10 cm - 20 cm.

Contents

6.7 MEAN VOLUME PER HA BY TOPOGRAPHY

The distribution of Mean volume per ha by topography classes for both Teak and Miscellaneous forest has been given in table 6.7 below. It indicates that hilly areas have slightly better stocking than that of plain and undulating areas. In Teak forests stocking is better in areas having gently rolling topography as compared to flat land, whereas Miscellaneous forest shows the reverse trend.

Table 6.7T

MEAN VOLUME (M^3) PER HA BY TOPOGRAPHY IN WARDHA DISTRICT.

Forest Type	Flat	Gently rolling	Hilly	Very hilly
Teak	30.499	32.407	36.833	-
Misc	14.901	11.026	16.82	-

6.8 MEAN VOLUME PER HA BY SLOPE CLASSES

Mean volume per ha by slope classes is indicated in the following table 6.8T. Stocking is better in lower slopes of less than 10% in both the strata. No vegetation exists beyond 60% slopes.

Table 6.8T

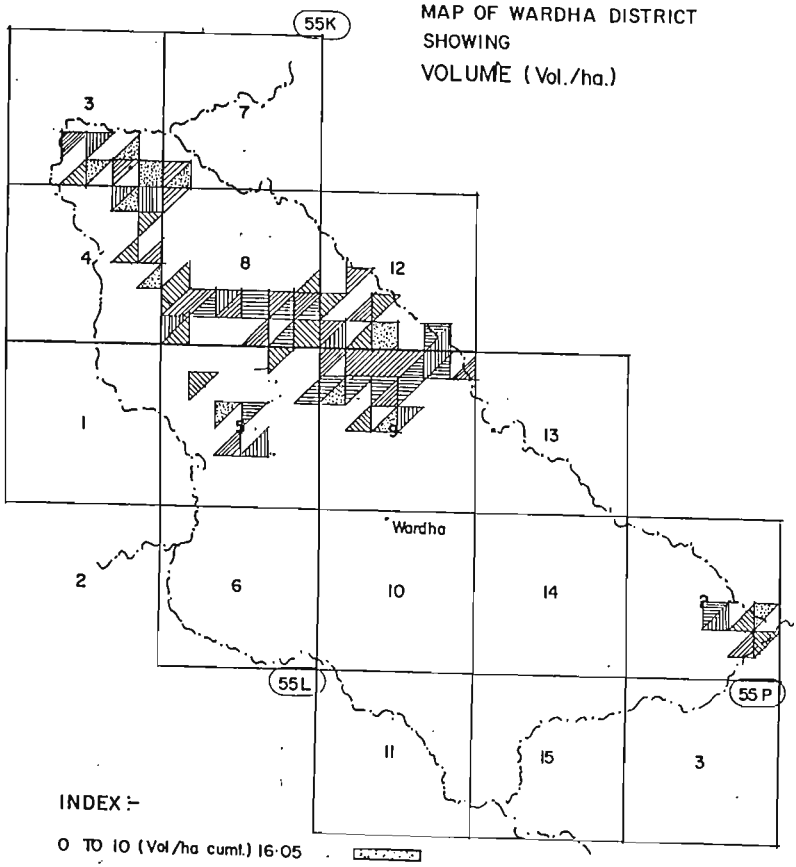
MEAN VOLUME (M^3) PER HA BY SLOPE CLASSES IN WARDHA DISTRICT

Forest type	<10%	10<60%	60<100	>100% +	Not recorded
Teak	36.825	31.713	-	-	33.792
Misc	18.621	10.099	-	-	-

Contents

No: 6.7 M

MAP OF WARDHA DISTRICT
SHOWING
VOLUME (Vol./ha.)



INDEX :-

0 TO 10 (Vol/ha cumt.)	16·05	
10 TO 20	14·81	
20 TO 30	19·75	
30 TO 50	28·40	
50 & ABOVE	20·99	

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6.9 MEAN VOLUME PER HA BY SOIL DEPTH CLASSES

The table 6.9T produced below indicates the distribution of mean volume per ha in different soil depth classes. As expected stocking is found better in areas with more soil depth. In Miscellaneous forest, deep soil is absent and so no vegetation exist in that category.

Table 6.9T

MEAN VOLUME (M^3) PER HA BY SOIL DEPTH CLASSES IN WARDHA DISTT

Forest Type	No soil	Very shallow	Shallow	Medium	Deep
Teak	-	20.401	33.625	32.414	58.209
Misc	-	-	10.886	16.82	-

6.10 MEAN VOLUME PER HA BY TOP HEIGHT CLASSES

Table 6.10T gives the distribution of mean volume per ha (M^3) by top height classes. It is clear from the table that the mean volume is increasing from low top height class to higher top height class in both crop compositions. No vegetation exists in Teak stratum of top height more than 20 m.

