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Inventory Survey
(NON-FOREST AREA)

of

Mahendergarh District

HARYANA STATE

INVENTORY RESULTS

FOREST SURVEY OF INDIA
NORTHERN ZONE
SHIMLA
1997

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P R E F A C E

Forest Survey of India, for the first time took up inventory of forest resources in the rural areas with the primary objective of assessing the distribution of trees and the growing stock in the rural areas and to have an overview of the achievements of various social forestry schemes implemented by the State Forest Departments. The inventory survey was carried out according to stratified random sampling methodology. One of the important Objective in this survey was to stratify various types of trees in a village. The strata were farm forestry, roadside plantations, village wood lot, block plantations, plantations raised along canal banks, railway lines, ponds and others. This report pertains to district Mahendragarh of Haryana state.

The geographical area of Mahendragarh district is 3010 sq.km. The survey was carried out during 1993-94 and 1994-95 in the rural areas of the district covering an area of 2928.01 sq.km.

Out of the total species inventoried, 20 species on basis of their predominance and commercial importance have been presented separately. Other species have been grouped together as miscellaneous.

The total number of trees in the district have been assessed at 57.68 lakhs i.e. 19.70 trees/ha and the corresponding volume has been assessed at 10.71 lakh cubic metres i.e. 3.659 cum/ha. Prosopis cineraria have been found to constitute largest representation with 21.95 lakh trees (38.06%) while Populus has the lowest representation amongst important species of the State

It is hoped that this report will be quite useful to the State Forest Department of Haryana and other organisations dealing with natural resources.

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Director
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Dehradun.

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SUMMARY

1. To assess the availability of forest resources for the production of timber, fuelwood and raw material for paper pulp, matchwood, packing cases and essential oils etc. in areas outside the traditional Reserved Forests and those forest areas which could not be covered during the course of regular Inventory Survey of the district, it was proposed to carry out the inventory of such areas. The Inventory Survey has been carried out in the Mahendragarha district during 1993-94 and 1994-95.

2. As per 1981 Census, Mahendragarh district had a total of 743 villages having a total area of 2928.01 Sq. km., out of which 16 villages having an area of 88.26 Sq. km. were randomly selected and surveyed.

3. In the entire rural area of Mahendragarh district 57.68 lakh trees (19.70 trees/ha.) have been estimated. The analysis shows that when all the species are combined the maximum number of the estimated trees occur in 10-20 cm. dia-class i.e. 30.62 lakh trees (53.08%) and the minimum in 40 cms. and above dia-class i.e. 2.16 lakh trees (3.75%).

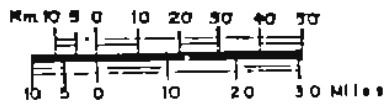
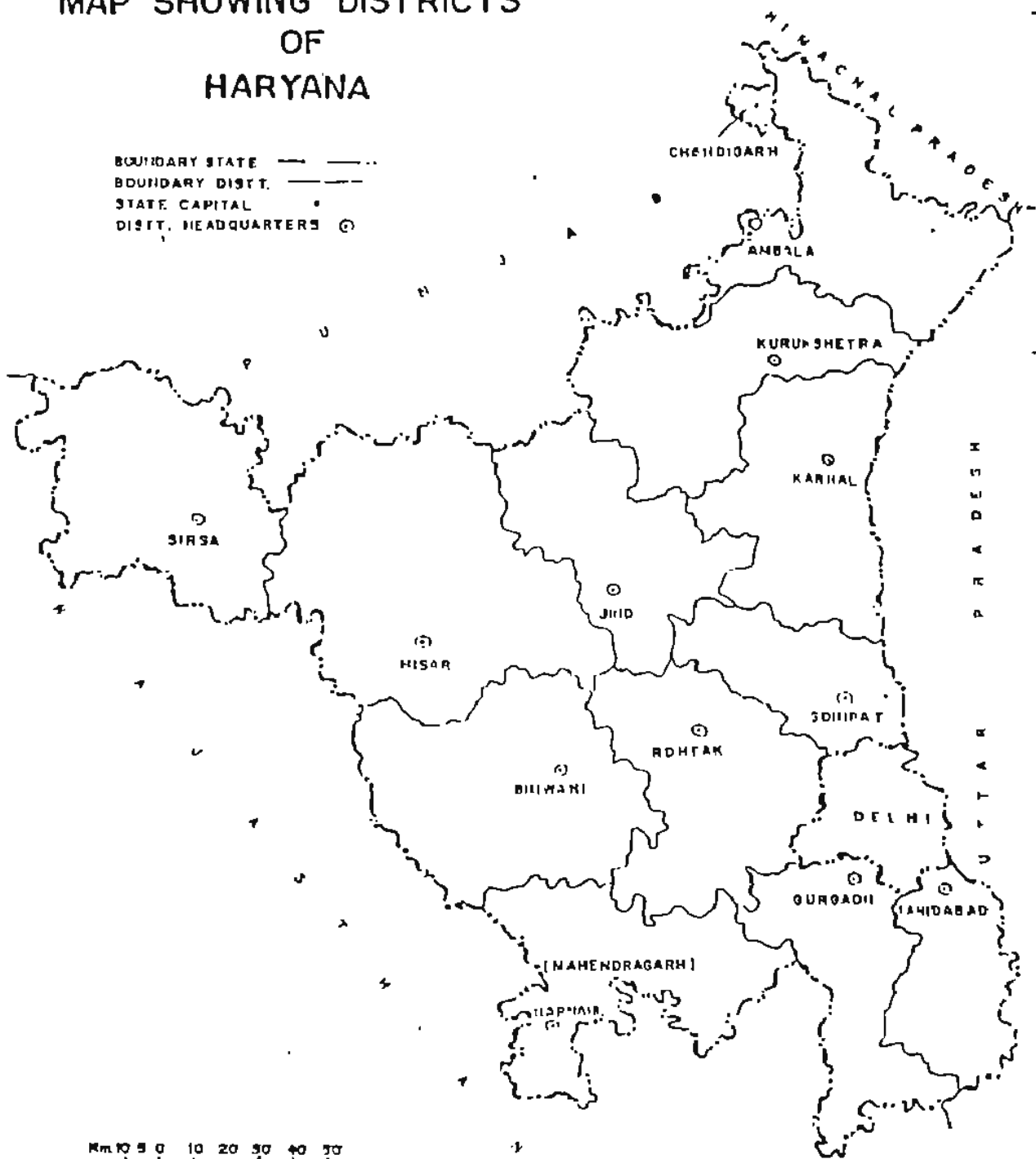
4. The specieswise distribution of total number of estimated trees shows that Prosopis cineraria has the largest representation i.e. 21.95 lakh trees (38.06%) followed by Acacia nilotica (Babul) 11.27 lakh trees (19.54%), Salvadora spp. 8.39 lakh trees (14.55%), Acacia tortilis 4.88 lakh trees (8.46%), Zizyphus spp. 2.01 lakh trees (3.48%), Prosopis juliflora 1.97 lakh trees (3.42%), Acacia spp. 1.62 lakh trees (2.82%), Azadirachta indica 1.40 lakh trees (2.43%), Eucalyptus spp. 1.29 lakh trees (2.23%) and Lamarix aphylla 0.96 lakh trees (1.67%). The representation of rest of the species is less than 1% each.

5. The distribution of total number of trees categorywise and dia-classwise, when all the species are combined, shows that the representation of trees is maximum in the category-III -Village Woodlots i.e. 33.76 lakh trees (58.53%) and minimum in category-V-Ponds 0.32 lakh trees (0.55%) for the combined dia-class.

6. In the entire rural area of Mahendragarh district total estimated volume of all the species and dia-classes combined comes to 10.714 lakh cum. i.e. 3.659 cum./ha.

MAP SHOWING DISTRICTS OF HARYANA

BOUNDARY STATE ———
BOUNDARY DIST. - - - -
STATE CAPITAL *
DIST. HEADQUARTERS ⊙



CHAPTER 1

1.1 Introduction

To assess the availability of forest resources for production of timber, fuelwood and raw material for paper pulp, packing cases, essential oils, match wood etc. in areas outside the traditional Reserved Forest areas and those forest areas which could not be covered while undertaking the regular Inventory Survey of Haryana State.

