

T.F.I. Unit



GOVERNMENT OF INDIA
MINISTRY OF
ENVIRONMENT AND FORESTS

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**REPORT
ON
INVENTORY OF NON-FOREST AREA
IN
WARDHA DISTRICT
(MAHARASHTRA STATE)**



**FOREST SURVEY OF INDIA
CENTRAL ZONE
NAGPUR
2003**

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PREFACE

Over the years it was observed that assessment of growing stand & stock on non-forest areas has not attracted anybody's attention particularly those of the policy makers in the forestry sector. Forest Survey of India, for the first time undertook inventory of trees growing on non-forest areas in 1991 in selected districts across the country. The growing stand on revenue lands/non-forest areas are not included in the definition of 'forest' or 'forestlands'. The trees growing outside the conventional forest areas i.e. on agricultural lands, meadows, grazing lands, unproductive or wastelands along canal/railway sides, in and around human settlements, urban lands etc. have numerous, often essential roles and functions. These trees make a critical contribution to sustainable agriculture, food security and rural household economies. Besides providing useful products including timber, fuelwood, fodder, fruits, bark etc., these also render a variety of services to mankind such as bio-diversity, carbon storage, micro-climatic stabilization, habitat for wildlife similar to the forests. These also protect crops against wind & soil erosion.

Inventory of non-forest area of Wardha district was carried out by the Central Zone of FSI, in 1994-95. The survey results reveal that there are an estimated 5578976 in non-forest area of the district with 10.26 stems/ha. and a corresponding volume of 1424933 cu. m. and 2.62 cu. m./ha. It is seen that maximum tree cover exists on Village woodlots around the villages which is a significant departure from what has been observed in non-forest areas of other districts. An estimated $\frac{3}{4}$ th the growing stand and $\frac{2}{3}$ rd of the growing stock is formed by the Village woodlots. Farm Forestry sector occupies the second position.

Shri. P.M. Bhatt IFS, Dy. Director assisted by Shri. Anil Biala STA drafted this report under the able guidance of Dr. F. S. Jafry IFS, Regional Director. The efforts made in bringing out this report are highly appreciated. I trust that the report gives indicative information on tree vegetation in non-forest area of Wardha district and the same will be useful to user agencies.

ACKNOWLEDGEMENTS

On behalf of Forest Survey of India, Central Zone, Nagpur, I express a deep sense of gratitude and sincere thanks to the office bearers of the Village Panchayats as well as to the villagers of Wardha district for extending every possible help, co-operation and hospitality to the field staff of this organization and making their stay comfortable during the course of field survey without which the field inventory could not have been completed within the stipulated time.

I am also thankful to the Collector, Wardha district and other revenue officials for providing useful information required for the inventory of trees outside forest area of the district. Thanks are also due to the Conservator of Forests, Nagpur Circle, the Deputy Conservators of Forests, Wardha Forest Division and the field staff who extended much needed help and co-operation to our field parties without which it would not have been possible to complete this survey.

Forest Survey of India
Central Zone, Nagpur.

Dr. Tejinder Singh,
Regional Director

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CHAPTER – I

GENERAL

1.1 INTRODUCTION:

The Pre-Investment Survey of Forest Resources (PISFR) was created in 1965 as a joint project of Food & Agriculture Organization (FAO) of United Nations Development Programme (UNDP) and Government of India (GOI) to collect forest data and present it on scientific lines for forestry planning. The joint project ended in 1968 and PISFR started functioning as a GOI organization. In 1976, the National Commission on Agriculture converted the Pre-Investment Survey of Forest Resources into National Forest Resources Survey Organization to carryout country-wide comprehensive forest resources surveys at regular intervals and present the information in suitable form for the use of planning purposes at the national, the state and the local levels. The National Forest Resources Survey Organization was re-christened as **Forest Survey of India (FSI)** with effect from 1st June 1981, with its headquarters at Dehradun and four zonal offices, namely, Northern Zone at Shimla, Central Zone at Nagpur, Eastern Zone at Kolkata and Southern Zone at Bangalore. The main activities of Forest Survey of India include the following:

- * To prepare Forest Cover/Vegetation Maps of the country on 1: 2,50,000 scale and comprehensive biennial "**State of Forest Report**" (**SFR**) including **National Vegetation Map (NVM)**.
- * To prepare **Thematic Maps (TM)** on 1: 50,000 scale depicting forest types and density classes by visual interpretation of aerial photographs procured from the Survey of India.
- * To carry out **Inventory of Forest Resources** in conventional forest areas of selected States/Union Territories.
- * To carryout **inventory of trees outside conventional forest areas** (non - forest areas) in villages/towns/cities of selected districts falling in different physiographic zones across the country.
- * To **design methodologies for forest surveys** and subsequent updating.

- * To conduct **Wood Consumption Studies** in villages/towns/cities of selected districts of States/Union Territories.
- * To **impart training in modern forest survey techniques** to forestry personnel working at various levels in Forest Departments of the States/UTs.
- * To **support and oversee techniques/inventory work** undertaken by the Forest Departments of States/UTs.

The inventory of tree species growing outside conventional forest areas in the country was first carried out by Forest Survey of India in 1991, with an aim to assess the extent of growing stock on non-forest areas. The rural populace in India has been planting tree species in their homestead, agricultural lands, waste lands, community lands, as well as along the road sides, canal banks, sides of railway lines etc., to meet their immediate requirements of fuel, fodder, agricultural implements and timber etc. Inventory in non-forest areas of Wardha district of Maharashtra State was carried out by this zone during 1993-94 simultaneously with forest inventory of the district with an objective to assess the growing stock existing on revenue lands, i.e. the areas other than the Reserved Forests, the Protected Forests and various categories of un-classed forests in the vicinity of villages.