Table 6.10T

MEAN VOLUME/ HA BY TOP HEIGHT CLASSES IN WARDHA DISTRICT

Forest Type	1-5m	6-10m	11-15m	16-20	21-25m	26-30m	31m+
Teak	-	17.26	29.565	53.095	-		
Misc	1.605	10.474	27.261	33.688	-		

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6.11 MEAN VOLUME PER HA BY SIZE CLASSES

The distribution of the mean volume/ha by size classes has been given in table 6.11T. In Teak forest mixed size crop and small timber crop yield more volume whereas in Miscellaneous forest it is small timber class which yields more volume. The contribution of big timber is nil due to absence of big trees in the surveyed area. Here the number of stems present is basically responsible for contribution of more volume for no particular size class.

Table 6.11T

MEAN VOLUME PER HA BY SIZE CLASSES

Forest Type	Regeneration	Pole crop	Small timber	Big timber	Mixed size
Teak	-	25.147	41.443	-	41.67
Misc	1.914	9.364	42.422	-	25.352

6.12 MEAN VOLUME PER HA BY CANOPY LAYER

The Table 6.12T gives the distribution of mean volume (M^3) per ha by canopy layer. For both the forest two storyed canopy yields more volume per ha.

Table 6.12T

MEAN VOLUME PER HA BY CANOPY LAYER

Forest Type	No Storey	Single storeyed	Two storeyed	More than two storeyed
Teak	-	16.754	38.485	-
Misc	-	2.04	20.531	-

Contents

6.13 GROWING STOCK WITH ESTIMATE OF STANDARD ERROR

The following table indicates the standard error in estimating the growing stock of the Wardha district.

Table No. 6.13T

GROWING STOCK WITH ESTIMATE OF STANDARD ERROR

Forest Type	No. of plots	Area in (000'ha)	SE%	Vol./ ha	No. of plots	SE%	Total volume (000'm^3)	SE%
Teak	68	55.9184	8.3	34.3302	68	7.2	1919.6899	10.9
Misc	19	15.6243	23.5	14.5845	19	22.9	227.8726	32.8
Total	87	71.5427	8.3	30.0179	87	6.3	2147.5625	10.4

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GROWING STOCK TABLES

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Table 6.1T(A)

STEM PER HA IN TEAK STRATUM OF WARDHA DISTRICT

AREA 55918.4 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	6.618	0.588	0.441	0.441	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.088
Anogeissus latifolia	4.118	5.147	2.500	1.324	0.294	0.000	0.147	0.000	0.000	0.000	0.000	13.529
Butea monosperma	14.118	7.647	1.618	0.882	0.147	0.000	0.000	0.000	0.000	0.000	0.000	24.412
Chloroxylon swietenia	12.353	6.324	3.088	1.471	0.147	0.147	0.000	0.000	0.000	0.000	0.000	23.529
Lagerstroemia parviflora	5.147	1.029	1.029	0.000	0.147	0.000	0.000	0.000	0.000	0.000	0.000	7.353
Tectona grandis	94.559	44.706	20.882	6.765	3.382	0.441	0.294	0.147	0.000	0.000	0.000	171.176
Terminalia crenulata	2.647	2.794	1.324	0.294	0.147	0.294	0.294	0.147	0.000	0.000	0.000	7.941
Miscellaneous	20.588	9.559	4.412	3.235	0.735	1.324	0.294	0.294	0.000	0.000	0.000	40.441
All species total	160.147	77.794	35.294	14.412	5.000	2.206	1.029	0.588	0.000	0.000	0.000	296.471

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Table 6.1T(B)

TOTAL STEM IN TEAK STRATUM OF WARDHA DISTRICT

AREA 55918. 4 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	370.048	32.893	24.670	24.670	0.000	0.000	0.000	0.000	0.000	0.000	0.000	452.281
Anogeissus latifolia	230.252	287.815	139.796	74.010	16.447	0.000	8.223	0.000	0.000	0.000	0.000	756.543
Butea monosperma	789.436	427.611	90.456	49.340	8.223	0.000	0.000	0.000	0.000	0.000	0.000	1365.067
Chloroxylon swietenia	690.757	353.602	172.689	82.233	8.223	8.223	0.000	0.000	0.000	0.000	0.000	1315.727
Lagerstroemia parviflora	287.815	57.563	57.563	0.000	8.223	0.000	0.000	0.000	0.000	0.000	0.000	411.165
Tectona grandis	5287.578	2499.881	1167.708	378.272	189.136	24.670	16.447	8.223	0.000	0.000	0.000	9571.914
Terminalia crenulata	148.019	156.243	74.010	16.447	8.223	16.447	16.447	8.223	0.000	0.000	0.000	444.058
Miscellaneous	1151.261	534.514	246.699	180.912	41.116	74.010	16.447	16.447	0.000	0.000	0.000	2261.406
All species total	8955.167	4350.123	1973.591	805.883	279.592	123.349	57.563	32.893	0.000	0.000	0.000	16578.160

Contents

Table 6.2T(A)