1.2 Description of the District

Mahendragarh district is a part of Southern Haryana Plain. The district takes its name from the town of Mahendragarh. The district headquarters are located at Narnaul one of its sub-divisional towns. Mahendragarh is supposed to have been once called Kanaud since it was first inhabited by the Brahmans of Kanaudia group. Later it came to be associated with Malik Mahaud Khan, a servant of Babar. It remained a pargana of the Government of Narnaul under the Moghul Emperors and about the beginning of the 19th century it was conquered by the Thakur of Jaipur, who was in turn expelled by Nawab Nafia Qulf Khan, the great minister of the Delhi court under Shah Alam Khan. On his death his widow maintained her independence in the fortress but in 1792, Sindhia's General De Boigne sent a force against her. Ismail Beg persuaded his mistress to resist and marched to her relief but she was killed in the battle which ensued under the walls of Kanaud and Ismail Beg surrendered. Kanaud then became the principal stronghold of Appa Khande Rao, Sindhia's feudatory, who held the Rewari territory. It eventually became a possession of the British who gave it to the Nawab of Jhajjar. Later by the Sanad of 4th January, 1861, the pargana of Kanaud was granted, with all the rights pertaining thereto, by the British Government to Maharaja Narinder Singh. The fort of Kanaud is said to have been built by the Marathas.

Narnaul, the district headquarter, is said to have been founded about 900 years ago near the Dhosi hill which is traditionally associated with the Vedic sage Chyavana of the Bhargava clan. Being in the midst of a vast forest it was called 'Naharnaul' or the 'Lion's dread'. Another myth ascribes its foundation to Raja Launkaran after whose wife it was named as "Nar Laun" which corrupted to "Narnaul". Other parts of the district were urbanised during the Moghul period and thereafter.

1.3 Location

The district lies between $27^{\circ} 47' 50''$ and $28^{\circ} 28'$ North Latitudes and $75^{\circ} 54'$ and $76^{\circ} 51' 30''$ East

longitudes. On its north are situated the districts of Bhiwani and Rohtak. To its east lies Gurgaon district. On the south-east, south-west and west, the district is surrounded by the state of Rajasthan. The total area of the district is 3010.00 sq. km. The population of the district was 959,400 as per 1981 Census.

1.4 Physical Features

The district on the whole is sub divided into following four sub-micro regions on the basis of soils, topography, climate and vegetation.

(a) Satnali Bagar

The region spreads over the northwestern parts of Mahendragarh tahsil of the district. It makes its boundaries with Rajasthan in the south-west, Bhiwani district in the North and north-west and Mahendragarh Undulating Plain in the east.

The maximum altitude in the region is 308 metres above m.s.l. near village Bas(153) and minimum altitude is 278 metres near village Patharwa(150). Sand is found in thick layer throughout the region. The heavy concentration of sand dunes of shifting nature are found at villages Shampura(149), Patharwa(150), and Sureti Jakhari(156). Most of the sand dunes are latitudinal in their extent, Near villages Deorota(134) and Nanwan(138), these dunes are found in their uneven direction.

The soils, found here are sandy and loamy sand. Due to peculiar characteristics of the soils, climate, under ground water level (brackish) and lack of irrigation facilities, the region can raise only inferior type of coarse cereals. Soils as classified by NBSS & IUP (ICAR), Nagpur is Psamments type of soils.

Psamments: Sandy soils (Recent)

Transportation facilities are not well developed in the region, except a metre gauge railway line which passes through the region. Village Satnali has railway station with a road link to Mahendragarh, to Loharu and to Badhara.

(b) Mahendragarh Undulating Plain

The region includes 4 villages of Narnaul tahsil, major part of Mahendragarh tahsil and some western parts of Rewari and Itawal tahsils. It has its boundaries with state of Rajasthan and Satnali Bagar in the west, Krishnawati Plain and again Rajasthan in the south, the districts of Bhiwani and Rohtak in the north and Sahibi Plain in the east.

The region is an undulating plain, due to the presence of Tals and Tibhas. Some Aravalli Offshoots are

also found in the region which provide undulating relief features to it. Maximum altitude in the region is 525 metres above m.s.l. on top of a hill near village Garhi(141) in Mahendragarh tahsil, and the minimum altitude is 243 metres near village Fatehpuri Tapar Dahina(26) in Rewari tahsil. In addition to this, there are hills related to Aravalli outcrops having typical heights and slopes with rocky surfaces near village Madhogarh (135) & Khudana(140) in Mahendragarh tahsil, Dhawana(14), Lohana(16), Sina(17), Masit(22), Didoli(23), Bhalaki(274), Majara Mustal Bhalaki(275), Nandha(276), Mayan(278), Khol(279), & Ahrod(280) in Rewari tahsil.

Two seasonal rivers Dohan and Krishnawati drain out the area. These rivers bring rain water from Rajasthan side. Most of the area is not agriculturally rich. Many patches of land are seen covered with scrubby and bushy types of natural vegetation. Scattered trees of 'Babul' and 'Kikar' are found in the entire region.

Soils in the region are sandy and loamy sand(Dagar) and relatively sand loam. Poor characteristics of the soils, availability of brackish water, undulating and low water level allow the cultivation of coarse grain as the main crops with poor yields. Soils as classified by the NBRS & LIP (ICAR), Nagpur, are Orthids-Fluvents & Psamment types of soils.

Orthids: Soils of arid region with some development.

Fluvents: Alluvial soils (Recent alluvium)

Psamment: Sandy soils (Recent)

Mahendragarh is linked with other towns namely Narnaul, Ateli and Kanina by metalled roads. Mahendragarh has rail link with Narnaul. Most of the villages have link roads. Main roads like Charkhi Dadri - Mahendragarh - Narnaul and Rewari - Narnaul pass through the region. Two railway lines, Rewari - Mahendragarh - Loharu and Rewari - Narnaul (metre gauge) pass through the region.

(c) Krishnawati Plain

The region covers the whole of Narnaul tahsil excepting 4 villages namely Khairani(1), Mohalra(2), Rata Khurd(3) and Rata Kalan(4) and 9 villages of Mahendragarh tahsil. The region has its boundaries with Rajasthan from east to west and with Mahendragarh Undulating Plain in the north.

The maximum altitude of the region is 652 metres above m.s.l. on hill top near village Thana(118) while minimum altitude is 287 metres near village Maria(30) in Narnaul tahsil. Krishnawati river is the main river interlined with many seasonal rivers. Most of the area is not agriculturally developed. Some Aravalli offshoots are also found near some villages. Many patches of lands are covered with scrubby and bushy types of natural vegetation. Scattered trees of Babul and Kikar are found in the entire region.

Soils found in the region are sandy and loamy sand and at a few places are rocky. Soils as classified by the NBSS & LUP (ICAR), Nagpur, the region has Psammments-Fluvents and Orthids-Fluvents types of soils.

Psammments: Sandy soils (Recent)
Fluvents: Alluvial soils (Recent alluvium)
Orthids : Soils of arid region with some development.

As far as means of communications and transportation are concerned, the region has all kinds of major and minor metalled roads. Narnaul and Ateli are two towns in the region connected by a major road and also by a railway line (Rewari- Phulera branch, Metre gauge).

(d) Sahibi Plain

The region extends over eastern part of Mahendragarh district, covering the major parts of Rewari and Rawal tahsils. It has its south eastern border with Rajasthan, Mahendragarh Undulating Plain in the west, Rohtak district in the north and Gurgaon district in the north-east.

From the point of view of physiography, the whole area is a plain land. Maximum altitude of the region is 308 metres above m.s.l. and minimum altitude is shown by DM 224, L merles. Sahibi river is the main river which flows from south to north in the extreme east of the region.

Relatively sandy loam and light loam are the main soils of the region. Soils as classified by NBSS & LUP (ICAR), Nagpur are Orthids- Fluvents types of soils.

Orthids: Soils of arid region with some development

Fluvents: Alluvial soils (Recent alluvium)

There are two important towns namely Rewari and Rawal in the region. Rewari is a big railway junction and roadways depot. National Highway No 9 passes through the region from east to south-west. Communication facilities are well developed in the region.

1.5 Climate

The district has a semi-arid type of climate. Hot summers, cold winter nights and meagre rainfall concentrated during monsoon are the peculiarity of the district.

1.6 Rain

Monsoon brings rain in the district from July to September. From October to June, the weather remains generally dry except a few showers received from the

western cyclones. The rainfall varies from year to year. The rainfall during 1979-80 was only 28.3 cms. against 55.3 cms. during 1976-77, 59.4 cms. during 1977-78 and 61.2 cms. during 1978-79. The rainfall also varies from place to place. The rainfall in the district generally varies from 400 mm. to 600 mm. Most parts of the district receive rainfall between 500 mm. to 600 mm. where as north-eastern parts of the district receive rain fall between 400 mm. to 500 mm.