1.2 LOCATION:

Wardha district is historically important district in Vidarbha region of Maharashtra State. The renowned Bhoodan leader of yester years Vinobha Bhave hailed Paunar, a place quite near to the district headquarters Wardha town. The district is located between 20° 28' and 21° 21' north latitude and between 78° 30' and 79° 15' east longitude. The district is bounded by Nagpur district in the north, Amravati district in the west, Yavatmal district in the south and Chandrapur district in the east. The river "Wardha" forms the boundaries of the district with Amravati and Yavatmal districts. The district headquarters is well connected with rest of the country by rail and roads.

1.3 TOPOGRAPHY:

The southern slopes of Satpuda hill ranges lie towards northern part of the district. Ashti, Arvi and Karanja tehsils are located in this region. The remaining part of the district lies between the river Wardha and the river Vena. Most of the areas are covered by thick layers of volcanic eruptions approximately 400 mt in thickness

1.4 DRAINAGE:

The Wardha is the most important river of the district. It originates from the Satpuda hills near Multai in Betul district of Madhya Pradesh and flows along northern and western boundary of the district. The rivers, Yashoda, Vena and Bakli are the main contributories of the river Wardha. The vena originates in Nagpur district and flows through Hinganghat before joining the river Wardha near Sawangi village. The river Yashoda originates in Arvi tehsil, flows through Deoli tehsil before joining the river Wardha.

1.5 CLIMATE:

The climate of the district is generally dry. There are three distinct seasons viz. Summer, winter and rainy season. March onwards there is continuous rise in temperature. May is the hottest while December is the coldest month of the year. The maximum temperature goes up to 46°C and the minimum temperature occasionally touches the low of 9.4°C There is appreciable drop in the temperature with the on set of monsoon. Most of the rainfall is received in July and August. The average annual rainfall 1160 mm.

1.6 PHYSIOGRAPHIC ZONE:

The country has been divided into 14 physiographic zones. Primarily, the entire Maharashtra State comprises 3 physiographic zones viz. 1. North Deccan (code-08), 2. Western Ghats (code-11) and 3. West Coast (code-13). Wardha district falls under North Deccan physiographic zone.

1.7 AREA AND POPULATION:

The district is spread over a geographical area of 6310 sq. km. The forest area is 847 sq. km. Therefore the net non-forest area of the district works out to 5435 sq. km. The total population of the district as per 2001 census is 1230640 with 635751 males and 594889 females. The decadal rate of growth is 15.30%. The rural population of the district has been recorded as 905695 and the urban as 324945. As such 73.54% of the total population inhabit rural areas and the remaining 16.46% dwell in urban areas. The population density has been recorded at 195 persons per sq. km. and 80.50% of the population is literate.

1.8 SOCIO-ECONOMIC SCENARIO:

The district predominantly has an agrarian economy. Most of the area is irrigated with major irrigation dams covering a cumulative area of 13348 ha. It is expected that these irrigation projects will provide water to an estimated 34872 ha area in the near future. Besides, an estimated 75000 ha area is expected to be brought under irrigation on completion of the Upper Wardha, Lower Wardha and Lower Vena irrigation projects. 92% of the villages in Wardha have been electrified. The Maharashtra Industrial Corporation (MIDC) has set up an industrial estate at a distance of 6 km. from Wardha town over an area of 313.19 ha. There are 173 registered industrial units in the district that have employed many people. There is a road net work of 1856 km. in rural areas and 121 km. in urban areas of the district.

1.9 ADMINISTRATIVE UNITS:

The district with its headquarters at Wardha town forms an important part of Vidharba region of Maharashtra state and covered under Nagpur revenue division. There are 8 tehsils comprising 909 inhabited villages. The district has 8 Panchayat Samitis, 517 Gram Panchayats and 7 towns

CHAPTER – II

DESIGN AND METHODOLOGY

2.1 DESIGN:

The sample size, i.e. number of sample villages to be considered for non-forest inventory, was determined by conducting a pilot survey in 12 villages in equal number of district spread over different physiographic zones covering the entire state of Maharashtra. The total geographical area of the State is 307713 sq. km. The forest and non-forest area of State are 63767 sq. km. and 243946 sq. km. respectively. As per 1991 Census, the State had 39354 inhabited villages in total. On the basis of pilot survey, 351 sample villages were determined to be taken up for detailed non-forest inventory in whole of the State. These were distributed among various districts according to their geographical areas. Accordingly, 8 sample villages were selected randomly in Wardha district for inventory of non-forest area.

2.2 SELECTION OF SAMPLE VILLAGES IN THE DISTRICT:

A list of villages was prepared consulting the toposheets covering the entire Wardha district. From the above list, 8 sample villages were randomly selected using random number table. The details of sample villages so selected are given below:

Table 2.1: LIST OF SAMPLE VILLAGES SELECTED FOR THE SURVEY:

Sl. No.	Name of sample village	Area of sample village (Ha.)	Map sheet No.	Total No. of	
				Trees	Bamboo clumps
1.	Anji	1148.61	55 I/09	13514	009
2.	Bothli	256.14	- do -	3837	009
3.	Chistur	189.93	55 K/04	1717	008
4.	Jamkhuta	295.00	55 K/08	3556	025
5.	Ladki	1249.28	55 I/15	14553	016
6.	Nandpur	441.52	55 I/09	8160	003
7.	Palora	630.00	55 K/08	4815	107
8.	Sirpur	868.39	55 I/06	4561	025

2.3 DEFINITION OF NON- FOREST AREA:

For the purpose of this survey, which are outside the forestlands shown by green wash or indicated as Reserved Forests, Protected Forests and unclassed forest boundaries on the map sheets, have been considered as non-forest areas i.e. mostly revenue lands whether under private occupation or under any village panchayat or a community have been considered for this survey.