STEM PER HA IN MISCELLANEOUS FORESTS OF WARDHA DISTRICT

AREA 15624.3 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	35.789	3.684	2.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	41.579
Anogeissus latifolia	20.000	4.211	0.526	1.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	25.789
Butea monosperma	7.895	3.684	0.526	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.105
Chloroxylon swietenia	7.368	3.158	1.579	0.526	1.579	1.579	0.000	0.000	0.000	0.000	0.000	15.789
Lagerstroemia parviflora	3.684	0.526	0.526	0.526	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.263
Tectona grandis	1.053	0.526	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.579
Terminalia crenulata	3.158	1.579	1.579	1.053	0.000	0.526	0.000	0.000	0.000	0.000	0.000	7.895
Miscellaneous	15.263	7.368	5.789	4.211	2.632	1.053	0.526	0.000	0.000	0.000	0.000	36.842
All species total	94.211	24.737	12.632	7.368	4.211	3.158	0.526	0.000	0.000	0.000	0.000	146.842

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Table 6.2T(B)

STEMS (000)/M^3 IN MISCELLANEOUS FOREST OF WARDHA DISTRICT

AREA 15824.3 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	559.185	57.563	32.893	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	649.642
Anogeissus latifolia	312.486	65.787	8.223	18.447	0.000	0.000	0.000	0.000	0.000	0.000	0.000	402.943
Butea monosperma	123.350	57.563	8.223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	189.136
Chloroxylon swietenia	115.126	49.340	24.670	8.223	24.670	24.670	0.000	0.000	0.000	0.000	0.000	246.699
Lagerstroemia parviflora	57.563	8.223	8.223	8.223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	82.233
Tectona grandis	16.447	8.223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	24.670
Terminalia crenulata	49.340	24.670	24.670	16.447	0.000	8.223	0.000	0.000	0.000	0.000	0.000	123.350
Miscellaneous	238.476	115.126	90.456	65.787	41.117	16.447	8.223	0.000	0.000	0.000	0.000	575.632
All species total	1471.974	386.496	197.360	115.126	65.787	49.340	8.223	0.000	0.000	0.000	0.000	2294.305

Contents

Table 6.3T

TOTAL STEMS AND STEMS/HA OF WARDHA DISTRICT

AREA 71542.703125

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	929233	90456	57563	24669	0	0	0	0	0	0	0	1101923
Per ha	12.989	1.264	0.805	0.345	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.402
Anogeissus latifolia	542738	353601	148019	90456	16446	0	8223	0	0	0	0	1159485
Per ha	7.586	4.943	2.069	1.264	0.230	0.000	0.115	0.000	0.000	0.000	0.000	16.207
Butea monosperma	912785	485174	98679	49339	8223	0	0	0	0	0	0	1554203
Per ha	12.759	6.782	1.379	0.690	0.115	0.000	0.000	0.000	0.000	0.000	0.000	21.724
Chloroxylon swietenia	805883	402941	197359	90456	32893	32893	0	0	0	0	0	1562426
Per ha	11.264	5.632	2.759	1.264	0.460	0.460	0.000	0.000	0.000	0.000	0.000	21.839
Lagerstroemia parviflora	345378	65786	65786	8223	8223	0	0	0	0	0	0	493397
Per ha	4.828	0.920	0.920	0.115	0.115	0.000	0.000	0.000	0.000	0.000	0.000	6.897
Tectona grandis	5304025	2508104	1167707	378271	189135	24669	16446	8223	0	0	0	9596584
Per ha	74.138	35.057	16.322	5.287	2.644	0.345	0.230	0.115	0.000	0.000	0.000	134.138
Terminalia crenulata	197359	180912	98679	32893	8223	24669	16446	8223	0	0	0	567407
Per ha	2.759	2.529	1.379	0.460	0.115	0.345	0.230	0.115	0.000	0.000	0.000	7.931
Miscellaneous spp	1339737	649640	337155	246699	82233	90456	24669	16446	0	0	0	2837038
Per ha	19.425	9.080	4.713	3.448	1.149	1.264	0.345	0.230	0.000	0.000	0.000	39.655
All species total	0427141	4736618	2170950	921009	345378	172689	65786	32893	0	0	0	18872464
Per ha	145.747	66.207	30.345	12.874	4.828	2.414	0.920	0.460	0.000	0.000	0.000	263.793

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Table 6.4T(A)

VOLUME PER HA OF TEAK FOREST OF WARDHA DISTRICT

AREA 55918.4 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	0.163	0.033	0.040	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.293
Anogeissus latifolia	0.189	0.802	0.736	0.606	0.195	0.000	0.186	0.000	0.000	0.000	0.000	2.714
Butea monosperma	0.440	0.608	0.204	0.157	0.032	0.000	0.000	0.000	0.000	0.000	0.000	1.443
Chloroxylon swietenia	0.489	0.684	0.649	0.535	0.064	0.096	0.000	0.000	0.000	0.000	0.000	2.517
Lagerstroemia parviflora	0.241	0.118	0.282	0.000	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.753
Tectona grandis	4.576	5.701	4.838	2.395	1.888	0.299	0.298	0.216	0.000	0.000	0.000	20.210
Terminalia crenulata	0.114	0.305	0.264	0.107	0.062	0.174	0.278	0.229	0.000	0.000	0.000	1.533
Miscellaneous	0.644	0.889	0.745	0.934	0.306	0.748	0.257	0.346	0.000	0.000	0.000	4.869
All species total	6.857	9.140	7.757	4.790	2.658	1.317	1.020	0.791	0.000	0.000	0.000	34.330