1.7 Temperature

Due to its distance from the sea and closeness to the Arid and Semi-arid of Haryana and Rajasthan, there is a great difference between the maximum and minimum temperatures of day and night, as well as during winter and summer.

The maximum temperature during summer months may reach more than 45°C during May-June. Hot dry winds blow during the day in summer due to its proximity to the arid areas of Haryana and Rajasthan.

1.8 Socio-Economic conditions

The economy of the district is primarily agricultural. At the time of 1981 Census, about 60 per cent of the total main workers were cultivators and agricultural labourers. There were 45 registered working factories in the district during 1979. The large and medium scale units are engaged in manufacturing synthetic detergents, brass, copper and aluminium sheets and utensils; printing and wrapping paper, shoddy yarn and capillary tubes etc. There are many small scale units also in Mahendragarh district manufacturing food products, metal products and parts, rubber, plastic, petroleum and coal products, leather products, machine tools, wood products, furniture and fixtures, textile products, chemicals and chemical products, cotton textiles and non-metallic mineral products etc.

Irrigation in the district is generally done by tubewells. Area under cultivation of foodgrains was 287.4 thousand hectares during the year 1979-80. Among the foodgrains, mostly baira, wheat and gram are grown. A very small area of 12 sq. kms. is under reserved forests. In 1977 the number of livestock in Haryana was 6,904,900 which includes cattle, buffaloes, horses and ponies, donkeys, sheep, goats, camels and pigs etc. During 1979-80, the number of different types of motor vehicles on road was 93,583 in the state out of which 2,750 came from Mahendragarh district.

Out of the total population of the district, 86.93% is the rural population and 13.07% is urban, 38.61% of the total population are literates. Literacy rate of males and females is 55.52 and 20.44 respectively. Out of total population 23.61% are main workers, 5,835 marginal

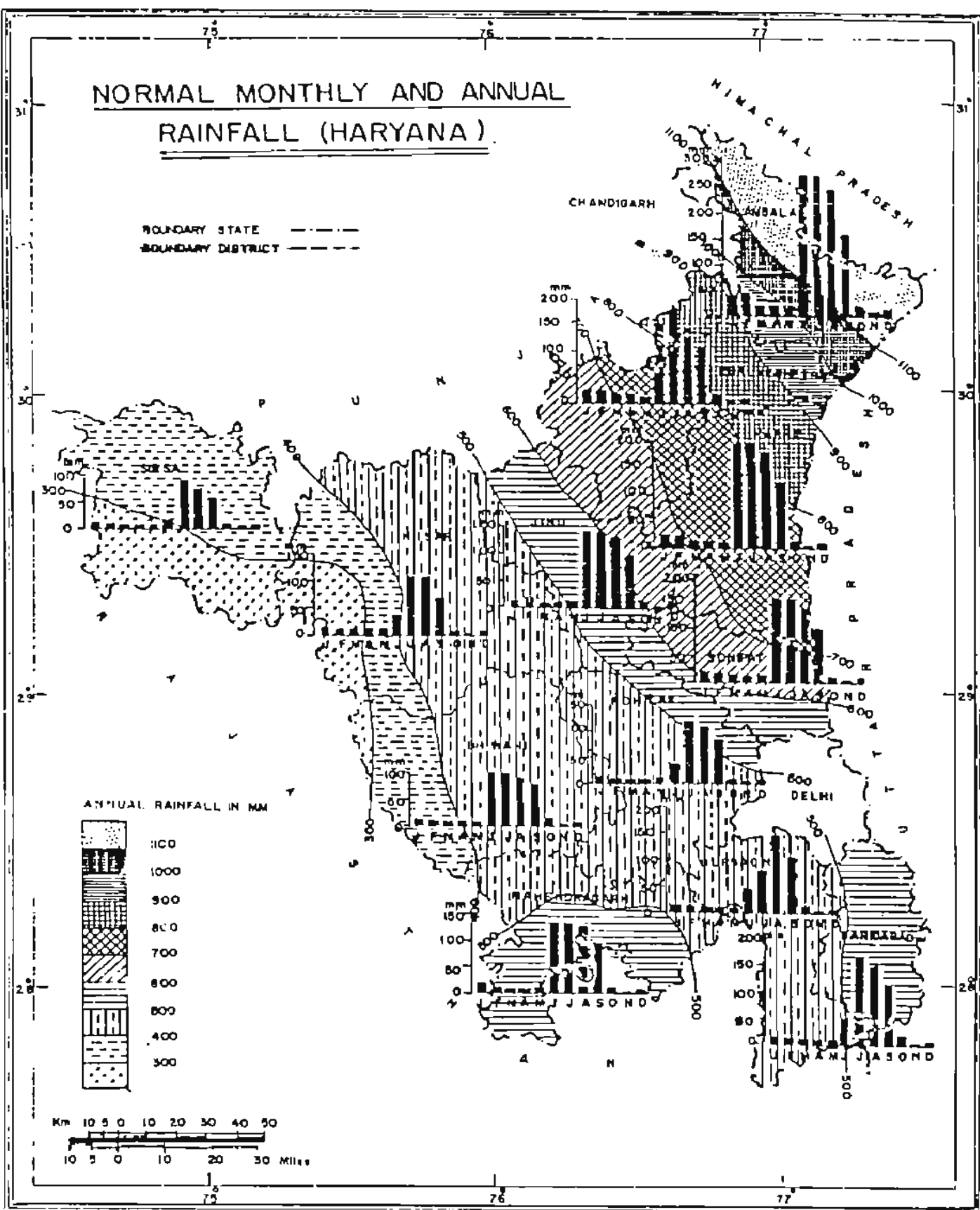
1.9 Uses

The trees provide mainly timber, fuelwood, fodder, fruit and shade. Timber is obtained mainly from Dalbergia sissoo, Eucalyptus spp., Melia azedarch, Syzygium cumini, Morus alba, Mangifera indica, Azadirachta indica, Albizia spp. etc. Small timber is mainly obtained from Acacia nilotica, Acacia spp., Morus alba, Prosopis spp. etc. All the above mentioned tree spp. provide fuelwood also. Trees of Acacia nilotica, Albizia spp., Morus alba, Prosopis spp. etc. also provide fodder in the form of leaves or pods. Morus spp. provides wood for manufacturing hockey sticks and other sports goods. Eucalyptus spp. provides paper pulp wood. Fruits are obtained from Zizyphus spp. and Syzygium cumini. Neem oil is obtained from Azadirachta indica.

It has been seen that ban on felling of green trees in Himachal Pradesh, packing cases for apple and other fruits/vegetables are being supplied from wood of Eucalyptus spp.. Eucalyptus wood is also used for making cheap furniture and as a fuelwood.

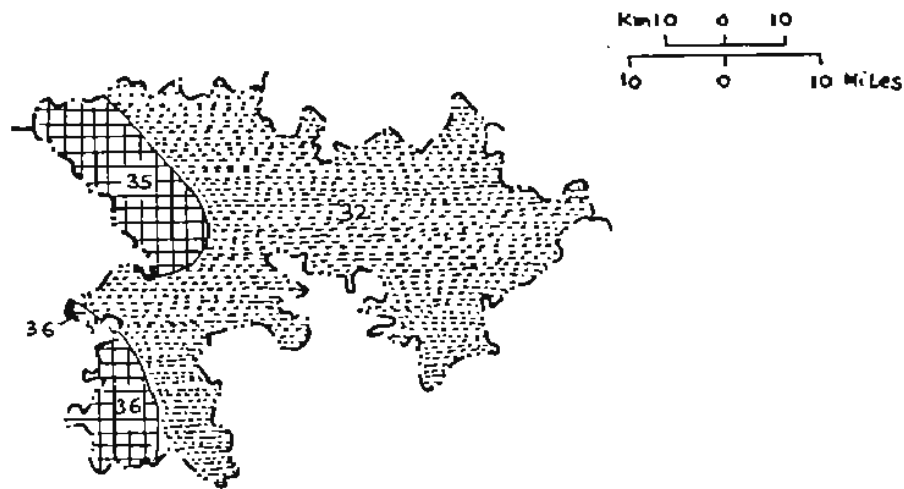
NORMAL MONTHLY AND ANNUAL RAINFALL (HARYANA)




BOUNDARY STATE - - - - -
BOUNDARY DISTRICT - - - - -



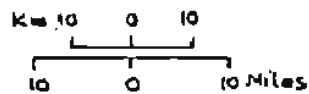
HARYANA DISTRICT MAHENDRAGARH

SOILS



-  ORTHIDS - FLUENTS (32)
-  PSAMMENTS (35)
-  PSAMMENTS - FLUENTS (36)

GEOLOGY



-  ALLUVIUM
-  DELHI GROUP

RECENT
MIDDLE
PROTEROZOIC

CHAPTER 2

2.1 Design and Methodology of Non-Forest Inventory Survey

District Census Books of Census Survey 1981 were used as basis of Inventory of Non-Forest Areas. A list of villages in the district was prepared and each village was given a serial number.