2.4 METHODOLOGY:

The selected sample villages were allotted to field crews, each headed by a Junior Technical Assistant and assisted by one Deputy Ranger, two Fieldmen. A Khalasi and two local unskilled labourers were also engaged to assist the crews in camping arrangement and identifying boundaries of the villages in the course of data collection. The sample villages were marked on toposheets to facilitate approach and location of villages by the shortest convenient route. On reaching the sample village, the next job of the crew was to ascertain and determine the boundary of the sample village. For this purpose, they took help of the local people and revenue maps obtained from the Revenue Department. The entire sample village was considered to be the sampling unit. To commence data collection, a starting/reference point, preferably some conspicuous object/permanent feature in the village such as well/temple/school building etc., which need not necessarily be a geometrical centre of the village was selected. A detailed description of the starting/reference point of the selected village was recorded in the **Village Description Form**. This is essential to facilitate checking the correctness of fieldwork by the check crew or supervising officers.

After fixing the starting/reference point, the enumeration work started from the reference point by dividing the entire village into wedges with the help of compass in such a way that enumeration in each wedge could be completed easily without scope for omitting any tree/bamboo clump. The enumeration of all the trees having breast height diameter 10 cm and above and all the bamboo clumps were

carried out. Enumeration data was recorded in the **Village Tree Enumeration Form** beginning from the north and proceeding further in a clock-wise direction. This procedure is important to avoid duplication/omission of trees/bamboo clumps. All enumerated trees/bamboo clumps were also marked with chalk stick to check any omission/duplication of work.

2.4.1 THE FIELD FORMS:

The data were collected in following field Forms. (Sample Forms are annexed to this report):

(1) Form No. 1

The details of data collection is recorded in this Form

(2) Village Description Form:

The information regarding location of village, description of reference point, various measurements taken by field staff, date of survey and abstract of enumeration in quadrants was recorded in this Form.

(3) District Tree Form:

This Form was filled in for each sample village. The information such as State, district, total no. of villages in the district, no. of sample villages in the district, area of sample village, category of sample village etc was collected together with abstract of category-wise enumeration.

(4) Village Tree Enumeration Form:

All the trees having breast height diameter 10 cms and above occurring in non-forest areas were enumerated and recorded in this Form.

(5) Village Bamboo Enumeration Form:

The enumeration of bamboo clumps occurring in the sample village was recorded in this Form by measuring its diameter at the base of the clump.

(6) Village Sample Bamboo Enumeration and Clump Analysis Form:

The enumerated clumps bearing S. No. 1, 9, 17, 25 (1st clump and every 8th clump thereafter) of each species occurring in sample village were analysed in detail and recorded in this Form.

(7) Village Bamboo Weight Form:

The length and weight of two green representative bamboo culms of each species were recorded in this Form.

2.4.2 CATEGORY OF TREES:

While carrying out the survey, the trees were enumerated by its category. The category of each tree was indicated in the Form against the enumerated trees. For this purpose, the following categories of trees were identified:

- (1) Farm Forestry: Trees existing along the farm bunds and in small patches up to 0.1 ha in area
- (2) Road-side Plantations: Trees planted along the road side.
- (3) Village Woodlots: Naturally growing trees on community/private land.
- (4) Block Plantations: Plantation patch covering an area more than 0.1ha and not falling in any of the above category.
- (5) Pond-side Plantations: Trees planted in and around ponds.
- (6) Railway-side Plantations: Trees planted along railway tracks.
- (7) Canal-side Plantations: Trees planted along canals.
- (8) Others: Trees not falling in any of the above category.

2.5 VERIFICATION OF DATA:

The data collected from selected sample villages in various forms by the field parties were counter checked in the field by supervisory staff and Group Officer and sent to the Zonal Office at regular intervals. The data were further checked for errors and rectified if any, by the technical wing. The scrutinised data were thereafter sent to the **Machine Data Management Unit (MDMU) of FSI Headquarter at Dehradun**, where it was processed and various stand and stock tables were generated.

CHAPTER – III

DATA PROCESSING

3.1 PROCESSING OF DATA:

The field forms of sample villages received at Machine Data Management Unit were consolidated and checked for inconsistencies and coding mistakes if any. The data from each village was entered in the PC and the distribution of trees in each diameter class for each category of trees was obtained species-wise with the help of "Software package d-Base IV" by suitably developed programme. The data was further analysed by using ratio method of estimation to arrive at final results. Since many of the tree species in Wardha district occurred in small numbers, such species were clubbed together under miscellaneous species. 19 main species were selected for calculating the number of stems on the basis of their numerical occurrence, commercial and regional importance in this district.

3.2 AREA COMPUTATION:

The rural non-forest area of the district was worked out by subtracting forest area from the total geographical area of the district (6310 sq. km.– 847 sq. km.). The net non-forest area of the district works out to 5463 sq. km.

3.3 VOLUME ESTIMATION:

To estimate volume of trees in non-forest areas, a local volume table was generated using local volume equation developed during the forest inventory of the district. In the absence of local volume equation for any of the species, local volume equation of nearby area was taken into consideration. A copy of the local volume table is annexed to this report.

CHAPTER - IV

ESTIMATION OF GROWING STAND AND STOCK

4.1 ESTIMATION:

The data collected during the inventory of non-forest area pertaining to 8 sample villages in Wardha district were analysed and distribution of trees in each diameter class for each category of trees was obtained species-wise, from Machine Data Management Unit. The Wardha district has 970 inhabited villages, covering a non-forest area of 5463 sq. km. Out of the 970 inhabited villages, 8 villages were randomly selected for this survey and of the total species inventoried, 19 species have been identified as predominant and rest of the species have been clubbed together as miscellaneous species. All the tree species having breast height diameter of 10 cm & above were enumerated for calculating the total growing stand and the stock. The data was analysed statistically in respect of tree stand and stock parameters besides, calculating number of stems per hectare and volume per hectare. The estimation of total growing stand and stock was made for the entire non-forest area of the district. The result of the analysis indicate a growing stand of 5578976 stems and 10.26 stems per ha. with a corresponding growing stock of 1424933 cu. m. and 2.62 cu. m. per ha.