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Table 6.4T(B)

VOLUME (000)M^3 IN TEAK FOREST OF WARDHA DISTRICT

ARRA 55918.4 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	9.138	1.865	2.244	3.163	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.410
Anogeissus latifolia	10.564	44.829	41.141	33.899	10.901	0.000	10.417	0.000	0.000	0.000	0.000	151.753
Butea monosperma	24.632	34.019	11.400	8.798	1.815	0.000	0.000	0.000	0.000	0.000	0.000	80.663
Chloroxylon swietenia	27.347	38.233	36.289	29.915	3.588	5.358	0.000	0.000	0.000	0.000	0.000	140.729
Lagerstroemia parviflora	13.498	6.616	15.770	0.000	6.196	0.000	0.000	0.000	0.000	0.000	0.000	42.081
Tectona grandis	255.864	318.804	270.510	133.903	105.561	16.743	16.653	12.080	0.000	0.000	0.000	1130.116
Terminalia crenulata	6.379	17.048	14.763	5.957	3.470	9.728	15.565	12.786	0.000	0.000	0.000	85.696
Miscellaneous	36.007	49.685	41.655	52.219	17.122	41.803	14.395	19.353	0.000	0.000	0.000	272.239
All species total	383.428	511.099	433.772	267.854	148.653	73.631	57.030	44.220	0.000	0.000	0.000	1919.688

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Table 6.5T(A)

VOLUME PER HA^{3} IN MISCELLANEOUS FORESTS OF WARDHA DISTRICT

AREA 15624.3 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	0.845	0.220	0.182	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.247
Anogeissus latifolia	0.833	0.557	0.127	0.517	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.034
Butea monosperma	0.259	0.299	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.616
Chloroxylon swietenia	0.293	0.340	0.404	0.213	0.797	1.072	0.000	0.000	0.000	0.000	0.000	3.120
Lagerstroemia parviflora	0.128	0.067	0.125	0.205	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.524
Tectona grandis	0.060	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.119
Terminalia crenulata	0.147	0.166	0.321	0.352	0.000	0.331	0.000	0.000	0.000	0.000	0.000	1.317
Miscellaneous	0.524	0.723	1.086	1.190	1.066	0.633	0.385	0.000	0.000	0.000	0.000	5.608
All species total	3.089	2.431	2.304	2.477	1.863	2.037	0.385	0.000	0.000	0.000	0.000	14.584

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Table 6.5T(B)

VOLUME (ØØØ)M^3 IN MISCELLANEOUS FORESTS OF WARDHA DISTRICT

AREA 15624.3 HA

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	13.203	3.431	2.850	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	19.485
Anogeissus latifolia	13.016	8.706	1.989	8.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	31.786
Butea monosperma	4.041	4.675	0.903	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.620
Chloroxylon swietenia	4.580	5.310	6.315	3.328	12.456	16.752	0.000	0.000	0.000	0.000	0.000	48.741
Lagerstroemia parviflora	1.999	1.042	1.952	3.199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.191
Tectona grandis	0.938	0.920	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.858
Terminalia crenulata	2.290	2.597	5.019	5.502	0.000	5.171	0.000	0.000	0.000	0.000	0.000	20.579
Miscellaneous	8.193	11.300	16.966	18.593	16.650	9.897	6.015	0.000	0.000	0.000	0.000	87.614
All species total	48.259	37.981	35.995	38.698	29.106	31.819	6.015	0.000	0.000	0.000	0.000	227.872

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Table 6.6T

TOTAL VOLUME AND VOLUME/HA OF ALL STRATA COMBINED IN WARDHA DISTRICT

AREA 71542.703125

SPECIES DESCRIPTION	DIAMETER CLASSES IN CM											
	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80+	Total
Acacia catechu	22340	5296	5094	3163	0	0	0	0	0	0	0	35894
Per ha	0.312	0.074	0.071	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.502
Anogeissus latifolia	23580	53534	43130	41974	10901	0	10417	0	0	0	0	183538
Per ha	0.330	0.748	0.603	0.587	0.152	0.000	0.146	0.000	0.000	0.000	0.000	2.565
Butea monosperma	28673	38694	12303	8797	1814	0	0	0	0	0	0	90283
Per ha	0.401	0.541	0.172	0.123	0.025	0.000	0.000	0.000	0.000	0.000	0.000	1.262
Chloroxylon swietenia	31926	43543	42604	33242	16044	22109	0	0	0	0	0	189469
Per ha	0.446	0.609	0.596	0.465	0.224	0.309	0.000	0.000	0.000	0.000	0.000	2.648
Lagerstroemia parviflora	15497	7658	17721	3199	6196	0	0	0	0	0	0	50272
Per ha	0.217	0.107	0.248	0.045	0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.703
Tectona grandis	256801	319723	270509	133902	105560	16742	16652	12080	0	0	0	1131974
Per ha	3.589	4.469	3.781	1.872	1.475	0.234	0.233	0.169	0.000	0.000	0.000	15.822
Terminalia crenulata	8668	19644	19781	11459	3470	14898	15565	12786	0	0	0	106274
Per ha	0.121	0.275	0.277	0.160	0.049	0.208	0.218	0.179	0.000	0.000	0.000	1.485
cellaneous spp	44199	60984	58621	70812	33771	51699	20409	19353	0	0	0	359852
Per ha	0.618	0.852	0.819	0.990	0.472	0.723	0.285	0.271	0.000	0.000	0.000	5.030
species total	431687	549080	469766	306551	177759	105450	63045	44219	0	0	0	2147560
Per ha	6.034	7.675	6.566	4.285	2.485	1.474	0.881	0.618	0.000	0.000	0.000	30.018