2.2 Definition of Non-Forest Area

For the purpose of this survey

(1) All those areas were taken which were outside the traditional Reserved Forest Areas.

(2) All those areas which satisfied the following conditions were also excluded:-

(a) All places within the Municipality, Corporation, Cantonment Board or a notified area Committee etc.

(b) All other places which satisfied the following criteria:-

(i) A minimum population of 5,000;

(ii) At least 75% of the male working population engaged in non-agricultural pursuits and

(iii) A density of population of at least 400 per Sq.km. (1,000 per Sq.mile).

In addition to all municipal areas/Cantonment Board, four villages namely (1) Bahiyal in Ambala district, (2) Smalaha in Karnal district, (3) Gurgaon (rural) and (4) Jharsa in Gurgaon district satisfying the above criteria had been treated as Census towns (non-municipal) in 1981 Census. Panchkula Urban Estate in Ambala district had also been treated as a town. The Faridabad Complex Administration consisting of Faridabad, Faridabad Township and Hallabqarh towns of 1971 and some surrounding villages in Faridabad district had been treated as towns.

2.3 Sampling Design and Method of Selection of Sample Villages

The inventory survey was undertaken in the rural area (non-forest area only) of the state. The design followed in the field inventory was random sampling with the villages as sampling units. A list of villages of Mahendragarh district was prepared according to 1981 Census and each village was given a serial number.

Firstly, the number of sample villages to be surveyed in the state was decided by taking a pilot survey such that the results of the survey at State level would be at the precision level of $\pm 10\%$ at 95% probability.

For carrying out pilot survey, 2 to 3 villages were taken from each district of Haryana State. Total 31 villages were selected for pilot survey in Haryana State. A list of the villages selected for pilot survey is given in Appendix-I.

The villages selected for pilot survey were taken up one by one for carrying out complete enumeration of all the trees of 10 cms. and above diameter at B.Ht(08). Each of these selected villages, with its area and boundaries as per the revenue records, was treated as a sampling unit.

After completing the pilot survey the data was processed for obtaining number of trees/Ha. in each village for calculation of sample size by using the formula

$$n = \frac{\left(\frac{2 * c.v.}{10} \right)^2}{1 + \frac{1}{N} \left(\frac{2 * c.v.}{10} \right)^2}$$

$$\text{where } c.v. = \frac{s}{\bar{x}} * 100 \quad \text{and}$$

N = total no. of villages in the State.

For large N , it will be equal to

$$n = \left(\frac{2 * c.v.}{10} \right)^2$$

The method used was ratio method of estimation. The sample size obtained from pilot survey was 241 villages.

These 241 villages were distributed over all the districts proportional to the rural area of the district. A list of number of villages selected for each district is

given in the Appendix-II.

These randomly selected villages in each district were taken up one by one for carrying out complete enumeration of all the trees of 10 cms. and above diameter. Each of these randomly selected villages, with its area and boundaries as per the revenue records, was treated as a sampling unit.

2.4 Field Methodology

The field data is collected by a Crew, consisting of one Junior Technical Assistant (Crew Leader), a Deputy Ranger, two Fieldmen, a Khalasi and unskilled labourers engaged locally wherever necessary for showing the boundary of the village as well as helping in the survey work.

Each Crew Leader is provided with a list of villages to be tackled alongwith a set of 1:50,000 scale maps with location of villages duly marked. The Crew Leader is required to find the nearest convenient route so that they can reach the village with minimum traverse by jeep or on foot. After reaching the village the next job is to determine the boundary of the village. For this purpose, the maps of the Revenue department are referred and in addition the help of village level authorities are obtained. The unit of sampling is the whole of sample village. To begin the data collection it is necessary to select the starting/reference point preferably centre of the village. This reference point/centre is not necessarily to be the centre of the area. The details of the location of the reference point/centre and its description are recorded in the village description form. This is very important to enable the checking crew to reach this point and commence checking.

After fixing the starting/reference point, the enumeration work is started from the reference point by dividing the entire village into suitable sized angular quadrants with the help of compass in such a way that enumeration within each angular quadrant could be completed in one working day. The size of each angular quadrant is decided by the Crew Leader accordingly. Enumeration of trees/bamboo is commenced from the line marking due North from the centre/reference point and is proceeded in clockwise direction (i.e. North to East).

This procedure is important to avoid duplication/omission of trees when the enumeration work is continued on the next day. Further, all the enumerated trees are suit-

ably marked with chalk to achieve this objective. The informations regarding number of angular quadrants, the size of each angular quadrant and number of trees enumerated in each quadrant are recorded in the prescribed Field forms given below:

- (1) Village Description Form
- (2) Village Tree Enumeration Form
- (3) District Tree Form

Samples of the above field forms may be seen in the Appendix-VI. The field forms are briefly described below:

(1) Village Description Form

The information regarding the conspicuous features of the point selected as the Centre for starting the enumeration, number of angular quadrant, Size of each angular quadrant and number of trees enumerated in each quadrant are recorded in this form.

(2) Village Tree Enumeration Form

In this form the data of all trees of 10 cms. and above diameter at breast height over bark [DBH(OB)] in a sampled village are recorded. The dead trees having utility less than 70% and all trees of less than 10 cms. diameter are ignored.

(3) District Tree Form

This form has to be filled in for each sampled village selected in the district.

While carrying out the survey, i.e. enumeration and measurement of trees, the category of each tree - indicating the type of plantation it belongs to is also recorded in the columns of Village Tree Enumeration Form. The definitions used for this classification are as under:

Farm Forestry: Trees along the farm bunds and in small patches up to 0.1 ha. in area.

Road side Plantation: For trees planted along the road side.

Village Woodlot: Naturally growing trees on community/private land.

Block Plantation: Patches covering an area of more than 0.1 ha. and not falling in any of the above.

Ponds: For trees planted in and around water ponds.

Railway Lines: For trees planted along the railway lines.

Canals: Trees planted along the canals.

Rest: Trees not falling in any of the above categories.

CHAPTER 3

Data Processing

3.1 Processing of the Data

After completion of field work, the field forms of the villages surveyed were consolidated and checked for inconsistencies and Coding mistakes, if any. Forms for each village were then processed manually and information was filled in the tables. The species found in sample villages of Mahendragarh district during survey are given in Appendix-III. Since many of the species in the region were having a very small number of trees, they were clubbed together under Miscellaneous species. Twenty main species were selected for calculating the number of stems on the basis of their numerical occurrence, commercial importance and regional importance. After manual processing of the data the tabulated data was then transferred to the data files in the Personal Computer (PC) using suitable softwares. The data files were then processed for making various tables in desired formats required to be incorporated in the Report.

3.2 Area Computation

Rural area of the district was calculated by adding up the areas of the villages given in the Census Book of 1981 of that district.

3.3 Procurement of Volume factors

Collection of felled tree data has been discontinued by zones, for developing volume equations. The volume factors have been obtained from the Logging Divisions and Territorial Forest Divisions of the State Forest Department of Haryana.

The volume factors used for different tree species have been given in the volume table at the end of this chapter.