4.2 GROWING STAND:

Growing stand is the total number of stems and stems per hectare. The table showing species-wise, diameter class-wise and category-wise number of stems and stems per hectare in non-forest area of Wardha district is annexed later in this report. The entire non-forest area of the district has an estimated 5578976 trees @ 10.26 trees/ha. It may be seen from the table that *Acacia arabica* is the most prominent species contributing 40.67% to the growing stand followed distantly by *Azadirachta indica* - 7.11%, *Acacia leucophloea* - 7.03%, *Terminalia arjuna* - 4.30%, and *Tectona grandis* - 3.59%, *Zyzyphus mauratiana* - 3.23% and *Terminalia*

balerica – 1.30%. The tables also reveal that more than half of the growing stand (55.55%) is composed of pole crop i.e. trees of 10-20 cm diameter class and 24.74% & 10.68% trees are of 20-30 cm & 30-40 diameter class respectively, that means the crop is young in nature. The species-wise number of stems & stems/Ha that exist in the non-forest area of the district are shown in the table below:

Table 4.1: SPECIES-WISE NUMBER OF STEMS AND STEMS PER HECTARE

S. No.	Name of Species	Total No. of Stems	Stems/Ha	% of Stems
1.	Acacia arabica	2268778	4.17	40.67
2.	Acacia catechu	31357	0.06	0.56
3.	Acacia leucophaloea	392235	0.72	7.03
4.	Albizia procera	19797	0.04	0.35
5.	Azadirachta indica	396734	0.73	7.11
6.	Bombax ceiba	24184	0.04	0.43
7.	Citrus hystrix	30831	0.06	0.55
8.	Eucalyptus species	3103	0.01	0.06
9.	Ficus species	32640	0.06	0.59
10.	Gmelina arborea	8138	0.15	0.01
11.	Lennea coromandelica	11342	0.02	0.20
12.	Madhuca latifolia	20127	0.04	0.36
13.	Mangifera indica	69435	0.14	1.24
14.	Phoenix sylvestris	27287	0.05	0.49
15.	Syzygium cumini	5787	0.01	0.10
16.	Tectona grandis	200089	0.37	3.59
17.	Terminalia arjuna	239840	0.44	4.30
18.	Terminalia belerica	72338	0.13	1.30
19.	Zizyphus mauratiana	180432	0.33	3.23
20.	Miscellaneous	1544502	2.84	27.68
	Total	5578976	10.26	100

Distribution of various species of trees in terms of number of stems, stems/hectare found to occur under various categories in the non-forest areas of the district is shown in table No. 4.2 on succeeding page. It may be seen from the table that more than $\frac{3}{4}$ th of the vegetation in non-forest area of the district occur in Village woodlots (76.07%), distantly followed by Farm Forestry (13.34%), Roadside Plantation (3.33) and others (4.56%).

Table 4.2: CATEGORY-WISE TOTAL STEMS AND STEMS PER HECTARE

S. No.	Category	Total No. of Stems	Stems/ha	Percentage of Stems
1.	Farm forestry	744156	1.37	13.34
2.	Road side Plantations	185768	0.34	3.33
3.	Village woodlots	4243767	7.81	76.07
4.	Block Plantations	2209	0.01	0.04
5.	Pond side Plantations	77	0.00	0.00
6.	Railway side Plantations	130874	0.24	2.34
7.	Canal bank Plantations	17977	0.03	0.32
8.	Others	254148	0.46	4.56
	Total	5578976	10.26	100

4.3 GROWING STOCK

Growing stock is the cubical content or volume that the growing stand can yield. The estimation of total growing stock in the non-forest area of Wardha district has revealed the availability of 1424933 cu. m. of timber at 2.62 cu. m. per hectare. Detail species-wise, diameter class-wise and category-wise distribution of volume in the non-forest area of Wardha district is given in the tables annexed to this report. An abstract of species-wise volume and volume/Ha, so also the percentage of occurrence is tabulated below:

Table 4.3: SPECIES-WISE TOTAL VOLUME AND VOLUME PER HECTARE

S. No.	Name of Species	Total No. of Trees	Total Volume (Cu. m.)	Volume/Ha (Cu. m.)	Percentage of Volume
(1)	(2)	(3)	(4)	(5)	(6)
1.	Acacia arabica	2268778	547999	1.01	38.46
2.	Acacia catechu	31357	1997	0.00	0.14
3.	Acacia leucophaloea	392235	61021	0.11	4.28
4.	Albizia procera	19797	6555	0.01	0.46
5.	Azadirachta indica	396734	146870	0.27	10.31
6.	Bombax cieba	24184	8947	0.02	0.63
7.	Citrus hystrix	30831	1813	0.00	0.13
8.	Eucalyptus species	3103	1249	0.00	0.09
9.	Ficus species	32640	22826	0.04	1.60

(1)	(2)	(3)	(4)	(5)	(6)
10.	Gmelina arborea	8138	1798	0.00	0.13
11.	Lennea coromandelica	11342	2326	0.00	0.16
12.	Madhuca latifolia	20127	30500	0.06	2.14
13.	Mangifera indica	69435	110618	0.27	10.31
14.	Phoenix sylvistrus	27287	9405	0.02	0.66
15.	Syzygium cumini	5787	3553	0.01	0.46
16.	Tectona grandis	200089	35158	0.06	2.47
17.	Terminalia arjuna	239840	114473	0.21	8.03
18.	Terminalia belerica	72338	26254	0.05	1.84
19.	Zizyphus mauritiana	180432	28669	0.05	2.01
20.	Miscellaneous	1544502	262902	0.48	18.45
	Total	5578976	1424933	2.62	100