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ANNEXURE - I

LIST OF COMMON TREES, SHRUBS, CLIMBERS, BAMBOOS AND GRASSES OCCURRING IN THE FORESTS OF WARDHA DISTRICT

Local Name	Botanical Name	Natural order (Family of the plant).
1	2	3
	TREES	
Al.	Morinda tinctiraia Roxb.	Rubiaceae
Amba	Mangifera indica Linn.	Anacardiaceae
Anjan	Hardwickia binata Roxb.	Leguminosae (Caesalpineae)
Apta	Bauhinia recemosa Lamk	-do-
Arati	Mimosa hamata	Leguminosae. (Mimoseae)
Arjun sadada	Terminalia arjuna wight and Arn.	Combretaceae.
Asana	Bridelia retusa spreng.	Euphorbiaceae.
Awali or Amla.	Emblica officinalis Gaert.	-do-
Babul	Acacia arabica willd.	Leguminosae(Mimoseae)
Bel	Aegle marmelos corr.	Rutaceae.
Beheda	Terminalia belerica	Combretaceae.
Bahawa	Cassia fistula Linn.	Leguminosae (Caesalpineae)
Bhendi	Thespesia populnea corr.	Malvaceae.
Bhokar	Cordia dichotoma -Forst F.	Borageineae.
Bhutkes	Elaeodendron Ilaucum	Celastraceae.
Bibla or Bija	Pterocarpus marsupium	Leguminosae (Papilionaceae)
Boodara	Lagerstroemia parviflora Roxb.	Lythraceae
Bor	Zizyphus mauritiana Lamk	Rhamnaceae.
Chinch	Tamarindus indica Linn.	Leguminosae (Caesalpineae)
Charoli	Buchanania lanzan spreng.	Anacardiaceae
Chinchola	Albizzia lebbek	Leguminosae(Mimoseae)
Dhaman	Grewia tiliaefolia vahl.	Tiliaceae.
Dhavada	Anogeissus latifolia Wall	Combretaceae
Dhudhi kuda	Holarrhena antidysenterica (BR) wall.	Apocynaceae
Gadhad khair.	Acacia ferruginea willd	Leguminosae (Mimoseae)
Ghatbor	Zizyphus xylopyra willd.	Rhamnaceae
Ghela(Gel)	Randia dumetorum lamk	-do-

Contents

1	2	
Gorad	Albezzia procera benth	Leguminosae(Mimoseae)
Hed (Haladu) (Haladwan)	Adina cordifolia Hook F	Rubiaceae
Hingan	Belanites aegyptiaca Del.	Simarabeae.
Hirda	Terminalia chebula Retz.	Combretaceae.
Hiwar	Acacia leucophloea willd.	Leguminosae
Humb	Saccopetalum tomentosum H.f&t	Anonaceae
Jambul	Syzygium cumini (Linn) skeels	Myrtaceae.
Kadai	Sterculia urens roxb	Sterculiaceae
Kaddhaman	Grewia villosa	Tiliaceae.
Kakad	Garuga pinnata roxb	Burseraceae.
Kamala	Mallotus philippinensis Muel.	Euphorbiaceae.
Kalamb	Stephegyne parvifolia Roxb)-korth.	Rubiaceae.
Kala siras	Albizzia odoratissima bength	Leguminosae (Mimoseae)
Kansar	Albizzia amara bength	-do-
Karanj	Pongamia pinnata(linn.) Pigrre.	Leguminosae (Papilionaceae)
Khair	Acacia catechu willd.	Leguminosae(Mimoseae)
Koshimb (Kusuk)	Schliechera oleosa (Lour)Oken.	Sapindaceae.
Kudi(Kodai)	Wrightia tinctoria Br.	Apocynaceae.
Kumbi	Careya arborea Roxb.	Mytraceae.
Medsing	Dolichandrone falcata seem	Bignoniaceae
Modal (Mohin)	Lannea coromandelica(Hort) Merra.	Anacardiaceae
Muhuwa (Moowra)	Madhuca indica Gmel.	Sapotaceae.
Nana-	Lagerstroemia lanceolata Dalz & Gibs.	Lythraceae.
Nimb(Neem)	Azadirachta indica Juss	Meliaceae
Nimbara	Melia dubia Heirn.	-do-
Palas	Butea monosperma (Lamk)Taub.	Leguminosae (Papilionaceae)
Pangara	Erythrina indica Lam.	-do-
Petara	Gardenia turgida Roxb	Rubiaceae
Phasi	Dalbergia paniculata Roxb.	Leguminosae (Papilionacea).
Pimpal	Ficus religiosa Linn.	Urticaseae.
Payar (Pimpri)	Ficus Pumphii Blume	-do
Ritha	Sapindus emarginatus Vehl	Sopindaceae.
Rohin	Soymida febrifuga Adr.Fuss	Meliaceae..
Sadada	Terminalia tomentosa Wight and Arn.	Combretaceae