3.4 Estimation Procedure

The estimation procedure is given below:

Let,

x_i = area of the i th village

y_i = volume/no. of trees for the i th village

n = no. of sample villages in the district/state
 N = total no. of villages in the district/state

$$\bar{x} = \sum_{i=1}^n x_i / n = \text{average area per village in the sample}$$

$$\bar{X} = \sum_{i=1}^N x_i / N = \text{average area per village in the population (District/State)}$$

$$\bar{y} = \sum_{i=1}^n y_i / n = \text{average volume/no. of trees in the sample}$$

$$\bar{Y} = \sum_{i=1}^N y_i / N = \text{average volume/no. of trees in the population (District/State)}$$

$$A = \sum_{i=1}^N x_i = \text{total area of all villages in the population (District/State)}$$

Then the mean volume/no. of trees per unit area for the population (District/State) is given by

$$\hat{R} = \frac{\bar{Y}}{\bar{X}}$$

The estimate of R is the sample ratio

$$\hat{R} = \frac{\sum_{i=1}^n y_i}{\sum_{i=1}^n x_i} = \frac{\bar{y}}{\bar{x}}$$

The estimate of total volume/no. of trees in the population (District/State) is given by

$$\hat{T} = \frac{A * \bar{y}}{\bar{x}} = A * \hat{R}$$

Estimated variance of \hat{R} is given by

$$\hat{V}(\hat{R}) = \frac{N-n}{Nn\bar{x}^2} * \frac{1}{(n-1)} \left[\sum_{i=1}^n y_i^2 - 2\hat{R} \sum_{i=1}^n y_i x_i + \hat{R}^2 \sum_{i=1}^n x_i^2 \right]$$

When N is large, then

$$\hat{V}(\hat{R}) = \frac{1}{n(n-1)\bar{x}^2} \left[\sum_{i=1}^n y_i^2 - 2\hat{R} \sum_{i=1}^n y_i x_i + \hat{R}^2 \sum_{i=1}^n x_i^2 \right]$$

Estimated variance of \hat{T} is given by

$$\hat{V}(\hat{T}) = A^2 * \hat{V}(\hat{R})$$

$$\text{S.E. of } \hat{R} = \sqrt{\hat{V}(\hat{R})} \quad \text{and} \quad \text{S.E.\%} = \frac{\text{S.E.}}{\hat{R}} * 100$$

$$\text{S.E. of } \hat{T} = \sqrt{\hat{V}(\hat{T})} \quad \text{and} \quad \text{S.E.\%} = \frac{\text{S.E.}}{\hat{T}} * 100$$

Volume table - specieswise and dia-classwise

S.No.	Name of Species	10-20	20-30	30-40	40+
1	<u>Acacia catechu</u>	0.10	0.21	0.51	1.13
2	<u>Acacia nilotica</u>	0.06	0.14	0.57	1.13
3	<u>Acacia tortilis</u>	0.06	0.14	0.57	1.13
4	<u>Acacia</u> spp.	0.06	0.14	0.57	1.13
5	<u>Albizia</u> spp.	0.06	0.14	0.57	1.13
6	<u>Anadenanthe indica</u>	0.06	0.14	0.57	1.13
7	<u>Batharaja stason</u>	0.06	0.14	0.57	1.13
8	<u>Eucalyptus</u> spp.	0.10	0.41	0.95	1.71
9	<u>Ficus</u> spp.	0.06	0.14	0.57	1.13
10	<u>Gonolobus indica</u>	0.06	0.14	0.57	1.13
11	<u>Holia azedarach</u>	0.06	0.14	0.57	1.13
12	<u>Horus</u> spp.	0.06	0.14	0.57	1.13
13	<u>Populus</u> spp.	0.07	0.35	0.75	1.56
14	<u>Prosopis juliflora</u>	0.06	0.14	0.57	1.13
15	<u>Prosopis juliflora</u>	0.06	0.14	0.57	1.13
16	<u>Psidium guajava</u>	0.06	0.14	0.57	1.13
17	<u>Salvadora</u> spp.	0.06	0.14	0.57	1.13
18	<u>Syzygium cumini</u>	0.06	0.14	0.57	1.13
19	<u>Tamarix aphylla</u>	0.06	0.14	0.57	1.13
20	<u>Zizyphus</u> spp.	0.06	0.14	0.57	1.13
21	<u>Unc. spp.</u>	0.06	0.14	0.57	1.13

CHAPTER 4

Stand and Stock Tables

As per 1981 Census Mahendragarh district has a total of 743 villages having an area of 2928.01 Sq.km. Out of these, 16 villages having an area of 88.26 Sq. km. were randomly selected and surveyed (see Appendix-IV).

During the course of inventory, data have been collected for trees having 10 cms. and above diameter only. The data collected from 16 villages have been statistically analysed for variability in respect of stand and stock parameters of trees and "number of trees/ha." and "volume/ha." The analysis shows that the estimated number of trees/ha. is 19.70 and the corresponding volume is 3.689 cum./ha. for the entire district of Mahendragarh.

The distribution of total number of stems and stems/ha. as well as corresponding total volume and volume/ha. which have been estimated on the basis of survey for the entire district have been included as table nos. 1 to 6.

In the entire rural area of Mahendragarh district 57.68 lakh trees having volume of 10.714 lakh cum. have been estimated and the distribution thereof is discussed below:

1. The distribution of total number of trees (estimated), specieswise and dia-classwise (all categories combined), is given in table no. 1. The specieswise distribution of total number of trees in the State has been estimated by ratio estimation method.

The analysis shows that, when all species are combined, the maximum number of the estimated trees occur in 10-20 cms. dia-class i.e. 30.62 lakh trees (53.08%) followed by 18.38 lakh trees (31.87%) in 20-30 cms. dia-class, 6.52 lakh trees (11.30%) in 30-40 cms. dia-class and 2.16 lakh trees (3.75%) in 40 cms. and above dia-class.

It also shows that in the rural area of Mahendragarh district, when all the dia-classes are combined, Prosopis cineraria (Jandi) has the largest representation i.e. 21.95 lakh trees (38.06%), followed by Acacia nilotica 11.27 lakh trees (19.54%), Salvadora spp. 8.39 lakh trees (14.55%), Acacia tortilis 4.88 lakh

trees(8.46%) Zizyphus spp. 2.01 lakh trees (3.48%), Prosopis juliflora 1.97 lakh trees (3.42%), Acacia spp. 1.62 lakh trees (2.82%), Azadirachta indica 1.40 lakh trees, (2.43%), Eucalyptus spp. 1.29 lakh trees (2.23%) and Tamarix aphylla 0.96 lakh trees (1.67%). The representation of the rest of the species is less than 1% each.

2. The distribution of total number of trees (estimated), categorywise and dia-classwise (all species combined), is given in table no. 2.

It shows that, when all the dia-classes are combined, the representation of trees in Category-III - Village Woodlot is the highest i.e. 53.76 lakh trees (58.53%) followed by Category-I - Farm Forestry 13.34 lakh trees (23.13%), Category-IV- Block Plantations 4.96 lakh trees (8.60%), Category-II - Roadside Plantations 2.77 lakh trees (4.81%), Category-VI- Railway lines 1.41 lakh trees (2.44%), Category-VII- Canals 1.12 lakh trees (1.95%), Category-V - Ponds 0.32 lakh trees (0.55%) and Category-VIII- Rest has been found to be absent.

The dia-classwise distribution of total number of stems and percentage thereof, for combined categories, are the same as in table no. 1 i.e. dia-classwise total number of trees for all species combined as already described above in para 1.

Though the overall distribution of stems per hectare is 19.70, the dia-classwise distribution of stems per hectare is maximum in dia-class 10-20 cms. i.e. 10.46 followed by 6.28 in 20-30 cms dia-class, 2.23 in 30-40 cms. dia-class and 0.74 in 40 cms. and above dia-class.

3. The distribution of total number of estimated trees, specieswise and categorywise (all dia-classes combined), has been presented in table no. 3.

The specieswise total number of trees (all categories combined) and the percentage thereof are the same as in table no. 1 i.e. specieswise distribution of total number of trees for combined dia-classes as already described above in para 1.

Similarly, categorywise total number of trees estimated (all species combined) and the percentage thereof are also same as in table no. 2 i.e. categorywise total number of trees for combined dia-classes as described in para 2 above.

The analysis shows that the specieswise total number of estimated trees (in order of decreasing number) in the various prescribed categories are as under:

Category-I - Farm Forestry

As per the estimate, this category has a total number of 13.34 lakh trees (23.13%) in this category. It is mainly comprised of Acacia nilotica 7.27 lakh trees, Acadraghla indica 1.32 lakh trees, Acacia tortilis 1.01 lakh trees, Lamarix alphyllia 0.75 lakh trees, Eucalyptus spp. 0.73 lakh trees, Zizyphus spp. 0.63 lakh trees, Prosopis juliflora 0.51 lakh trees, Dalbergia sissoo 0.33 lakh trees, Ficus spp. 0.16 lakh trees. The remaining species are represented very poorly.

Category-II - Roadside Plantation

As per the estimation there are 2.77 lakh trees (4.81%) in all in this category. It is mainly represented by Acacia nilotica 0.95 lakh trees, Prosopis cineraria 0.75 lakh trees, Acacia tortilis 0.56 lakh trees and Eucalyptus spp. 0.15 lakh trees. The representation of the remaining species is very poor and hence not presented here.