Analysis of the above table indicates that *Acacia arabica* (38.46%), distantly followed by *Azadirachta indica* (10.31%), *Terminalia arjuna* (8.03%) and *Mangifera indica* (7.76%). mainly contribute to the growing stock Others i.e. miscellaneous species also make a contribution of 18.45% to the growing stock. It is also evident from the tables annexed to the report that the species which fall in the diameter class 20 - 40 cm, constitute 41.47% of the growing stock while, those of 40 – 50 cm diameter class contribute 17.22% to the growing stock. Significantly, the trees of 70+ diameter class also contribute to the extent of 14.11% to the growing stock. An abstract of Category-wise growing stock in the non-forest area of Wardha district is tabulated below:

Table No. 4.4: CATEGORY-WISE TOTAL VOLUME AND VOLUME PER HACTARE

S. No.	Category	Total No. of trees	Total Vol. (cu. m.)	Vol. per Ha. (cu. m.)	% of Vol.
1	Farm Forestry	744156	247412	0.46	17.36
2	Roadside Plantations	185768	92147	0.17	6.47
3	Village woodlots	4243767	963208	1.77	67.58
4	Block Plantations	2209	348	0.00	0.02
5	Pond-side Plantations	77	14	0.00	0.01
6	Railway-side Plantations	130874	29536	0.05	2.08
7	Canal bank Plantations	17977	3891	0.01	0.28
8	Others	254148	88377	0.16	6.20
	Total	5578976	1424933	2.62	100

The table reveals that almost 2/3rd (67.58%) of the growing stock is constituted by Village woodlots while. Farm forestry and Roadside plantations have a share of 17.36% and 6.47% respectively in the total growing stock.

4.4 CONCLUSION:

According to this survey, the non-forest area of Wardha district has adequate number of trees. An estimated 5578976 trees yielding an estimated volume of 3893224 cu. m. @ 10.26 stems and 2.62 cu. m. per hectare respectively. The Village woodlots, Farm forestry and Roadside plantations contribute mainly to the growing stock while *Acacia arabica*, *Azadirachta indica*, *Acacia leucophaloea* are the main tree species occurring in the non-forest area of the district. The growing stock of the non-forest area is substantial to meet the local demand of timber and fuel wood of the villagers. However, to bring down the pressure on the Government forests which is depleting rapidly, suitable schemes are required to be formulated to grow more and more trees on the non-forest area such as waste lands, community lands, unproductive lands grazing lands private lands and along canals, railway tracks, roads etc., so that the increased growing stock shall become major contributor in improving the socio-economic conditions of people dwelling therein. This requires motivation of the villagers enticing them in the afforestation programmes. Efforts should also be made to adopt Joint Forest Management in these areas.

ANNEXURE - I

LOCAL VOLUME TABLE FOR WARDHA DISTRICT											
S.NO.	NAME OF SPECIES	DIAMETER CLASS (in cm.)									
		10-20	20-30	30-40	40-50	50-60	60-70	+70			
1	Acacia arabica	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
2	Acacia catechu	0.043	0.106	0.174	0.246	0.323	0.404	0.490			
3	Acacia leucophaloea	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
4	Albizia procera	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
5	Azadirachta indica	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
6	Bombax ceiba	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
7	Citrus nystrix	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
8	Eucalyptus species	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
9	Ficus species	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
10	Gmelina arborea	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
11	Lannea coromandelica	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
12	Madhuca latifolia	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
13	Mangifera indica	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
14	Phoenix sylvestris	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
15	Syzygium cumini	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
16	Tectona grandis	0.080	0.291	0.637	1.117	1.731	2.480	3.363			
17	Terminalia arjuna	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
18	Terminalia belerica	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
19	Zizyphus mauritiana	0.056	0.217	0.483	0.854	1.330	1.912	2.598			
20	Rest of species	0.056	0.217	0.483	0.854	1.330	1.912	2.598			

ANNEXURE - II

DISTRIBUTION OF ESTIMATED TREES IN NON FOREST AREA OF WARDHA DISTRICT												
Non-forest area of the District 546300 Ha.						Area of Villages Surveyed - 5079 Ha.						
All Categories Combined												
S.No.	Name of Species	Diameter Class						Total	% of Trees	Stems/Ha		
		10-20	20-30	30-40	40-50	50-60	60-70				70+	
1	Acacia arabica	1125943	657950	297613	134623	36384	10487	5778	2268778	40.67	4.17	
2	Acacia catechu	24294	5244	1284	107	321	107	0	31357	0.56	0.06	
3	Acacia leucophaloea	250442	103056	28037	8132	1819	321	428	392235	7.03	0.72	
4	Albizia procera	7491	6100	3317	2033	535	107	214	19797	0.35	0.04	
5	Azadirachta indica	153059	112159	64207	40450	13269	6635	6955	396734	7.11	0.73	
6	Bombax ceiba	11129	5244	3424	2140	1391	535	321	24184	0.44	0.04	
7	Citrus hystrix	30295	536	0	0	0	0	0	30831	0.55	0.06	
8	Eucalyptus species	1391	963	214	107	214	107	107	3103	0.06	0.01	
9	Ficus species	9310	7170	5672	2889	2677	1177	3745	32640	0.59	0.06	
10	Gmelina arborea	4069	2570	857	535	107	0	0	8138	0.15	0.01	
11	Lennea coromadelica	5671	4173	749	535	214	0	0	11342	0.20	0.02	
12	Madhuca latifolia	1713	1499	2247	2355	2677	2356	7280	20127	0.36	0.04	
13	Mangifera indica	3220	6877	6762	8575	8995	6639	28367	69435	1.24	0.13	
14	Phoenix sylvestris	107	17228	7919	1819	214	0	0	27287	0.52	0.05	
15	Syzygium cumini	1396	1070	1714	535	537	214	321	5787	0.10	0.01	
16	Tectona grandis	143532	43324	8825	3976	218	107	107	200089	3.59	0.37	
17	Terminalia arjuna	81771	65928	41311	21831	10594	7169	11236	239840	4.30	0.44	
18	Terminalia belerica	31033	20439	8989	6099	2782	1391	1605	72338	1.30	0.13	
19	Zizyphus mauritiana	118041	42916	12841	4922	1605	107	0	180432	3.23	0.33	
20	Miscellaneous species	1095075	276061	99741	44518	13162	5030	10915	1544502	27.65	2.84	
	Total	3098982	1380507	595723	286181	97715	42489	77379	5578976	100.00	10.26	
	Percentage of Trees	55.55	24.74	10.68	5.13	1.75	0.76	1.39	100			
	Stems per Ha.	5.70	2.54	1.10	0.52	0.18	0.08	0.14	10.26			