Contents

Sag	Tectona grandis Linn.	Verbenaceae.
Salai	Boswellia serrata Roxb.	Burseraceae
Savar (Semal)	Salmalia malabrica (D.C.) Schott and Endl.	Malvaceae.
Shewga	Moringa oleifera Lamk	Morginceae.
Shiwan	Gmelina arboria Linn.	Verbenaceae.
Sissu (Shisham)	Dalbergia latifolia (Roxb)	Leguminosae. (Papilionaceae).
Kinhai	Albizzia procera Benth.	Leguminosae (Mimosoae)
Tembhuri	Diospyros peregrina (Gaerth) Gurke.	Ebenaceae.
Tiwas	Ougeinia oojeinensis (Roxb.)Hochveut.	Leguminosae (Papolionaceae).
Umbar	Ficus glomerata (Rixb)	Urticaceae.
Wad	Ficus bengalensis Linn.	-do-

S H R U B S

Ati	Helicteres isora Linn.	Sterculiaceae.
Murudsheng		
Bhamini (Bhaman)	Colebroockia Oppositifolia(Smith)	Lebiatae.
Dhatti	Woodfordia fruticosa Saligb	Lythreceae
Ghaneri	Lantana camara L.	Verbenaceae.
Ghoti	Zizyphus xylopyra Wiild.	Rhamnaceae.
Shaypat	Agave cantala Schaver	Amaryllidaceae.
Henkal	Gymnosporia spinos(Forsk) Fiori	Celastraceae.
Karwi	Carvia callosa Wight and Arn.	Acanthanceae.
Karwand	Carissa carandas Linn.	Apocynanceae.
Kanguli (Bandgul)	Dendrophthoe falcata	Loranthaceae.
Kutri	Solanum gigenteum Linn. (Lecg.)	Solanaceae
Nivdung	Opuntia dilleni mill(Haw)	Cactaceae
Nirgudi	Vitex magundo Roxb.	Verbenaceae.
Parhenkal	Flacourtia indica Roxb.	Bixaceae.
Rantulas	Ocimumbasilycum(Canum)Sims.	Labiatae
Rui	Calotropis gigantea Br.	Asceepiadaceae.
Sabri Sabar	Euphorbia nerifolia Dalz	Euphorbiaceae.
Tarwad	Cassia auriculata L.	Laguminosae (Caesalpineae).
Turan	Zizyphus rugosa Lam	Rhamnaceae.
Thor	Euphorbia ligularia L.	Euphorbiaceae.
Velatur (Vurtuli)	Dichrostachys cinerea Wight and Arr.	Leguminosae (Mimosene)

Contents

H E R B S

Bhinguli	Indigofera ennaephylla Linn.	Leguminosae (Papilionaceae)
Rankel (Chivni)	Ensete superbum(Roxb) cheesman.	Scitamineae.
Tarota (Takla)	Cassia tora W & A.	Leguminosae (Papilionaceae)
Safed musali	Asparagus adscendens Bak	Liliaceae

C L I M B E R S

Argar	Millettia auriculata	Leguminosae. (Papilionaceae)
Alsi	Dalbergia volubilia Roxb.	-do-
Chilhar (Chillari)	Caesalpinia sepiaria Roxb.	Leguminosae (Caesalpineae)
Chambuli	Bauhinia vihili W & A prod.	-do-
Gunj	Abrus precatorius Linn.	-do-(Papilionaceae)
Kantherbal	Capparis sepiaria Linn.	Capparidaceae.
Modwel	Conbretum ovalifolium Roxb.	Combretaceae.
Palaswel.	Butea superba Roxb.	Leguminosae (Papilionaceae)
Ukshi	Calycopteris floribunda Lam.	Combretaceae.