Category-III - Village Woodlots

As per estimate, this category has a total number of 33.76 lakh trees (58.53%) which is the highest amongst all the categories. It is mainly comprised of Prosopis cineraria 20.89 lakh trees, Salvadora spp. 8.22 lakh trees, Acacia spp. 1.38 lakh trees, Zizyphus spp. 1.31 lakh trees, Prosopis juliflora 1.02 lakh trees. The remaining species have a poor representation.

Category-IV - Block Plantations

There are 4.96 lakh trees (8.60%) in all in this category. The main species forming bulk of the crop are Acacia tortilis 2.68 lakh trees, Acacia nilotica 1.67 lakh trees, Eucalyptus spp. 0.19 lakh trees, Prosopis cineraria 0.17 lakh trees. Representation of the remaining species being very poor are not mentioned here.

Category-V - Ponds

As per the estimate, there are only 0.32 lakh trees (0.55%) in this category. Acacia nilotica has 0.21 lakh trees. Other spp. are either absent or have a very poor

representation.

Category-VI - Railway Lines

This category has 1.40 lakh trees (2.44%) in all. Acacia nilotica having 0.81 lakh trees and Acacia tortilis 0.28 lakh trees. The rest of the main spp. are either very poorly represented or are found to be absent in this district.

Category-VII - Canals

It is estimated that this category in total has 1.12 lakh trees (1.95%). The main species in this category are Acacia tortilis 0.34 lakh trees, Prosopis juliflora 0.26 lakh trees, Acacia nilotica 0.25 lakh trees and Eucalyptus spp. 0.21 lakh trees. The representation of the rest of the spp. is very poor.

Category-VIII - Rest

The representation of main spp. in this category is absent.

Analysis of Volume (Stock)

As per the estimate the entire rural area of Mahendragarh district has a total volume (all species and dia-classes combined) of 10.71 lakh cum. corresponding to the estimated total of 57.68 lakh trees. The distribution of this stock is discussed below:

1. An assessment of dia-classwise and specieswise distribution of volume (all categories combined) has been presented in table no. 4. The dia-classwise total estimated volume of trees and percentage thereof (in decreasing order) of all species is as given below:

Dia-class 30-40 cms. having a volume of 3.73 lakh cum. (34.87%) followed by dia-class 20-30 cms. having a volume of 2.66 lakh cum. (24.79%), 40 cms. and above having a volume of 2.45 lakh cum. (22.85%) and 10-20 cms. having volume of 1.87 lakh cum. (17.49%).

It also shows that the total volume per hectare contributed by trees of all species of all dia-classes combined is 3.659 cum. The volume per hectare for different dia-classes (in decreasing order) are as below:

30-40 cms. dia-class (1.276 cum.), 20-30 cms. (0.907

cum.), 40 cms. and above dia-class (0.836 cum) and 10-20 cms dia -class(0.640 cum.).

It may also be seen from the said table that the bulk of the volume, for combined dia-classes, is mainly contributed by the following species (in decreasing order):

Prosopis cineraria 4.72 lakh cum. (44.02%), Acacia nilotica 1.71 lakh cum. (15.93%) Salvadora spp. 1.58 lakh cum. (14.74%), Acacia tortilis 0.75 lakh cum. (6.99%), Azadirachta indica 0.45 lakh cum. (4.19%) Eucalyptus spp. 0.28 lakh cum. (2.58%), Zizyphus spp. 0.23 lakh cum. (2.10%), Lamarix aphylla 0.20 lakh cum. (1.86%), Ficus spp. 0.19 lakh cum. (1.74%), Prosopis juliflora 0.16 lakh cum. (1.53%) and Dalbergia sissoo 0.13 lakh cum. (1.18%). The volume contributed by the rest. of species is very less.,

2. The distributing of total volume (estimated), categorywise and dia-classwise (all species combined), is given in table no. 5.

It shows that, when all dia-classes are combined, category-III has the maximum volume of 6.61 lakh cum. (61.69%) followed by category-I having 2.41 lakh cum. (22.47%), category-IV having 0.65 lakh cum. (6.10%), category-II, having 0.57 lakh cum. (5.36%) and category-VII having 0.25 lakh cum. (2.36%) and category-VI having 0.16 lakh cum. (1.47%). The volume contributed by categories V has been found to be less than 1% each.

It also shows that the dia-classwise total volume of all categories combined and the percentage thereof are the same as in table no. 4 i.e. dia-classwise total volume of all species combined as described in para 1 above.

3. The distribution of total estimated volume, specieswise and categorywise (all dia-classes combined), is given in table no. 6.

The specieswise total volume of trees (all categories combined) and the percentage thereof are the same as in table no. 4 i.e. specieswise distribution of total volume of trees for combined dia-classes as described above in para 1.

Similarly, the categorywise total volume of trees (all species combined) and the percentage thereof are also same as in table no. 5 i.e. categorywise total volume of trees for combined dia-classes as described in para 2 above.

Table No. 1

Distribution of total number of stems specieswise and Dia-classwise
(All Categories Combined)

Rural area of MAHENDRAGARH DISTT.		2928.01 Sq.Km.					
S.No.	Name of Species	10-20	20-30	30-40	40+	Total	Zone
1	Acacia catechu	0	66	0	0	66	0.00
2	Acacia nilotica	724741	278339	92891	31250	1127221	19.54
3	Acacia spp.	156254	5076	863	266	162459	2.82
4	Acacia tortilis	256543	177354	47208	6834	487939	8.46
5	Albizia spp.	26142	5673	2057	1724	35596	0.62
6	Azadarachta indica	59549	37256	22427	20668	139900	2.43
7	Dalbergia sissoo	17582	11212	7431	5076	41301	0.72
8	Eucalyotus spp.	92259	30621	5108	563	128551	2.23
9	Ficus spp.	5705	4446	4280	13468	27899	0.48
10	Mangifera indica	0	66	0	0	66	0.00
11	Melia azadirach	3848	796	166	0	4810	0.08
12	Morus spp.	6303	1294	531	232	8360	0.14
13	Populus spp.	0	0	33	0	33	0.00
14	Prosopis cineraria	776693	985430	361309	71759	2195191	38.06
15	Prosopis juliflora	167468	25545	3781	498	197292	3.42
16	Psidium guyava	829	0	0	0	829	0.01
17	Salvadora spp.	519056	194141	77000	49266	839463	14.55
18	Syzygium cumini	365	100	0	0	465	0.01
19	Tamarix aphylla	55999	23986	8990	7199	96174	1.67
20	Zizyphus spp.	149718	38981	9687	2255	200641	3.48
21	Misc. spp.	42499	17716	8293	5308	73816	1.28
Total		3061553	1838098	652055	216366	5768072	100.00
Zone		53.08	31.87	11.30	3.75	100.00	

Table No. 2
 Distribution of total number of stems- Categorywise and
 Dia-classwise
 (All species combined)
 Rural area of MAHENDRAGARH DISTT. 2928.01 SQ.Ka.

Category	10-20	20-30	30-40	40+	Total	% age
I	819555	333610	119697	61240	1334102	23.13
II	133561	95180	36659	11910	277310	4.81
III	1603712	1202728	441659	127989	3376088	58.53
IV	321798	139122	32576	6370	495866	8.60
V	23521	3816	1924	2454	31715	0.55
VI	107322	26075	4179	2920	140496	2.44
VII	52084	41567	15361	3483	112495	1.95
TOTAL	3061553	1838098	652055	216366	5768072	100.00
% age	53.08	31.87	11.30	3.75	100.00	
Stems/ha.	10.46	6.28	2.23	0.74	19.70	

Table No. 3

Distribution of total number of Stems Specieswise and Categorywise
(All Dia-classes Combined)