ANNEXURE - III

DISTRIBUTION OF ESTIMATED VOLUME OF TREES IN NON-FOREST AREA OF WARDHA DISTRICT														
Non-forest area of the District 546300 Ha.			Area of Villages Surveyed - 5079 Ha.											
All Categories Combined														
S.No.	Name of Species	Diameter Class										Total	% of Volume	Volume per Ha.
		10-20	20-30	30-40	40-50	50-60	60-70	70+	70+	70+	70+			
1	Acacia arabica	63054	142776	143746	114969	48390	20052	15012	547999	38.46	1.01			
2	Acacia catechu	1045	555	224	26	104	43	0	1997	0.14	0			
3	Acacia leucophaloea	14026	22364	13541	6944	2420	614	1112	61021	4.28	0.11			
4	Albizia lebeck	420	1324	1603	1736	711	205	556	6555	0.46	0.01			
5	Azadirachta indica	8571	24338	31013	34544	17648	12686	18070	146870	10.31	0.27			
6	Bombax ceiba	623	1136	1654	1828	1849	1023	834	8947	0.63	0.02			
7	Citrus hystrix	1697	116	0	0	0	0	0	1813	0.13	0.01			
8	Eucalyptus species	78	209	103	91	285	205	278	1249	0.09	0			
9	Ficus species	522	1556	2740	2467	3560	2251	9730	22826	1.60	0.04			
10	Gmelina arborea	228	557	414	457	142	0	0	1798	0.13	0			
11	Lannea coromandelica	318	905	362	457	284	0	0	2326	0.16	0.01			
12	Madhuca latifolia	96	325	1086	2011	3561	4507	18914	30500	2.14	0.06			
13	Mangifera indica	181	1492	3266	7324	11964	12694	73697	110618	7.76	0.20			
14	Phoenix sylvestris	6	3738	3824	1553	284	0	0	9405	0.66	0.02			
15	Syzygium cumini	78	232	828	457	715	409	834	3553	0.25	0.01			
16	Tectona grandis	11483	12609	5622	4442	377	265	360	35158	2.47	0.06			
17	Terminalia arjuna	4579	14306	19954	18645	14090	13707	29192	114473	8.03	0.21			
18	Terminalia belerica	1738	4436	4341	5209	3700	2660	4170	26254	1.84	0.05			
19	Zizyphus mauritiana	6611	9313	6202	4203	2135	205	0	28669	2.01	0.05			
20	Miscellaneous species	61324	59905	48173	38018	17506	9618	28358	262902	18.45	0.48			
	Total	176678	302192	288696	245381	129725	81144	201117	1424933	100	2.62			
	Percentage of Volume	12.40	21.21	20.26	17.22	9.10	5.69	14.12	100.00					
	Volume per Ha	0.33	0.56	0.53	0.45	0.24	0.15	0.37	2.62					

ANNEXURE - IV

DISTRIBUTION OF ESTIMATED TREES IN NON-FOREST AREA OF WARDHA DISTRICT														
Non-forest area of the District - 546300 Ha.											Area of Villages Surveyed - 5079 Ha.			
All Diameter Class Combined														
S.No.	Name of Species	Category										Total	% of Trees	Stems per Ha.
		I	II	III	IV	V	VI	VII	VIII					
1	Acacia arabica	339549	96845	1694642	173	59	90746	8561	38203	2268778	40.67	4.17		
2	Acacia catechu	2461	107	27074	3	0	642	214	856	31357	0.56	0.06		
3	Acacia leucophaoea	19904	15195	293426	38	1	14125	2889	46657	392235	7.03	0.72		
4	Albizia procera	2461	2033	15089	0	0	0	0	214	19797	0.35	0.04		
5	Azadirachta indica	61318	12840	300597	41	2	1712	749	19475	396734	7.11	0.73		
6	Bombax ceiba	3103	321	20224	0	1	428	0	107	24184	0.43	0.04		
7	Cytrus hystrix	30284	0	214	333	0	0	0	0	30831	0.55	0.06		
8	Eucalyptus species	428	0	2675	0	0	0	0	0	3103	0.06	0.01		
9	Ficus species	3103	749	26646	0	2	0	0	2140	32640	0.59	0.06		
10	Gmelina arborea	963	0	7062	6	0	0	0	107	8138	0.15	0.01		
11	Lannea coromadelica	4066	0	5992	0	0	0	107	1177	11342	0.20	0.02		
12	Madhuca latifolia	3210	535	14767	10	0	321	0	1284	20127	0.36	0.04		
13	Mangifera indica	38096	963	28250	93	0	0	0	2033	69435	1.24	0.13		
14	Phoenix sylvestris	6099	428	18085	0	0	0	0	2675	27287	0.49	0.05		
15	Syzygium cumini	1391	0	4387	9	0	0	0	0	5787	0.10	0.01		
16	Tectona grandis	29214	1605	153777	619	0	1498	321	13055	200089	3.60	0.37		
17	Terminalia anjuna	7490	4173	155274	29	0	0	642	72232	239840	4.30	0.44		
18	Terminalia belerica	17871	2675	45479	0	0	535	321	5457	72338	1.30	0.13		
19	Zizyphus mauritiana	25041	1605	146070	10	1	1391	0	6314	180432	3.23	0.33		
20	Miscellaneous	148104	45694	1284037	845	11	19476	4173	42162	1544502	27.68	2.84		
	Total	744156	185768	4243767	2209	77	130874	17977	254148	5578976	100	10.26		
	Percentage of Trees	13.34	3.33	76.07	0.04	0	2.35	0.32	4.55	100				
	Stems per Ha	1.37	0.34	7.81	0	0	0.24	0.03	0.47					