B A M B O O S

Kashti	Bambosa arundinacea Willd	Gramineae.
Manwel, (Tokar) Bamboos.	Dendrocalamus strictus Neos	-do-

G R A S S E S

Bhuti	Aristida funiculata	Gramineae(Poaceae)
Bora	Andropogan halepensis Pers.	-do-
Gondwel (Tamadgota)	Andropogan pumilus Roxb.	-do-
Hariyali	Cynodon dactylon Pers	-do-
Husali (Kusali)	Heteropogon contortus Linn.	-do-
Kathora	Bothriochloa pertusa	-do-
Kunda	Ischaemum pilosum(Flacks)	-do-
Kowla	Setaria glauca Beauv.	-do-
Marvel	Dichanthium annulatum	-do-
Moshi	Iseilema laxum Hack	-do-
Pavanya	Schima sulcatum	-do-
Phulia	Apludo varia Hack	-do-
Rosha	Cymbopogon martini (Roxb.) Wats.	-do-
Sheda	Schima nervosum	-do-

Contents

ANNEXURE II

LIST OF TOPOSHEETS

Toposheets	Scale	Year of survey.
55 K/3	1:50,000	1967-68
55 K/4	"	1967-68
55 K/7	"	1974-75
55 K/8	"	1967-68
55 K/12	"	1974-76
55 L/1	"	1977-78
55 L/5	"	1976-77
55 L/6	"	1976-77
55 L/7	"	1976-77
55 L/9	"	1976-77
55 L/10	"	1976-77
55 L/11	"	1976-77
55 L/13	"	1976-77
55 L/14	"	1976-77
55 L/15	"	1976-77
55 P/2	"	1974-75
55 P/3	"	1974-75

Contents

ANNEXURE - III

BIBLIOGRAPHY

1. A Statistical Outline - Current Salient Forest Statistics, 1994, M.S.

2. Working Plans of Wardha district

3. Socio-economic Reveiw and District Statistical Abstract of Wardha district.

4. District Census Hand Book (Wardha district)

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Contents

ANNEXURE - IV

LIST OF OFFICERS AND STAFF ASSOCIATED WITH SURVEY WORK IN WARDHA DISTRICT OF MAHARASHTRA STATE.

1. S/Shri P.V.Savant, IFS, Joint Director.
2. S.B. Elkunchwar,IFS, Deputy Director.
3. M.D.Singh,STA
4. B.R.Pandey,STA
5. M.K.Madaria,JTA
6. P.R.Singh,JTA
7. R.P.Sao,JTA
8. R.K.Mahobe,JTA
9. S.K.Bajpai,JTA
10. J.S.Kumbhkar,JTA
11. N.P.Singh, Dy.Ranger
12. M.H.Kanoje, Dy.Ranger
13. G.G.Pathak, Dy.Ranger
14. Jagdeo Prasad, Dy.Ranger
15. C.S.Rawat, Fieldman
16. Fagoo Ram, Fieldman
17. M.K.Singh, Fieldman
18. Sarwan Das, Fieldman
19. B.P.Sharma, Fieldman
20. L.N.Kuril, Fieldman
21. Bansi Ram, Fieldman
22. R.P.Thapliyal, Fieldman
23. P.A.Swamy, Fieldman
24. Dwarika Prasad, Fieldman
25. Chandan Singh, Fieldman
26. R.R.Singh, Fieldman
27. Ramadhin Yadav, Fieldman
28. Bharat Singh, Fieldman
29. Dharam Deo, Driver
30. R.S.Pandey, Driver
31. R.S.Ukey, Driver
32. V.J.Gondane, Driver
33. N.C.Malakar, Driver
34. David Kumar, Driver

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Contents

ANNEXURE V

F. S. I. CZ. NGP

Field Form No. 1

PLOT APPROACH FORM

(1) Plot Approach Form must be filled in while the journey is in progress.

(2) While recording data, it is essential to record month and years also.

(3) If a plot is visited on more than one day, a separate form for each visit shall be filled up.

1. State and Code .....
2. Division and Code .....
3. District and Code .....
4. Map-sheet and Code .....
5. Grid Code .....
6. Crew Leader (name) .....
7. Name of Camp .....
8. Time (hrs. at which left the camp) .....
9. Distance covered by Vehicle (km.) .....
10. Time taken in journey by vehicle ..... Hours ..... Minutes .....
11. Name of the place upto which journey was performed by vehicle (describe in brief) .....
12. Conspicuous features observed during the journey by vehicle (describe in brief) .....
13. Time at which started on foot (hrs.). .....
14. Direction and distance covered on foot upto the reference point (Km.) .....
15. Conspicuous features observed during the journey on foot (describe in brief) .....
16. Time (hrs.) at which arrived at the reference point. .....
17. Description of the reference point .....
18. Compass bearing from reference point to the plot approached for commencing survey (please give the plot No. also) .....
19. Distance of the plot from reference point (Mtrs.) .....
20. Date and time at which arriving at the plot. .....
21. Time (hrs. of leaving the plot) .....
22. Time (hrs. at which returned to the camp). .....

Contents

Name and Signature

23. Compassing done by .....
24. Distance measured by .....
25. Plot laid out by .....
26. Tree enumeration done by .....
27. Height measurements taken by .....
28. B. T. and other measurements taken by .....
29. Bamboo enumeration done by .....
30. Bamboo weight taken by .....
31. Reference in the field written by .....
32. Remarks .....

Date :

Signature of the Crew Leader.

Diagrams etc.

A

B

Contents

PLOT DESCRIPTION FORM **Field Form No. 2**

Job No.	Card design	Zone	State	District	Forest Division	Map sheet No.	Grid No.	Plot No.	Legal status	Land use
1–3	4–5	6	7–8	9–10	11–12	13–18	19–22	23	24	25–26

Terrain data							Soil data					
General Topography	Slopes	Position on slope	Altitude	Aspect	Rockiness	Humus	Soil colour	Soil consistency	Soil texture	Coarse fragments	Soil depth	Soil erosion
27	28-30	31	32-35	36	37	38	39	40	41	42	43	44

Crop data								Bamboo data							
Origin of stand	Crop composition	Canopy layer or storey	Top height	Size class	Intensity of regeneration	Important species	Injuries to crop	Fire incidence	Grazing incidence	Presence of Weeds	Presence of grass	Bamboo density	Bamboo quality	Bamboo flowering	Bamboo regeneration
45	46-47	48-49	50-51	52	53	54-56	57	58	59	60	61	62	63	64	65

Plantation potential	Road distance	Mud path distance	River distance	Kucha road	Pucca road	River distance to market outlet	Obstacles	Plot status	Degraded forests
66	67	68	69	70-71	72-74	75-76	77	78	79-80

Signature of Crew leader........................

Name of Crew leader........................

Contents

Job No.	Card Design	Mapsheet No.	Grid No.	Plot No.
1-3	4-5	6-11	12-15	16

FIELD FORM No. 3

PLOT ENUMERATION FORM

Total No. of bamboo clumps	Total No. of trees
71-73	74-76

Species		Species		Species		Species		Species		Species		Species		Species		Species	
Code	Dia	Code	Dia	Code	Dia	Code	Dia	Code	Dia	Code	Dia	Code	Dia	Code	Dia	Code	Dia
17-19	20-22	23-25	26-28	29-31	32-34	35-37	38-40	41-43	44-46	47-49	50-52	53-55	56-58	59-61	62-64	65-67	68-70

Contents

Date .....

Signature of Crew Leader .....

Name of Crew Leader .....

FIELD FORM No. 4

SAMPLE TREE FORM

Job No.	Card Design	Map Sheet No.	Grid No.	Plot No.
1-3	4-5	6-11	12-15	16

Total No. of Trees
55-—56

SPECIES	Tree Serial No.	Species Code	Dominance	D. B. H. OB (cm)	D. B. T. (mm)	Tree Height (m)	Clear bole (m)	Condition	Longitudinal	Sectional	SPECIES	Tree Serial No.	Species Code	Dominance	D. B. H. OB (cm)	D. B. T. (mm)	Tree Height (m)	Clear bole (m)	Condition	Longitudinal	Sectional
	17-18	19-21	22	23-25	26-28	29-30	31-32	33	34	35		36-37	38-40	41	42-44	45-47	48-49	50-51	52	53	54

Signature of Crew Leader _____

Contents

BAMBOO ENUMERATION FORM

Field Form 5

Job No.	Card Design	Map sheet No.	Grid No.	Plot No.
1-3	4-5	6-11	12-15	16

Average culm height (in cm.)		Bamboo quality
Upto 1 cm top dia.	Upto 2 cm top dia.	78
72-74	75-77	

Species	Species Code	Clump Sl. No.	Clump diameter (cm.)	Clump size class	Green sound culms							Green damaged culms							Dry sound culms			Dry damaged culms			Decayed culms	Total
					Current	One to two seasons old			Over two seasons old			Current	One to two seasons old			Over two seasons old										
						2-5 Cms	5-8 Cms	8+ Cms	2-5 Cms	5-8 Cms	8+ Cms		2-5 Cms	5-8 Cms	8+ Cms	2-5 Cms	5-8 Cms	8+ Cms	2-5 Cms	5-8 Cms	8+ Cms	2-5 Cms	5-8 Cms	8+ Cms		
	17-19	20-22	23-25	26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	41-42	43-44	45-46	47-48	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-71

Date .....

Signature of Crew Leader .....

Name of Crew Leader .....

Contents

BAMBOO WEIGHT FORM

Field Form No. 7

Job No.	Card Design
1—3	4—5

Mapsheet No.	Grid No.	Plot No.
6—11	12—15	16

Species Code	Sample No.	Green Weight of culm																		Green Weight of sub-sample		
		2 to under 5 cm.					Diameter Class 5 to under 8 cm.					8 cm. and over										
		Dia. in cm.	Total length in dmt.	Utilizable length in dmt.		Weight in Grams	Dia. in cm.	Total length in dmt.	Utilizable length in dmt.		Weight in Grams	Dia. in cm.	Total length in dmt.	Utilizable length in dmt.		Weight in Grams	Sub-Samples culms 2-5	Sub-Samples culms 5-8	Sub-Samples culms 8+
				Upto 1 cm. top dia.	Upto 2 cm. top dia.				Upto 1 cm. top dia.	Upto 2 cm. top dia.				Upto 1 cm. top dia.	Upto 2 cm. top dia.				
17-19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64-68	69-72	73-76	77-80

Date _____

Signature of Crew Leader _____

Name of Crew Leader _____

Conten