		Rural area of MAHENDRAGARH DISTT.								2928.01 Sq.Km.	
S.No.	Name of Species	I	II	III	IV	V	VI	VII	VIII	Total	Age
1	Acacia catechu	66	0	0	0	0	0	0	0	66	0.00
2	Acacia nilotica	727329	94615	12009	167003	20502	80682	25081	0	1127221	19.54
3	Acacia spn.	16455	1095	138772	1825	0	3582	730	0	162459	2.82
4	Acacia tortilis	101317	56497	232	267855	0	27702	34336	0	487939	8.46
5	Albizia spp.	15394	9853	497	8890	66	664	232	0	35596	0.62
6	Azadarachta indica	132435	1194	0	1294	465	4413	99	0	139900	2.43
7	Dalbergia sissoo	33340	4313	0	928	33	232	2455	0	41301	0.72
8	Eucalyptus spp.	73017	15426	0	19374	0	0	20734	0	128551	2.23
9	Ficus spp.	15758	697	9454	166	1427	331	66	0	27899	0.48
10	Mangifera indica	0	0	0	0	0	0	66	0	66	0.00
11	Melia azedarach	4214	464	0	66	0	66	0	0	4810	0.08
12	Morus spp.	8327	0	0	0	33	0	0	0	8360	0.14
13	Populus spp.	33	0	0	0	0	0	0	0	33	0.00
14	Prosopis cineraria	0	75075	2088534	17185	2156	9852	2389	0	2195191	38.06
15	Prosopis juliflora	50626	11379	102477	3185	730	3450	25445	0	197292	3.42
16	Psidium gujava	829	0	0	0	0	0	0	0	829	0.01
17	Salvadora spp.	0	565	821546	6701	3119	7266	266	0	839463	14.55
18	Syzygium cumini	465	0	0	0	0	0	0	0	465	0.01
19	Tamarix aphylla	74512	995	20535	0	0	66	66	0	96174	1.67
20	Zizyphus spp.	62667	3782	131572	1062	431	829	298	0	200641	3.48
21	Unidentified tree	17318	1360	50460	332	2753	1361	232	0	73816	1.28
Total		1334102	277310	3376088	495866	31715	140496	112495	0	5768072	100.00
Age		23.13	4.81	58.53	8.60	0.55	2.44	1.95	0.00	100.00	

Table No. 4

Distribution of total Volume (in cum.)-Specieswise and Dia-classwise
(All Categories Combined)

Rural area of MOHINDERGARH DISTRICT:		2928.01 So. km.						
S.No.	Name of Species	10-20	20-30	30-40	40+	Total	Zone	Vol./ha.
1.	Acacia catechu	0.000	13.860	0.000	0.000	13.860	0.00	0.000
2.	Acacia nilotica	43484.460	38967.460	52947.870	35312.500	170712.290	15.93	0.583
3.	Acacia spp.	9375.240	710.640	491.910	300.580	10878.370	1.02	0.037
4.	Acacia tortilis	15392.580	24829.560	26908.560	7722.420	74853.120	6.99	0.256
5.	Albizia spp.	1568.320	794.220	1172.490	1948.120	5483.350	0.51	0.019
6.	Azadirachta indica	3572.940	5215.840	12783.390	23354.840	44927.010	4.19	0.153
7.	Dalbergia sissoo	1054.920	1569.680	4235.670	5735.880	12596.150	1.18	0.043
8.	Eucalyptus spp.	9225.900	12554.610	4852.600	962.730	27595.840	2.58	0.094
9.	Ficus spp.	342.300	622.440	2439.600	15218.840	18623.180	1.74	0.064
10.	Mangifera indica	0.000	9.240	0.000	0.000	9.240	0.00	0.000
11.	Melia azadirach	230.880	111.440	94.620	0.000	436.940	0.04	0.001
12.	Morus spp.	378.180	181.160	302.670	262.160	1124.170	0.10	0.004
13.	Populus spp.	0.000	0.000	24.090	0.000	24.090	0.00	0.000
14.	Prosopis cineraria	46601.580	137960.200	205946.130	81087.670	471595.580	44.02	1.611
15.	Prosopis juliflora	10048.080	3576.300	2155.170	562.740	16342.290	1.53	0.056
16.	Psidium guava	49.740	0.000	0.000	0.000	49.740	0.00	0.000
17.	Salvadora spp.	31143.360	27179.740	43890.000	55670.580	157883.680	14.74	0.539
18.	Syzygium cumini	21.900	14.000	0.000	0.000	35.900	0.00	0.000
19.	Tamarix aphylla	3359.940	3358.040	5124.300	8134.870	19977.150	1.86	0.068
20.	Zizyphus spp.	8983.080	5457.340	5521.590	2548.150	22510.160	2.10	0.077
21.	Misc. spp.	2549.940	2480.240	4727.010	5998.040	15755.230	1.47	0.054
Total		187383.540	265606.010	373617.670	244920.120	1071427.340	100.00	
Zone		17.49	24.79	34.87	22.85	100.00		
Vol./ha.		0.640	0.907	1.276	0.836	3.659		

Table No. 5

Distribution of total volume - Categorywise and Dia-classwise
(All species combined)

		Rural area of MAHENDRAGARH DISTT.				2928.01 Sq.Km.	
S.No.	Category	10-20	20-30	30-40	40+	Total	% age
1	I	51366.820	50910.950	69127.470	69354.900	240760.140	22.47
2	II	8455.540	14337.430	21109.950	13496.580	57399.500	5.36
3	III	96222.720	168381.920	251745.650	144627.570	660977.840	61.69
4	IV	19980.680	19535.110	18669.020	7198.100	65382.910	6.10
5	V	1411.260	534.240	1096.680	2773.020	5815.200	0.54
6	VI	6439.320	3650.500	2382.030	3299.600	15771.450	1.47
7	VII	3507.200	8255.860	9486.890	4070.350	25320.300	2.36
TOTAL		187383.540	265606.010	373617.670	244820.120	1071427.340	100.00
% age		17.49	24.79	34.87	22.85	100.00	
Volume/ha.		0.64	0.91	1.28	0.84	3.66	

Table No. 6

Distribution of total number of Steas Specieswise and Categorywise
(All Dia-classes Combined)

S.No.	Name of Species	Rural area of MAHENDRAGARH DISTT.								2928.01 Sq.Km.	
		I	II	III	IV	V	VI	VII	VIII	Total	Age
1	Acacia catechu	13.860	0.000	0.000	0.000	0.000	0.000	0.000	0.000	13.860	0.00
2	Acacia nilotica	118883.490	20142.980	2024.170	15772.900	1718.450	7543.210	4627.090	0.000	170712.290	15.93
3	Acacia spp.	1390.070	181.210	8813.150	191.160	0.000	285.700	57.080	0.000	10878.370	1.02
4	Acacia tortilis	10997.110	10492.090	16.560	41794.460	0.000	2101.250	9451.650	0.000	74853.120	6.99
5	Albizia spp.	3307.610	918.050	112.070	946.810	74.580	39.840	84.390	0.000	5483.350	0.51
6	Azadarachta indica	40908.620	579.600	0.000	393.640	300.970	2700.290	43.890	0.000	44927.010	4.19
7	Dalbergia sissoo	7979.590	2717.830	0.000	159.130	1.980	159.860	1577.760	0.000	12596.150	1.18
8	Eucalyptus spp.	14553.390	3290.450	0.000	2872.240	0.000	0.000	6879.760	0.000	27595.840	2.58
9	Ficus spp.	10046.520	211.600	6714.860	187.580	1346.070	112.590	3.960	0.000	18623.180	1.74
10	Mangifera indica	0.000	0.000	0.000	0.000	0.000	0.000	9.240	0.000	9.240	0.00
11	Melia azedarach	346.320	82.700	0.000	3.960	0.000	3.960	0.000	0.000	436.940	0.04
12	Morus spp.	1122.190	0.000	0.000	0.000	1.980	0.000	0.000	0.000	1124.170	0.10
13	Populus spp.	24.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	24.090	0.00
14	Prosopis cineraria	0.000	15919.890	452053.520	1530.690	132.000	1379.930	579.550	0.000	471595.580	44.02
15	Prosopis juliflora	3852.470	1353.390	8769.960	220.300	49.080	256.580	1840.510	0.000	16342.290	1.53
16	Psidium guvava	49.740	0.000	0.000	0.000	0.000	0.000	0.000	0.000	49.740	0.00
17	Salvadora spp.	0.000	205.180	154608.100	1206.180	952.110	809.840	102.270	0.000	157883.680	14.74
18	Syzygium cumini	35.900	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.900	0.00
19	Tamarix aphylla	15239.560	649.830	4074.560	0.000	0.000	6.600	6.600	0.000	19977.150	1.86
20	Zizyphus spp.	8690.220	451.320	13162.750	77.000	39.140	69.210	20.520	0.000	22510.160	2.10
21	Misc. spp.	3319.390	203.380	10628.140	66.860	1198.840	302.590	36.030	0.000	15755.230	1.47
Total		240760.140	57399.500	660977.840	65382.910	5815.200	15771.450	25320.300	0.000	1071427.340	100.00
Age		22.47	5.36	61.69	6.10	0.54	1.47	2.36	0.00	100.00	

Appendix-I

List of villages selected for Pilot Survey
in Haryana State.