ANNEXURE - V

DISTRIBUTION OF ESTIMATED VOLUME OF TREES IN NON-FOREST AREA OF WARDHA DISTRICT													
Non-forest area of the District -546300 Ha												Area of Villages surveyed - 5079 Ha	
All Diameter Class Combined													
S.No.	Name of Species	Category								Total	% of Volume	Volume per Ha.	
		I	II	III	IV	V	VI	VII	VIII				
1	Acacia arabica	90482	56249	369588	17	10	21221	1907	8525	547999	38.46	1.01	
2	Acacia catechu	127	5	1764	0	0	34	16	51	1997	0.14	0.01	
3	Acacia leucophaloea	4200	4696	42619	3	0	4041	432	5030	61021	4.28	0.11	
4	Albizia procera	584	1013	4883	0	0	0	0	75	6555	0.46	0.01	
5	Azadirachta indica	22564	8928	108247	4	0	1022	76	6029	146870	10.31	0.27	
6	Bombax ceiba	1364	52	7288	0	0	240	0	23	8947	0.63	0.02	
7	Citrus hystrix	1782	0	12	19	0	0	0	0	1813	0.13	0	
8	Eucalyptus species	58	0	1191	0	0	0	0	0	1249	0.09	0	
9	Ficus species	1902	309	19435	0	3	0	0	1177	22826	1.60	0.04	
10	Gmelina arborea	169	0	1623	0	0	0	0	6	1798	0.13	0	
11	Lannea coromandalica	691	0	1295	0	0	0	6	334	2326	0.16	0.01	
12	Madhuca latifolia	5880	994	21069	16	0	535	0	2006	30500	2.14	0.06	
13	Mangifera indica	61916	1858	42842	70	0	0	0	3932	110618	7.76	0.20	
14	Phoenix sylvestris	2244	217	6164	0	0	0	0	780	9405	0.66	0.02	
15	Syzygium cumini	728	0	2821	4	0	0	0	0	3553	0.25	0.01	
16	Tectona grandis	6746	435	25436	144	0	211	26	2160	35158	2.47	0.06	
17	Terminalia arjuna	5808	3757	60532	6	0	0	514	43856	114473	8.03	0.21	
18	Terminalia belerica	5377	2435	15665	0	0	251	103	2423	26254	1.84	0.05	
19	Zizyphus mauritiana	3559	489	23970	1	0	78	0	572	28669	2.01	0.05	
20	Miscellaneous species	31231	10710	206784	64	1	1903	811	11398	262902	18.45	0.48	
	Total	247412	92147	963208	348	14	29536	3891	88377	1424933	100	2.62	
	Percentage of Volume	17.36	6.47	67.60	0.02	0.01	2.07	0.27	6.20	100			
	Volume per Ha.	0.46	0.17	1.77	0	0	0.05	0.01	0.16	2.62			

ANNEXURE - VI

DISTRIBUTION OF ESTIMATED TREES IN NON-FOREST AREA OF WARDHA DISTRICT												
	Non-forest area of the District - 546300 Ha.					Area of Villages Surveyed - 5079 Ha.						
	All species combined											
S.No.	Category	Diameter Class							Total	% of Trees	Stems/Ha	
		10-20	20-30	30-40	40-50	50-60	60-70	70+				
1	Farm Forestry	353031	203645	97592	41734	15945	8560	23649	744156	13.34	1.37	
2	Roadside Plantations	55539	43552	36384	28999	12199	3959	5136	185768	3.33	0.34	
3	Village Woodlots	2475186	1034592	417133	191870	60995	25789	38202	4243767	76.07	7.81	
4	Block Plantations	1696	355	89	35	14	8	12	2209	0.04	0	
5	Pondside Plantations	42	22	10	1	2	0	0	77	0	0	
6	Railwayside Plantations	73089	32959	15195	6742	1391	856	642	130874	2.34	0.24	
7	Canal bank Plantations	9738	5029	1712	1177	321	0	0	17977	0.32	0.03	
8	Others	130661	60353	27608	15623	6848	3317	9738	254148	4.56	0.47	
	Total	3098982	1380507	595723	286181	97715	42489	77379	5578976	100	10.26	
	Percentage of Trees	55.55	24.74	10.68	5.13	1.75	0.76	1.39	100			
	Stems per Hectare	5.70	2.54	1.09	0.53	0.18	0.08	0.14	10.26			