S.No.	Name of the village	Area of Village (Ha.)
1.	Baghana	1479.51
2.	Baidwala	1416.38
3.	Bhandari	677.00
4.	Bhatoo	583.00
5.	Bondkalan	2353.00
6.	B. Busna	248.00
7.	B. Tauru	184.94
8.	Dechaur	2728.00
9.	Dighal	2211.00
10.	Dobhi	2896.00
11.	Gorakhpur	4370.00
12.	Gurautbi	1720.00
13.	Hajiki	480.00
14.	Kalmeur	2762.00
15.	Khandalhari	2324.00
16.	Kharkhara	979.00
17.	Kona	766.28
18.	Kuramauwali	1479.00
19.	K. L. Akhasingh	110.00
20.	Lalheri	267.09
21.	Hammanaina	199.51
22.	Mohammedpur	1731.00
23.	Mandgaon	825.14
24.	Nathusari	1741.00
25.	Phadani	208.00
26.	Ratpur	130.00
27.	Saundhad	2753.00
28.	Shampura	1017.00
29.	Shoadapur	316.05
30.	Siwara	1126.00
31.	Sulehra	572.00
Total		40182.90

Appendix - II

Districtwise number of the villages selected for Inventory Survey in Haryana State.

S.No.	Name of the District	Total no. of villages in the District	No. of villages selected for survey
1.	Ambala	1306	39
2.	Bhiwani	428	23
3.	Faridabad	505	11
4.	Gurgaon	721	14
5.	Hisar	510	33
6.	Jind	354	16
7.	Kurukshetra	743	20
8.	Karnal	634	18
9.	Mohindergarh	743	16
10.	Rohtak	458	19
11.	Sirsa	323	21
12.	Sonapat	348	11
	Total	7073	241

Appendix - III

List of species found in Sample villages in Mahendragarh District.

S.No.	Botanical name	Common name
1	2	3
1.	<u>Acacia catechu</u>	Khair, Valsundra
2.	<u>Acacia lenticularis</u>	Safed babul, Amiar, Kanti, Bohira
3.	<u>Acacia nilotica</u>	Babul, Kitar, Rawar, Baval
4.	<u>Acacia tortilis</u>	Israeli Kikar
5.	<u>Acacia spp.</u>	
6.	<u>Aegle marmelos</u>	Bel, Belpara, Bil, Billi
7.	<u>Albizia lebbek</u>	Kala siris, Kalbage, Koko, Siris, Bhandar, Sarsaoda
8.	<u>Albizia procera</u>	Safed siris/siras, Karha, Karhar, Karhai
9.	<u>Albizia spp.</u>	Moroi, Mog, Kuris, Pujala, Kako, Hiharu, Sundi
10.	<u>Anthocephalus chinensis</u>	Kadamb, Attutek, Kodavara, Kadam, Vellaikadamby
11.	<u>Azadirachta indica</u>	Neem, Nimbo, Nibbaro, Vepa
12.	<u>Cassia fistula</u>	Amaltas, Bahra, Bhawa, Sonari
13.	<u>Cordia spp.</u>	Lassora, Bairula, Borala
14.	<u>Daemonoropsis jenkinsiana</u>	
15.	<u>Dalbergia sissoo</u>	Sisoo, Shisham, Tahli
16.	<u>Delonix regia</u>	Gulnohar, Krishnachura, Golmohan
17.	<u>Eucalyptus spp.</u>	Nituri, Safeda
18.	<u>Ficus bengalensis</u>	Bargat, Bad, Fiq
19.	<u>Ficus religiosa</u>	Pipal, Pipli, Papada, Pripari
20.	<u>Ficus spp.</u>	Anjar, Akhar, Budita
21.	<u>Flacourtia indica</u>	Kakai, Kanqu
22.	<u>Grevillea robusta</u>	Siver oak
23.	<u>Holoptelea integrifolia</u>	Kaneji, Pungo, Aval, Chie
	-bil, Nambinara	
24.	<u>Khasiaculnea oligocephala</u>	Haldu, Haludchapa
25.	<u>Mangifera indica</u>	Am, Amb, Ambo, Mavu, Moru
26.	<u>Melia azedarach</u>	Bijain, Baknia, Belain, Balain
27.	<u>Mitragyna parviflora</u>	Mundi, Phaldu, Kaiz, Battaganam

28. <u>Moringa</u> spp.	Sajna, Solina, Sanina, Saijna
29. <u>Morus</u> spp.	Tut, Kimu, Shahtoot
30. <u>Parkinsonia aculeata</u>	
31. <u>Phoenix sylvestris</u>	Khujur, Betha
31. <u>Prosopis cineraria</u>	Jand, Jant
32. <u>Prosopis juliflora</u>	Juliflora
35. <u>Psidium guajava</u>	Amrud
37. <u>Salvadora</u> spp.	Jal, Jhal
38. <u>Syzygium cumini</u>	Jamun, Jamoon, Jamak
40. <u>Tamarix aphylla</u>	France, Farash
41. <u>Tecomella undulata</u>	Roda, Rohinda
42. <u>Zizyphus</u> spp.	Ber, Beri

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Appendix-IV

List of the villages surveyed in MAHINDERGARH District.

S.No.	Name of the village	Name of Tehsil	Area (Ha.)	Map sheet No.
1.	Phadani	Rewari	208.00	53D/12
2.	Shampur	Mahindergarh	1017.00	44P/13
3.	Balwari	Rewari	487.00	53D/8
4.	Jatusona	Rewari	1108.00	53D/11
5.	Baqapur	Rewari	221.00	53D/12
6.	Nandha	Rewari	550.00	53D/8
7.	Rajyaka	Rewari	163.00	53D/12
8.	Bajar	Narnaul	348.83	53D/8
9.	Khori	Rewari	592.00	53D/8
10.	Khaira	Mahindergarh	424.10	53D/3
11.	Nangal Pathani	Rewari	543.00	53D/7
12.	Kamalpur	Bawat	265.00	53D/12
13.	Jhabuwa	Bawat	665.00	53D/12
14.	Mangala Mayao	Rewari	211.00	53D/8
15.	Pali	Mahindergarh	1800.02	53D/3
16.	Gulabpur	Rewari	223.00	53D/11
Total			8325.95	

Appendix - V

Definitions of Categories

Code No.	Category.	Definition
1.	Farm forestry	Trees along the farm bunds and in small patches upto 0.1 ha. in area.
2.	Roadside plantation	Trees planted along the roadside.
3.	Village woodlot	Naturally growing trees on private/ community land.
4.	Block Plantation	Block plantation having an area of more than 0.1 ha. and not falling in any of the above categories.
5.	Ponds	Trees planted in and around water ponds.
6.	Railway lines	Trees planted along the railway lines.
7.	Canals	Trees planted along the canals.
8.	Rest	Trees not falling in any of the above categories.

APPENDIX-VI
FIELD FORMS

DISTRICT TREE FORM

(ABSTRACT OF ENUMERATION IN SAMPLE VILLAGES)

JOB NO.	CARD DESIGN NO.	STATE	DISTRICT	NO. OF VILLAGES (NO OF SAMPLE VILLAGES IN THE DISTRICT)	TOTAL AREA OF THE VILLAGES IN THE DIST. (Km ²)	SAMPLE VILLAGE	GEOGRAPHICAL AREA OF THE SAMPLE VILL. (Hect.)	CATEGORY OF THE SAMPLE VILLAGE	
1-3	4-6	7-8	9-10	11-15	16-17	18-22	23-27	28-31	32

51
50

Number Of Trees In The Same Village According To Category Of The Plantation / Trees

FARM FORESTRY	ROAD SIDE PLANTATION	VILLAGE WOODLOT	BLOCK PLANTATION	PONDS	RAILWAY LINES	CANALS	REST	TOTAL
33-36	37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-70

DATE

Page No.
Total No. Of Pages

Sign. Of Crew Leader
Name Of Crew Leader

VILLAGE DESCRIPTION FORM

1. State and code
2. Division and code
3. District and code
4. Mapsheet and code
5. Name of the Village
6. Area of the Village
7. Crew Leader (Name)
8. Date of commencement of survey
9. Date of completion of survey
10. Conspicuous feature selected as the centre for starting the survey
11. Description of this centre and approach to this point
12. Number of angular quadrants into which the area of village has been divided (give size of quadrants in degrees)
13. Compassing done by
14. Tree enumeration done by
15. Height measurements taken by

P.T.O.

T. and other measurements
ten by

adrant-wise summary of enumerations

QUADRANT No.	DATE OF SURVEY	TOTAL No. OF TREES
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Dated :

Signature of
Crew Leader

Diagram etc. of village