ANNEXURE - VII

DISTRIBUTION OF ESTIMATED VOLUME OF TREES IN NON-FOREST AREA OF WARDHA DISTRICT												
	Non-forest area of the District - 546300 Ha.					Area of Villages surveyed - 5079 Ha.						
	All species combined											
S.No.	Category	Diameter Class							Total	% of Volume	Volume per Ha.	
		10-20	20-30	30-40	40-50	50-60	60-70	70+				
1	Farm Forestry	20177	44670	47599	35951	21207	16367	61441	247412	17.36	0.46	
2	Roadside Plantations	3128	9499	17589	24793	16224	7570	13344	92147	6.47	0.17	
3	Village Woodlots	141070	226350	201919	164440	80887	49209	99333	963208	67.60	1.77	
4	Block Plantations	104	92	49	35	21	16	31	348	0.02	0	
5	Pond-side Plantations	2	4	4	1	3	0	0	14	0	0	
6	Railway-side Plantations	4113	7172	7339	5757	1849	1638	1668	29536	2.07	0.05	
7	Canal-bank Plantations	553	1079	827	1005	427	0	0	3891	0.28	0.01	
8	Others	7531	13326	13370	13399	9107	6344	25300	88377	6.20	0.16	
	Total	176678	302192	288696	245381	129725	81144	201117	1424933	100	2.62	
	Percentage of Volume	12.40	21.21	20.26	17.22	9.10	5.70	14.11	100			
	Volume per Hectare	0.33	0.56	0.52	0.45	0.24	0.15	0.37	2.62			

ANNEXURE - VIII

FORM NO.1

Data collection on village forest (outside green wash area)

Mapsheet No.

Name of village: Tahsil District:

Range: Forest Division: Circle:

1 Reference point for

Village

(mention distance from nearest Railway station/Bus station etc.)

2 Area planted by social forestry/Individuals, Department etc.

- a. Village woodlot
- b. Rehabilitation of Degraded forest
- c. Rural fuelwood
- d. Any other schemes
- e. Vanmahotsava etc.

3 Category of the village

4 Land use

Area under Ha.

- 1. Habitation i.e Schools, Colleges, Hospitals, Play ground, Samshan etc.
- 2. Cultivaiton
 - A. Irrigated
 - B. Non-irrigated
- 3.Fallow lands including pasture lands,
waste lands,water body, ravines etc.
- 4. Strips.
 - A. Road (mention National, State, Other)
 - B Railway
 - C. Canal
 - D. Others

Total Area

Signature

Name.....

Designation

Date:

ANNEXURE - IX

VILLAGE DESCRIPTION FORM

- 1 State:
- 2 District:
- 3 Mapsheet No:
- 4 Sample village:
- 5 Area of the sample village (in Ha.)
- 6 Crew Leader (name):
- 7 Date of commencement of survey
- 8 Date of completion of survey
- 9 Conspicuous feature selected as the centre for starting the survey
- 10 Description of the centre and approach to this point
- 11 Number of angular quadrants formed in the sample village
- 12 Compassing done by:
- 13 Tree enumeration done by:
- 14 Height measurements taken by:
- 15 Quadrant-wise summary of enumerations

Quadrant No.	Date of survey	No. of trees enumerated
1		
2		
3		
4		
Total		

Date:

Name & Signature of the
Crew Leader

Rough diagram of sample village

ANNEXURE - X

DISTRICT TREE FORM

Job No.	Card design	State	District	No of Villages in the district	No. of Sample villages in the district	Geographical area of the district (Ha.)	Sample Village	Geo. Area of the sample village (Ha.)	Category of the sample village
1-3	4-6	7-8	9-10	11-15	16-17	18-22	23-27	28-31	32

Number of trees in the sample village according to category of the plantation/tract.

Farm forestry	Road side plantations	Village wood lots	Block plantations	Pond side plantations	Railway side plantations	Canal side plantations	Rest	Total
33-36	37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-70

Page No.....

Total No. of Pages.....

Name & Signature of the Crew Leader.....

ANNEXURE - XI

TREE ENUMERATION FORM (VILLAGE FOREST SURVEY)

Job No	Card Design	State	District	Sample Village	Geo. area of the Sample Village
1-3	4-6	7-8	9-10	11-15	16-19

Total No. of Trees
42-47

Name of the Village:

Mapsheet No.:

S.No	Species		DBH-OB(cms)	Tree Height(m)	Age (years)	Category	S.No	Species		DBH-OB(cms)	Tree Height(m)	Age (years)	Category
	Name	Code						Name	Code				

Date.....
Page No.....
Total No of Pages.....

Name & Signature of the Crew Leader.....

*Mention area in the case of Farm Forestry, Block Plantations & Village Woodlots (patches only)

ANNEXURE - XII

Village sample Bamboo Enumeration and clump Analysis Form.

Job No	Card Design	Distri-ct	Sample Village	Area of Sample Village(Ha)
1-3	4-5	6-7	8-12	13-16

Average culm height (in dmt)		Bamboo Quality
Upto 1 cm top	upto 2 cms top	
72-74	75-77	78

Species	Species code	Clump serial	Clump diameter(in cms)	Clump size class	Green Sound culms				Green damaged culms				Decayed culms	Total No. of Culms	
					one to two seasons old		over two seasons old		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

Date.....
 Signature of the Crew Leader.....
 Name of the Crew Leader.....

ANNEXURE - XIII

BAMBOO WEIGHT FORM

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

Spp. Code	Sample No.	Green Weight of Culms												Green weight of Sub-sample for Co-relation with dry wt.						
		Diameter Class						8 cm and above												
		2 to under 5 cm			5 to under 8 cm			Total Length (Dmt)			Utilizable Length (Dmt)					Weight (Grams)				
16-19	20	Dia. (cm)	21-22	23-25	26-28	29-31	32-36	37-38	39-41	42-44	45-47	48-52	53-54	55-57	58-60	61-63	64-68	69-72	73-76	77-80
		Total Length (Dmt)																		
		Utilizable Length (Dmt)																		
		Up to 1cm top dia.																		
		Up to 2cm top dia.																		
		Weight (Grams)																		
		Dia. (cm)																		
		Sub Sample Culm																		
		2 and under 5 cm dia.																		
		5 and under 8 cm dia.																		
		8 cm and above dia.																		

Date: Name & Signature of the Crew Leader: