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INVENTORY SURVEY

(Non - Forest Area)

OF

GURGAON DISTRICT

(HARYANA STATE)

INVENTORY RESULTS

FOREST SURVEY OF INDIA
NORTHERN ZONE
SHIMLA-1
1995

Contents

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P R E F A C E

Forest Survey of India, for the first time took up inventory surveys 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 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 point in this survey was to categorise various types of trees in a village.The categories were farm forestry, road side plantations, village woodlots, block plantations, plantations done along canals, railway lines, ponds and others. This report pertains to district Gurgaon of Haryana State.

The geographical area of Gurgaon district is 2716 sq. kms. The survey was carried out during 1993-94 in the rural area of the district covering an area of 2651.79 sq. kms.

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

The total number of trees in the district have been assessed at 17.31 lakh i.e.6.53 trees/ha. and the corresponding volume has been assessed at 2.61lakh cum.i.e.0.984cum./ha.Prosopis juliflora have been found to have the largest representation with 4.06 lakh trees(23.48%) while Populus has the lowest representation.

It is hoped that this report will be of use, not only to the State Forest Department of Harvana but also to others.

The inventory survey and data processing work was carried out by Forest Survey Of India.North Zone, Shimla. The work of the field staff and officers who were associated in carrying out the inventory survey,data processing and writing of this report.is appreciated.

(Dr.S.N. Rai)
Director
Forest Survey of India.
Dehradun - 248 195

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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 Gurgaon district during 1993-94.

2. As per 1981 census, Gurgaon district had a total of 721 villages having a total area of 2651.79 sq.km. out of which 14 villages having an area of 75.94 sq.km. were randomly selected and surveyed.

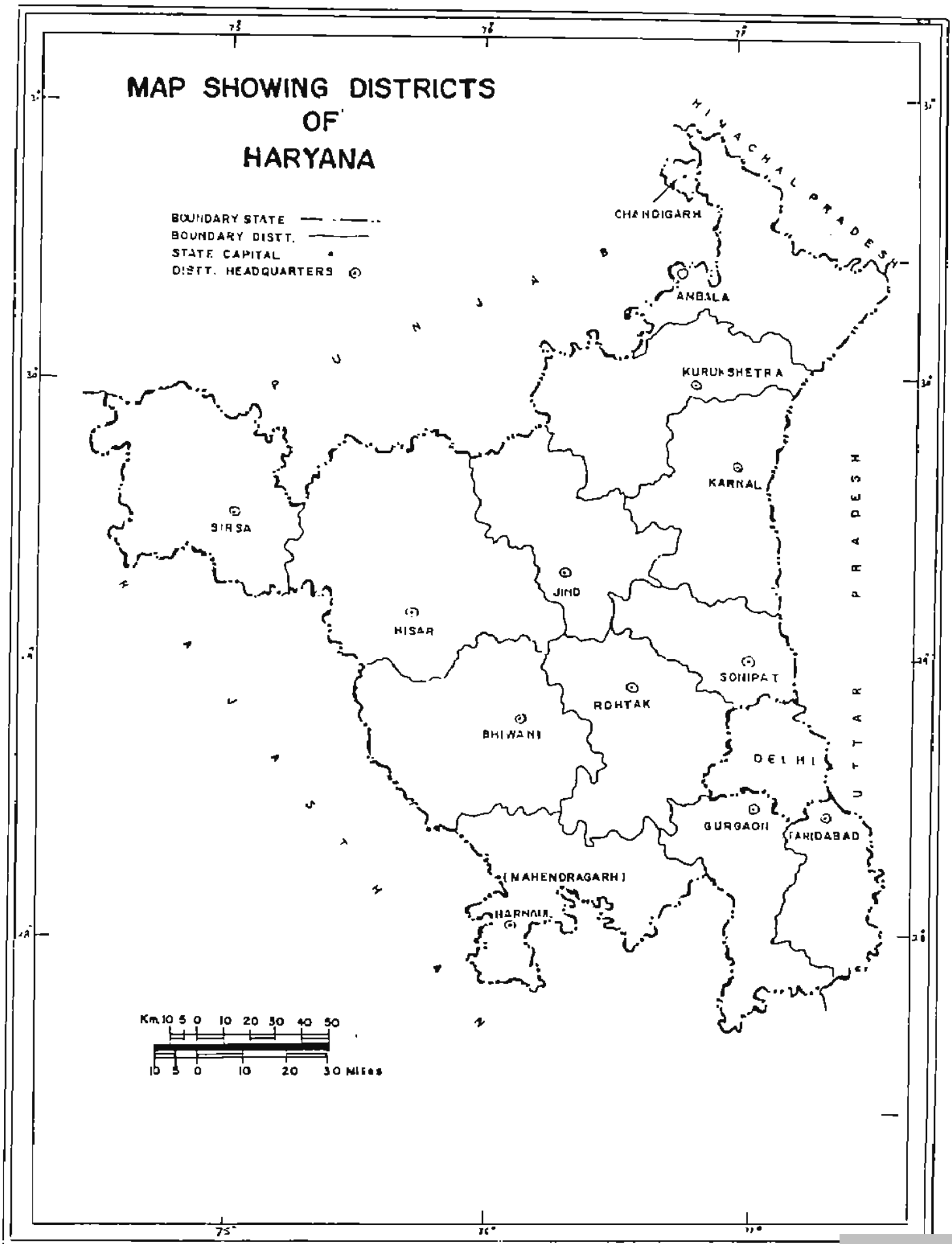
3. In the entire rural area of Gurgaon district 17.31 lakh trees (6.53 trees/ha) have been estimated, the analysis shows that when all the species are combined the maximum number of estimated trees occur in 10-20 cm. dia class i.e.12.18 lakh trees (70.38%) and the minimum in 40 cms. and above dia class i.e.0.46 lakh-trees (2.66%).

4. The specieswise distribution of total number of estimated trees shows that Prosopis juliflora has the largest representation i.e. 4.06 lakh trees (23.48%) followed by Acacia nilotica (Babul) 3.84 lakh trees (22.17%), Eucalyptus spp. 3.14 lakh trees (18.17%), Azadirachta indica 1.40 lakh trees (8.06%), Dalbergia sissoo 1.04 lakh trees (6.03%), Prosopis cineraria 0.85 lakh trees (4.90%), Melia azadarach 0.69 lakh trees (3.98%), Zizyphus spp. 0.35 lakh trees (2.03%), Ficus spp. 0.31 lakh trees (1.74%), Morus spp. 0.29 lakh trees (1.66%), Acacia tortilis 0.254 lakh trees per (1.47%) and Acacia spp. 0.253 lakh trees (1.46%). The representation of rest of the species is less then 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-I-Farm Forestry i.e. 13.22 lakh trees (76.41%) and minimum in the category-VII- Canals i.e.0.04 lakh trees (0.25%) for the combined dia-classes.

6. In the entire rural area of Gurgaon district, total estimated volume of all the species and dia-class combined comes to 2.61 lakh cubic meters i.e. 0.984 cum./ha.

Contents


MAP SHOWING DISTRICTS
OF
HARYANA
BOUNDARY STATE
BOUNDARY DISTT.
STATE CAPITAL
DISTT. HEADQUARTERS
HIMACHAL PRADESH
CHANDIGARH
AMBALA
KURUKSHETRA
KARNAL
SIRSA
JIND
HISAR
SONIPAT
ROHTAK
BHIWANI
DELHI
GURGAON
FARIDABAD
(MAHENDRAGARH)
NARNAUL
UTTAR PRADESH
Km. 10 5 0 10 20 30 40 50
10 5 0 10 20 30 Miles

Contents

CHAPTER 1

1.1 Introduction

The aim of carrying out the inventory survey was to assess the availability of forest resources for the production of timber, fuelwood and raw material for paper pulp, packing cases, essential oils, matchwood etc. in areas outside the traditional Reserved Forest areas and those forest areas which could not be covered during the course of regular inventory survey work of Haryana State.

1.2 Description of the District

Gurgaon District is a part of southern Haryana Plain. The district is named after its headquarter town Gurgaon. It is said that the name Gurgaon is corruption of Gurugram i.e. village of spiritual leader. The traditional account is that Yudhishthira, the eldest son of Pandavas, gave this village to his Guru, Dronacharya in whose memory a tank still exists on the west side of the road to the Railway station. The tradition also has it that it was here that Dronacharya gave instructions in archery to the Kauravas and the Pandavas. It may also be the case that on account of its association with Dronacharya or otherwise, this gram was considered Guru or big.

1.3 Location, Area and Population

The district lies between 27° 39′ and 28° 32′ 25" North latitudes and 76° 39′ 30 and 77° 20′ 45"East longitudes. On its North are situated the district of Rohtak and Delhi. To its East is Faridabad District. On its south the district had boundary with the states of Uttar Pradesh and Rajasthan. To its West is the District of Mahendergarh and the state of Rajasthan.

The area of the district is 2,716 Sq.km. and its population, as per 1981 census, was 8,49,598.

1.4 Physical Features

Soil, geology and topography

Gurgaon district is a rolling plain dominated by extension of Arravalis. The Arravali shoots are along the western parts of the district and extend up to the state of Delhi in the North-East South-West direction. These rocks are one of the oldest mountain system of the world. The hillocks are dissected by rain fed torrents. Underground water level is quite high in the district. The water level under the rocky surfaces is quite deep.The district on the whole is divided into four micro- regions on the basis of soils, topography etc.

(a) Gurgaon Plain

The region spreads over the North and North-western parts of Gurgaon District. From relief point of view, the maximum elevation of the region is 276 metres above m.s.l. near village Ghausgarh and minimum elevation is 217 metres above m.s.l. near village Garhi Nathe Khan. Both the heights are found in Gurgaon tehsil. The region as a whole is plain land and is under cultivation except some patches of land which are covered with scrubs and bushy type of vegetation.

The soils found in the region are relatively sandy loam and light loam. The relatively sandy loam belt stretches between the sandy soil and loam. It needs little ploughing and readily retains the moisture. Being capable of retaining moisture is the best soil for dry farming.

The light soils (sandy loam and light loam) which are found here, have advantage over the medium soils because in the former less moisture is required for germination growth and assured harvest. Soils as classified by NBSS and LUP (ICAR), Nagpur, in the region are Orthids-Fluvents and Ochrepts.

Orthids : Soils of arid region with some developments.

Fluvents : Alluvial soil (recent alluvium)

Ochrepts : Shallow black, brown and alluvi
, al soils of northern region.

Transportation facilities are well developed in the region. Railway lines and roads pass through the region. National highway no. 8 also pass through the region parallel to the railway line.

(b) Sohna Undulating Plain with Arravali Offshoots

The region spreads over the parts of Gurgaon, Nuh and Ferozepur Jhirla tehsils of the district. From relief point of view, the maximum height of the region is 440 metres above m.s.l. On top of hill near village Bhond in Ferozepur Jhirla tehsil while the minimum height is 198.4 metres near village Nawli in the same tehsil. The entire region is undulating due to offshoots of Arravali hills.

The soils found in the region are mostly rocky surface except some area is under relatively sandy loam and coarse loam.

Soils as classified by NBSS and LUP (ICAR), Nagpur, the region has Orthids-Fluvents, Ochrepts and Orchrepts-Ustalfs-Ustalfs, Ochrepts and Ochrepts-Usterts-Ustalfs types of soils.

Usterts : Deep black soils.

Ustalfs :High base status, red loamy, red sandy and alluvial soils.

Other types of soils are the same as already defined in the case of Gurgaon plain above.

There is little soil cover on the rocky areas. Scrubby and bushy types of vegetation are found in the entire region as a natural vegetation.

Roads radiating from Sohna are connecting the towns of Gurgaon, Taoru, Delhi, Palwal,Nuh and Ferozepur Jhirka. There is lack of link roads as compared to other regions. Railway line does not exists in the region.

(C) Nuh-Punhana Plain

The region spreads over the district covering parts of Nuh tehsil and northern-central and eastern parts of Ferozepur Jhirka tehsil. From relief point of view, the maximum height of the region is 236 metres above m.s.l. near village Hathan gaon in Feroipur Jhirka tehsil while the minimum height is 205 metres above m.s.l. near village Umra in the same tehsil. The entire region is generally a plain land.

The soils found in the region are coarse loam and loam or alluvial. The soil is compact and stiff because of the addition of silt over the years. It is less granular and has less water holding capacity. Soil as classified by NBSS & LUP (ICAR), Nagpur, are Orthids-Fluvents-Ochrepts and Ochrepts-Usterts-Ustalfs types of soils as already described in the above para.

(d) Ferozepur Jhirka Dissected Upland

The region extends over South-eastern and middle parts of Ferozepur Jhirka tehsil. From relief point of view, the region has its maximum height 371 metres above m.s.l. near village Ghat Ashmasabad in Ferozepur Jhirka tehsil while the minimum height is 200 metres above m.s.l. near village Umra in the same tehsil. The eastern parts of the region bordering Rajasthan are covered with rocky surfaces of Arravali outcrops and upland. Dissected lands are found on both sides of the ridge because the rainy seasonal streams come down from uplands and make erosion abruptly on both sides of the bank. The agriculture in the region is poor due to lack of canals for irrigation.

The region has coarse type of soils. A few parts of it are covered with rocky surfaces. The soils as classified by NBSS & LUP(ICAR),Nagpur are Ochrepts types of soils as already described in the para.

Means of communication and transportation in the region are not fully developed because of the hinderance caused by rocky surfaces and dissected lands. A few villages are inter linked with each other by minor roads.

1.5 Climate

The Gurgaon district lies in the Southern Haryana plain. The district has a subtropical continental monsoon climate.

1.6 Rain

The rainfall distribution is satisfactory as compared to western parts of Harvana which is mainly concentrated during monsoon months. Monsoon brings rain in the district from July to September. From October to June the weather is mostly dry except a few showers from western cyclones. The rainfall in the district ranges from 400 mm to 500 mm. Desides this, the annual rainfall also varies considerably over the years. During 1979-80 annual rainfall was 36.3 cms. as against 76.9 cms during 1977-78 and 86.4 cms during 1978-79. The climate in the district is attributed to short wet months and long dry months. Humidity is very high during the rainy season and very low during dry summer months.

1.7 Temperature

Due to its distance from the sea and closeness to the Thar desert the temperatures in the district are extreme. During summer the maximum daily temperature reaches as high as 45°C in May-June. Hot dry winds blow during the day in these months due to the proximity of the place to the semi-arid areas of Harvana and Rajasthan states. During the winters chilly winds blow at night due to the snowfall in the Himalayas and the minimum night temperature falls below 5°C. during December-January.

1.8 Frost, Fog and Hails

Ground frost occurs in December/ January when there is snowfall in the hills of Himachal Pradesh and Uttar Pradesh. Foggy weather prevails during December /January. Isolated spells of hailstorms occur during February to April. During May-June isolated dust storms may also occur in the district.

1.9 Socio-Economic conditions

The economy of the district is primarily agriculture.At the time of 1981 census, 50.39 % of the total workers were cultivators and agricultural labourers.Due to the proximity to Delhi and the availability of industrial climate and infrastructural facilities many industries have come up in the district. They are engaged in producing cotton yarn, building hard wares, wrist watches, printing machines, oxygen gas etc. Besides large scale units there are many small scale units are engaged in manufacturing food products, wood and its products.

furniture and fixtures, non-metallic mineral products, metal products and parts, textile products and rubber, plastic, petroleum and coal products.

Irrigation in the district is generally done by the tube wells. Out of the total geographical area, the cultivable area is 81.58% and of which 40.57% is under irrigation. Maximum area under irrigation is in Gurgaon tehsil where 58.95% of the total cultivable area is under irrigation whereas in Ferozepur Jhirka tehsil it is only 20.50%. Among the food grains grown in the district, mostly wheat and baira are grown. A very small area of 3 sq. km. is under Reserved Forest.

As per 1977 census of the livestocks, the district had 7,93,900 animals which included cattle, buffaloes, sheep goat and plus.

During 1979-80 the district had 3,694 vehicles of various types on the road.

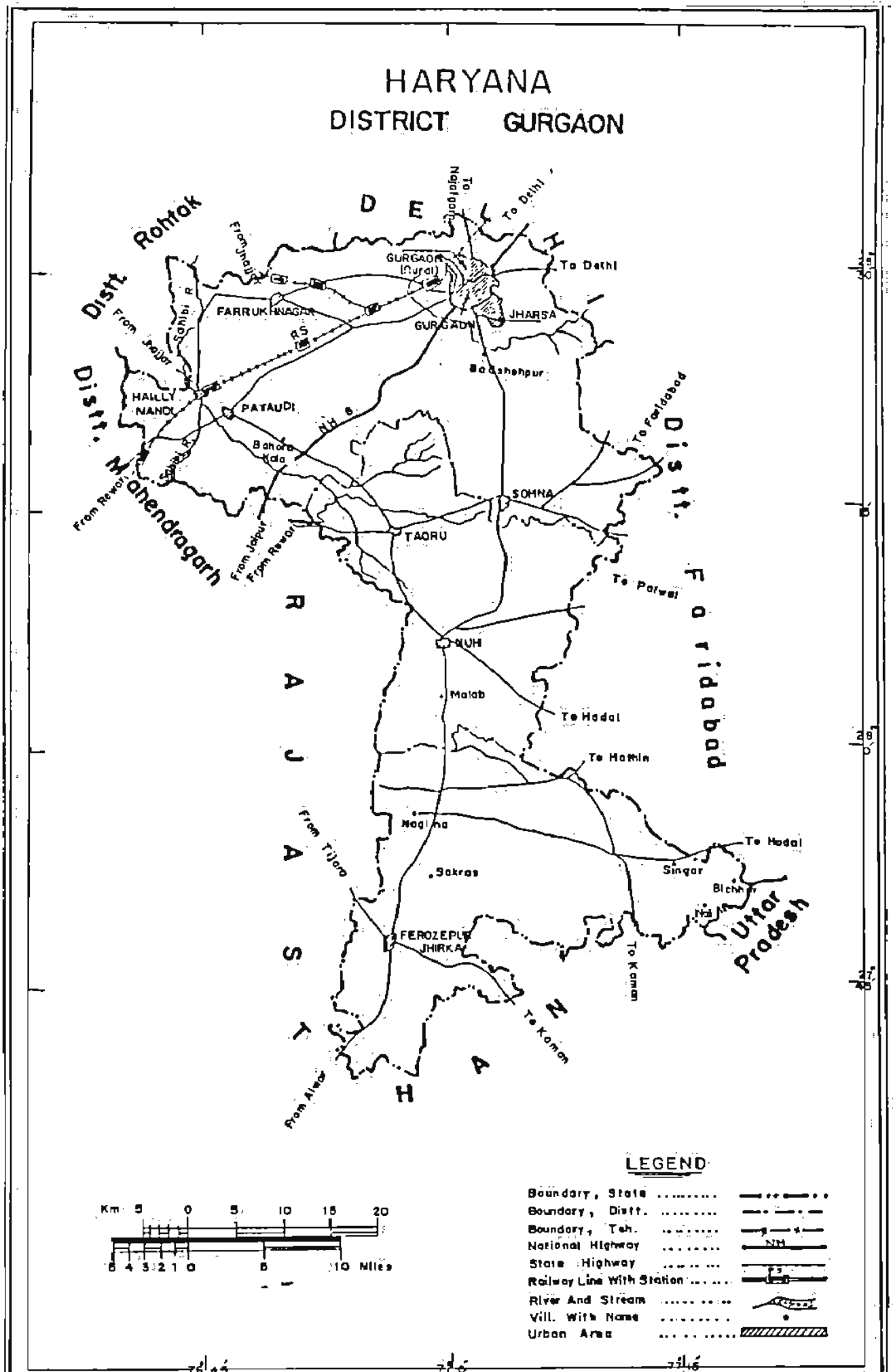
Wheat and baira are the main staple food of the people of the district. Milk consumption in the district is higher than all India average.

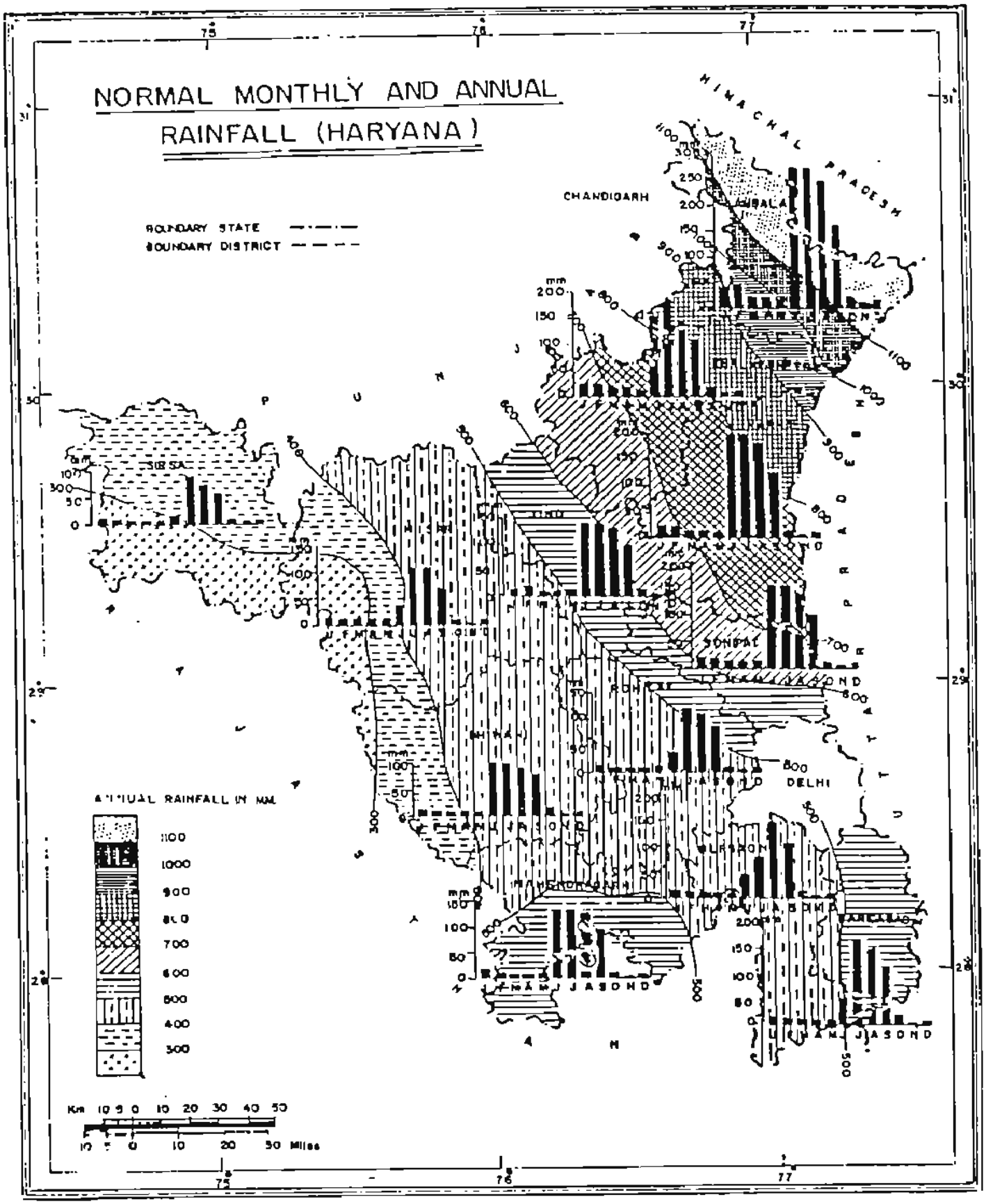
The northern part of the district adjoining Delhi has more population than the central part of the district. Out of the total population of the district, 80.9% is rural and 19.1% is urban. 35.23% of the total population is literate. Literacy percentage among the rural and urban population are 29.18% and 59.52% respectively. The literacy percentage among the males and females are 48.61% and 20.02% respectively. Out of the total population, 14.20%belong to S.C and S.T.Main workers constitute 27.80%, Marginal workers 3.87%and nonworkers 68.33% respectively.

1.10 Uses

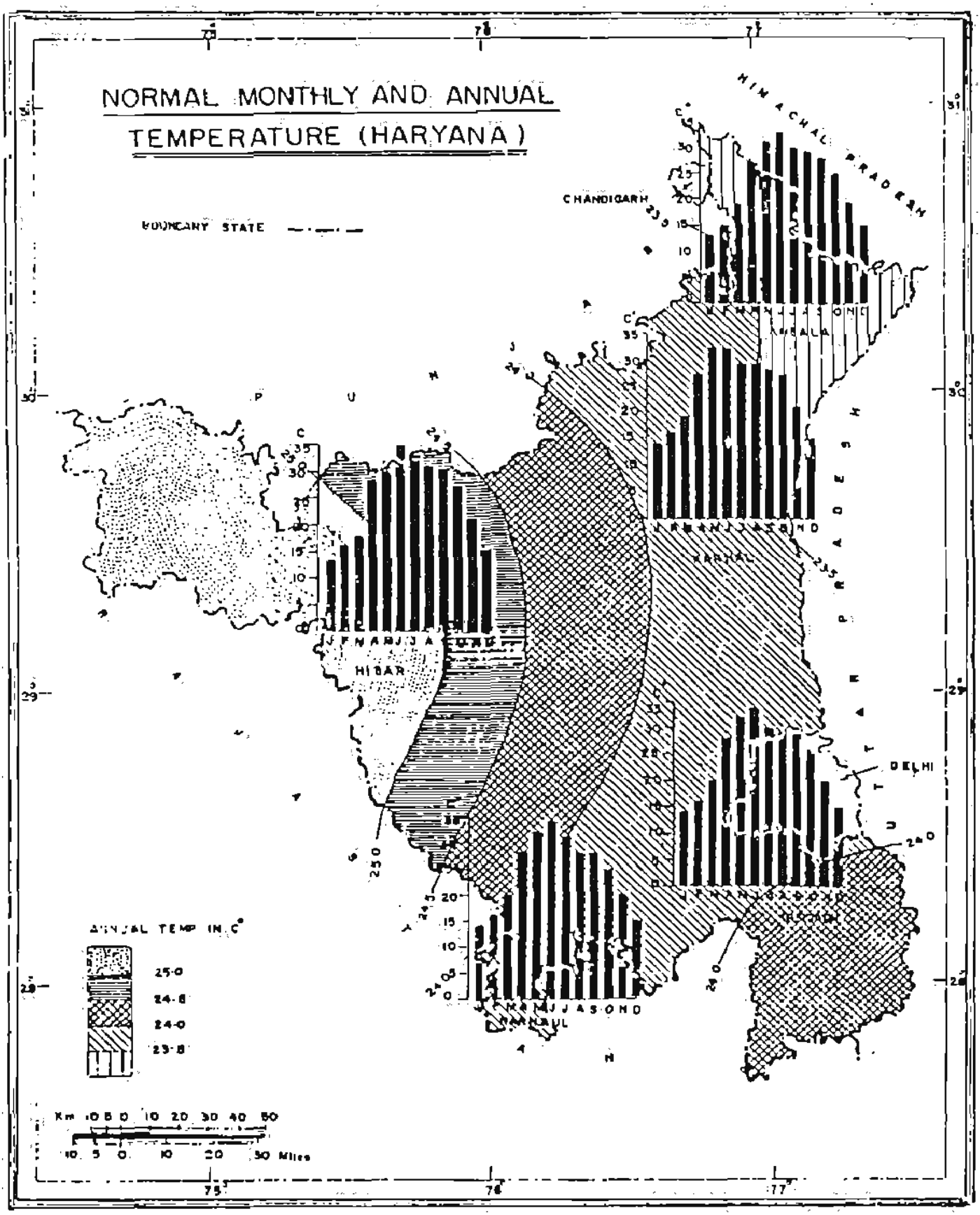
The trees mainly provide timber, fuel, fodder, fruits and shade. Timber is obtained mainly Dalbergia sissoo, Eucalyptus spp., Melia azedarach, Syzygium cumini, Morus spp., Mangifera indica, Azadiracta indica, Albizia spp. etc. Small timber is mainly obtained from Acacia nilotica, Acacia spp., Prosopis cineraria, Tamarix aphylla etc. All the above mentioned tree spp. provide fuelwood also. Trees like Prosopis juliflora, Acacia nilotica, Acacia tortilis, Albizia spp., Morus spp., Prosopis cineraria also provide fodder in the form of leaves or pods. Morus spp. provide wood for manufacturing hockey sticks and other sports goods. Populars provide matchwood and Eucalyptus spp. paper pulpwood. Fruits are obtained from Ziziphus spp. and Syzygium cumini .Neem oil is obtained from Azadirachta indica

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


HARYANA
DISTRICT GURGAON
Distt Rohtak
Distt. Mahendragarh
Distt. Faridabad
D E L H I
R A J A S T H A N
Uttar Pradesh
GURGAON (Rural)
GURGAON
JHARSA
FARRUKHNAGAR
PATAUDI
HAILY MANDI
Bahora Kala
Badshahpur
SOHNA
TAORU
NUH
Malab
Nagina
Sakras
FEROZEPUR JHIRKA
Singar
Bichhor
To Delhi
To Faridabad
To Rewari
To Jaipur
To Hodal
To Hathin
To Parwal
To Kaman
From Jhajjar
From Rewari
From Jaipur
From Tijara
From Alwar
Sahibi R.
NH 8
SH 5
LEGEND
Boundary, State
Boundary, Distt.
Boundary, Teh.
National Highway
State Highway
Railway Line With Station
River And Stream
Vill. With Name
Urban Area
Km 5 0 5 10 15 20
8 4 3 2 1 0 5 10 Miles


NORMAL MONTHLY AND ANNUAL
RAINFALL (HARYANA)
BOUNDARY STATE
BOUNDARY DISTRICT
CHANDIGARH
AMBALA
DELHI
ANNUAL RAINFALL IN MM
1100
1000
900
800
700
600
500
400
300
Km 10 5 0 10 20 30 40 50
10 5 0 10 20 30 Miles
75
76
77
31
30
29
28

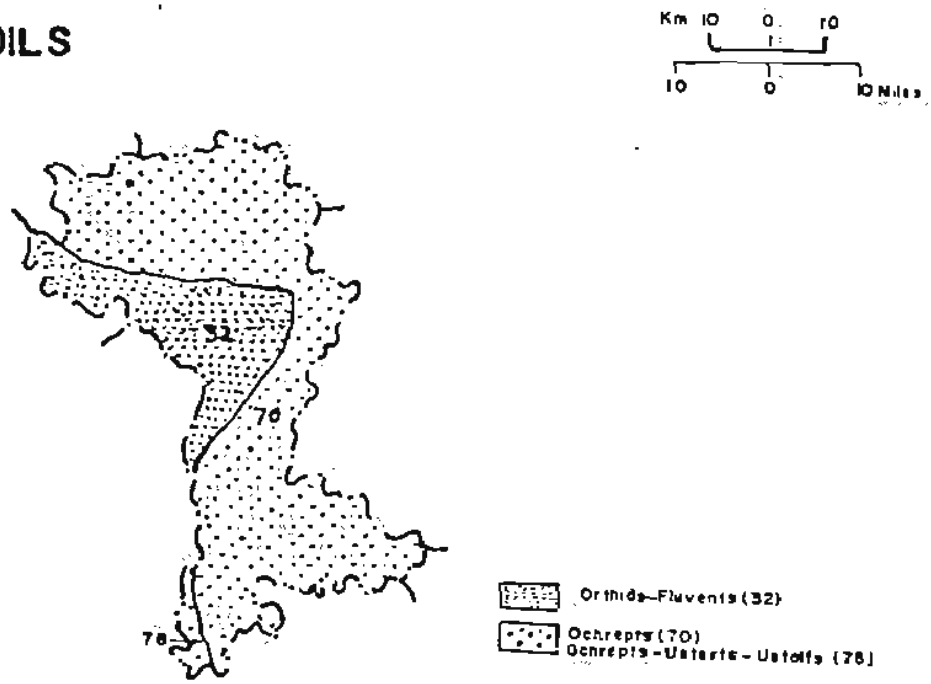
Contents


NORMAL MONTHLY AND ANNUAL
TEMPERATURE (HARYANA)
BOUNDARY STATE
HIMACHAL PRADESH
CHANDIGARH
UTTAR PRADESH
RAJASTHAN
DELHI
HISAR
KARNAL
ANNUAL TEMP IN C°
25·0
24·8
24·0
23·8
Km 10 5 0 10 20 30 40 50
10 5 0 10 20 30 Miles

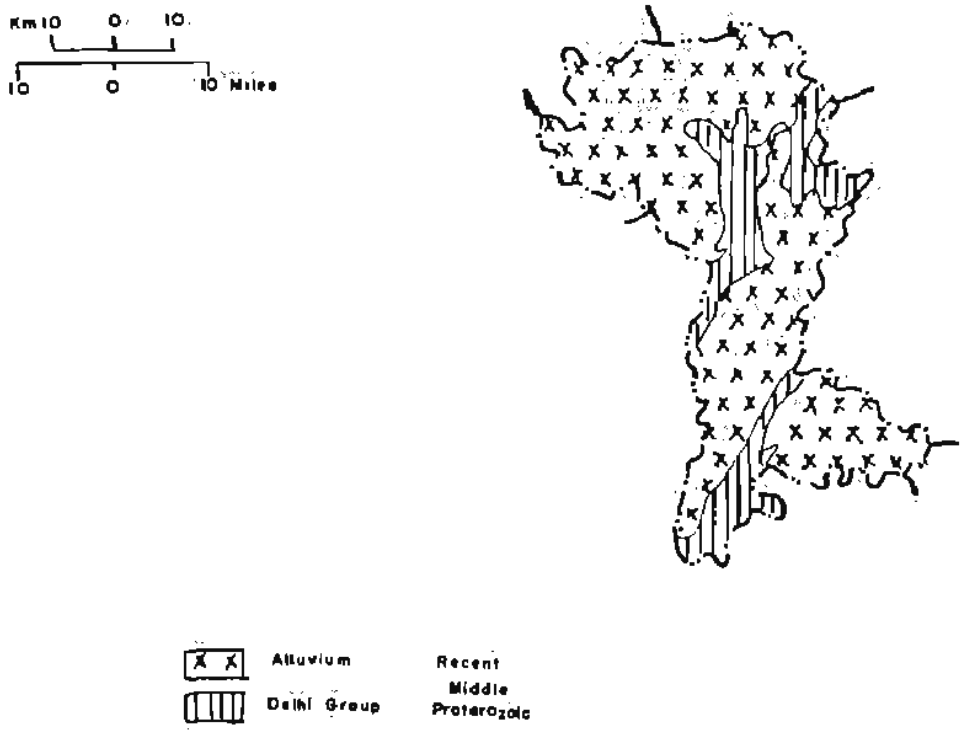
Contents

HARYANA
DISTRICT GURGAON

SOILS



GEOLOGY



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 persuits 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) Babiyal in Ambala district, (2) Smalakha 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 Ballabgarh 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 Gurgaon 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 ±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(OB). 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

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

where $c.v. = \frac{s}{\bar{x}} * 100$ 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 219 villages.

These 219 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 preferrably 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/ommission of trees when the enumeration work is continued on the next day. Further, all the enumerated trees are suitably 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:

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

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

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

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

5 Ponds: For trees planted in and around water ponds.

6 Railway Lines: For trees planted along the railway lines.

7 Canals: Trees planted along the canals.

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

4,7

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 Gurgaon 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 occurrance, 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 ith village

v_i = volume/no. of trees for the ith village

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

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

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

$\bar{v} = \sum_{i}^{n} v_i / n$ = average volume/no. of trees in the sample

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

$A = \sum_{i}^{N} x_i$ = 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

$$\hat{R} = \frac{\sum_{i}^{n} v_i}{\sum_{i}^{n} x_i} = \frac{\bar{v}}{\bar{x}}$$

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

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

Estimated variance of $\hat{R}$ is given by

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

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When N is large, then

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

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	Acacia catechu	0.10	0.21	0.51	1.13
2	Acacia nilotica	0.06	0.14	0.57	1.13
3	Acacia tortilis	0.06	0.14	0.57	1.13
4	Acacia spp.	0.06	0.14	0.57	1.13
5	Albizia spp.	0.06	0.14	0.57	1.13
6	Azadirachta indica	0.06	0.14	0.57	1.13
7	Dalbergia sissoo	0.06	0.14	0.57	1.13
8	Eucalyptus spp.	0.10	0.41	0.95	1.71
9	Ficus spp.	0.06	0.14	0.57	1.13
10	Mangifera indica	0.06	0.14	0.57	1.13
11	Melia azedarach	0.06	0.14	0.57	1.13
12	Morus spp.	0.06	0.14	0.57	1.13
13	Populus spp.	0.07	0.33	0.73	1.26
14	Prosopis cineraria	0.06	0.14	0.57	1.13
15	Prosopis juliflora	0.06	0.14	0.57	1.13
16	Psidium guyava	0.06	0.14	0.57	1.13
17	Salvadora spp.	0.06	0.14	0.57	1.13
18	Syzygium cumini	0.06	0.14	0.57	1.13
19	Tamarix aphylla	0.06	0.14	0.57	1.13
20	Zizyphus spp.	0.06	0.14	0.57	1.13
21	Misc. spp.	0.06	0.14	0.57	1.13

CHAPTER 4

Stand and Stock Tables

As per 1981 Census Gurgaon district has a total of 721 villages having an area of 2651.79 Sq. km. Out of these, 14 villages having an area of 75.94 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 14 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 6.53 and the corresponding volume is 0.984 cum./ha. for the entire district of Gurgaon.

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 Gurgaon district 17.31 lakh trees having volume of 2.61 lakh cubic meters 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. 12.18 lakh trees (70.38%) followed by 3.60 lakh trees (20.82%) in 20-30 cms. dia-class, 1.06 lakh trees (6.14%) in 30-40 cms. dia-class and 0.46 lakh trees (2.66%) in 40 cms. and above dia-class.

It also shows that in the rural area of Gurgaon district, when all the dia-classes are combined, Prosopis juliflora has the largest representation i.e.4.06 lakh trees (23.48%), followed by Acacia nilotica (Babul) 3.84 lakh trees (22.17%), Eucalyptus spp. 3.14 lakh trees (18.17%).Azadirachta indica 1.40 lakh trees (8.06%).Dalbergia sissoo 1.04 lakh trees (6.03%)

Prosopis cineraria 0.851akh trees (4.90%).Melia azedarach 0.69 lakh trees (3.98%), Zizyphus spp. 0.35 lakh trees (2.03%), Ficus spp. 0.31 lakh trees (1.74%), Morus spp. 0.29 lakh trees (1.66%), Acacia tortilis 0.254 lakh trees (1.47%), and Acacia spp. 0.253 lakh trees (1.46%). 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-I - Farm Forestry is the highest i.e. 13.22 lakh trees (76.41%) followed by Category-IV - block plantation 1.51 lakh trees (8.71%), Category-III - Village Woodlot 1.47 lakh trees (8.50%), Category-II- Roadside Plantations 0.998 lakh trees (5.77%). The representation of trees in Category-V - Ponds and Category-VII - Canals are found to be very poor while the remaining categories have 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.

The distribution of stems per hectare is maximum in dia-class 10-20 cms. i.e. 4.59 followed by 1.36 in 20-30 cms dia-class, 0.40 in 30-40 cms. dia-class and 0.17 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 categotries 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 13.22 lakh trees (76.41%) which is the highest amongst all the categories. It is mainly comprised of Prosopis juliflora 3.90 lakh trees, Acacia nilotica 3.14 lakh trees, Eucalyptus spp. 1.75 lakh trees, Azadirachta indica 1.38 lakh trees, Dalbergia sissoo 1.03 lakh trees, Melia azedarach 0.68 lakh trees, Morus spp. 0.28 lakh trees, Ficus spp. 0.24 lakh trees and Albizia spp. 0.15 lakh trees. The remaining species are represented very poorly.

Category-II - Roadside Plantation

As per the estimation there are 0.998 lakh trees (5.77%) in all in this category. It is mainly represented by Acacia nilotica 0.38 lakh trees, Eucalyptus spp. 0.32 lakh trees, Acacia tortilis 0.16 lakh trees. The representation of the remaining species is very poor and hence not presented here.

Category-III - Village Woodlots

In this category the total number of trees, as per the estimation, is 1.47 lakh trees (8.50%). The predominent species in this category are Prosopis cineraria 0.73 lakh trees Zizyphus spp. 0.30 lakh trees Acacia spp. 0.23 lakh trees. The remaining species have a poor representation.

Category-IV - Block Plantations

There are 1.54 lakh trees (8.71%) in all in this category. The main species forming bulk of the crop are Eucalyptus spp. 1.08 lakh trees, Acacia nilotica 0.26 lakh trees, and Prosopis cineraria 0.10 lakh trees. The representation of the remaining species being very poor are not mentioned here.

Category-V - Ponds

As per the estimate, there are only 0.06 lakh trees (0.36%) in this category.

Category-VI - Railway Lines

This category has been found to be absent in this district.

Category-VII - Canals

It is estimated that this category in total has 0.04 lakh trees (0.25%). The main species in this category

are Acacia nilotica 0.03 lakh trees Acacia tortilis 0.13 lakh trees.

Category-VIII - Rest

This category is found to be altogether absent.

Analysis of Volume (Stock)

As per the estimate the entire rural area of Gurgaon district has a total volume (all species and dia-classes combined) of 2.61 lakh cubic meters corresponding to the estimated total of 17.31 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 10-20 cms. having a volume of 0.84 lakh cubic meters (32.05%) followed by dia-class 30-40 cms. having a volume of 0.63 lakh cubic meters (24.15%), dia-class 20-30 cms.having 0.62 lakh cum.(23.71%)and 40 cms.and above dia-class having 0.52 lakh cubic meters (20.08%).

It also shows that the total volume per hectare contributed by trees of all species of all dia-classes combined is 0.984 cum. The volume per hectare for different dia-classes (in decreasing order) are as below:

10-20 cms. dia-class (0.316 cum.), 30-40 cms. dia-class (0.238 cum.), 20-30 cms.dia-class (0.233cum.)and 40 cms. and above dia-class (0.198 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):

Acacia nilotica 0.52 lakh cubic meters (19.99%), Eucalyptus spp. 0.51 lakh cubic meters (19.68%),Azadirachta indica0.35 lakh cubic meters (13.43%),Prosopis juliflora0.34 lakh cubic meters (13.19%), Dalbergia sissoo 0.22 lakh cubic meters (8.43%), Prosopis cineraria 0.15 lakh cubic meters (5.80%),Ficus spp. 0.15 lakh cubic meters(5.80%),Melia azedarach 0.07 lakh cubic meters(2.84%), Zizyphus spp. 0.037 lakh cubic meters (1.43%),Albizia spp. 0.035 lakh cubic meters (1.35%),

Morus spp. 0.033 lakh cubic metres (1.28%) and Acacia spp. 0.032 lakh cubic metres (1.22%).The volume contributed by the rest of the species is very less.

2. The distribution 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-I has the maximum volume of 1.99 lakh cubic metres (76.17%) followed by category-III having 0.25 lakh cubic metres (9.75%), category-II having 0.20 lakh cubic metres (7.78%), category-IV having 0.15 lakh cubic metres (5.73%) and category-V and VII have a very poor stock due to poor representation while category VI and VIII have been found to be absent.

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 GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Name of Species	10-20	20-30	30-40	40+	Total	% age
1	Acacia catechu	0	0	0	0	0	0.00
2	Acacia nilotica	247272	101548	28949	5867	383636	22.17
3	Acacia spp.	15436	8067	1641	174	25319	1.46
4	Acacia tortilis	21860	3319	210	0	25388	1.47
5	Albizia spp.	8521	4679	1711	1223	16135	0.93
6	Azadirachta indica	73822	33698	18334	13688	139542	8.06
7	Dalbergia sissoo	56362	28461	13409	6181	104413	6.03
8	Eucalyptus spp.	264766	42393	6530	768	314458	18.17
9	Ficus spp.	9498	5936	4994	9638	30066	1.74
10	Mangifera indica	4086	2689	1327	559	8660	0.50
11	Melia azedarach	48016	17565	2899	384	68865	3.98
12	Morus spp.	21196	5727	1396	419	28739	1.66
13	Populus spp.	105	70	0	0	174	0.01
14	Prosopis cineraria	44209	27831	9917	2828	84786	4.90
15	Prosopis juliflora	339286	57374	8660	977	406297	23.48
16	Psidium guvava	5622	174	0	0	5797	0.33
17	Salvadora spp.	2620	1781	628	978	6006	0.35
18	Syzygium cumini	4924	2689	1396	419	9429	0.54
19	Tamarix aphylla	1851	628	560	315	3354	0.19
20	Zizyphus spp.	26017	7472	1432	279	35200	2.03
21	Misc. spp.	22489	8207	2270	1292	34257	1.98
	Total	1217958	360309	106263	45991	1730521	100.00
	% age	70.38	20.82	6.14	2.66	100.00	

Table No. 2

Distribution of total number of stems - categorywise and dia-classwise
(All species combined)

Rural area of GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Category	10-20	20-30	30-40	40+	Total	% age
1	I	926336	276292	82551	37121	1322300	76.41
2	II	56364	32406	8695	2305	99771	5.77
3	III	81714	45919	14107	5377	147118	8.50
4	IV	145408	4015	524	699	150646	8.71
5	V	3981	1467	350	489	6287	0.36
6	VI	0	0	0	0	0	0.00
7	VII	4155	210	35	0	4400	0.25
8	VIII	0	0	0	0	0	0.00
	Total	1217958	360309	106263	45991	1730521	100.00
	% age	70.38	20.82	6.14	2.66	100.00	
	Stems/ha.	4.59	1.36	0.40	0.17	6.53	

Table No. 3

Distribution of total number of stems - specieswise and categorywise
(All dia-classes combined)

Rural area of GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Name of Species	I	II	III	IV	V	VI	VII	VIII	Total	% age
1	Acacia catechu	0	0	0	0	0	0	0	0	0	0.00
2	Acacia nilotica	313690	37749	0	25945	3212	0	3039	0	383636	22.17
3	Acacia spp.	1328	489	22663	839	0	0	0	0	25319	1.46
4	Acacia tortilis	6495	16482	524	594	0	0	1292	0	25388	1.47
5	Albizia spp.	15156	524	418	0	35	0	0	0	16135	0.93
6	Azadirachta indica	137691	838	0	35	978	0	0	0	139542	8.06
7	Dalbergia sissoo	103225	1188	0	0	0	0	0	0	104413	6.03
8	Eucalyptus spp.	174532	31812	0	108113	0	0	0	0	314458	18.17
9	Ficus spp.	24060	71	4539	454	943	0	0	0	30066	1.74
10	Mangifera indica	8660	0	0	0	0	0	0	0	8660	0.50
11	Melia azedarach	68131	629	0	0	105	0	0	0	68865	3.98
12	Morus spp.	28495	244	0	0	0	0	0	0	28739	1.66
13	Populus spp.	174	0	0	0	0	0	0	0	174	0.01
14	Prosopis cineraria	0	1501	73018	10266	0	0	0	0	84786	4.90
15	Prosopis juliflora	390410	6844	7682	314	978	0	70	0	406297	23.48
16	Psidium guvava	5797	0	0	0	0	0	0	0	5797	0.33
17	Salvadora spp.	0	0	2375	3632	0	0	0	0	6006	0.35
18	Syzygium cumini	9289	140	0	0	0	0	0	0	9429	0.54
19	Tamarix aphylla	3213	105	35	0	0	0	0	0	3354	0.19
20	Zizyphus spp.	5168	279	29717	0	35	0	0	0	35200	2.03
21	Misc. spp.	26784	874	6148	454	0	0	0	0	34257	1.98
	Total	1322300	99771	147118	150646	6287	0	4400	0	1730521	100.00
	% age	76.41	5.77	8.50	8.71	0.36	0.00	0.25	0.00	100.00	

Table No. 4

Distribution of total volume (cum.) - specieswise and dia-classwise
(All categories combined)

Rural area of GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Name of Species	10-20	20-30	30-40	40+	Total	% age	Vol./ha.
1	Acacia catechu	0.00	0.00	0.00	0.00	0.00	0.00	0.000
2	Acacia nilotica	14836.29	14216.76	16500.84	6629.92	52183.82	19.99	0.197
3	Acacia spp.	926.15	1129.42	935.64	197.11	3188.32	1.22	0.012
4	Acacia tortilis	1311.58	464.55	119.54	0.00	1895.67	0.73	0.007
5	Albizia spp.	511.26	655.12	975.30	1382.02	3523.70	1.35	0.013
6	Azadirachta indica	4429.35	4717.70	10450.16	15467.97	35065.19	13.43	0.132
7	Dalbergia sissoo	3381.72	3984.51	7643.23	6984.29	21993.75	8.43	0.083
8	Eucalyptus spp.	26476.63	17381.25	6203.18	1313.81	51374.87	19.68	0.194
9	Ficus spp.	569.88	831.01	2846.59	10891.15	15138.63	5.80	0.057
10	Mangifera indica	245.13	376.47	756.34	631.21	2009.15	0.77	0.008
11	Melia azedarach	2880.99	2459.14	1652.32	434.10	7426.55	2.84	0.028
12	Morus spp.	1271.77	801.79	796.00	473.96	3343.51	1.28	0.013
13	Populus spp.	7.34	24.35	0.00	0.00	31.69	0.01	0.000
14	Prosopis cineraria	2652.55	3896.30	5652.96	3195.92	15397.73	5.90	0.058
15	Prosopis juliflora	20357.13	8032.41	4936.29	1104.06	34429.90	13.19	0.130
16	Psidium guvava	337.33	24.42	0.00	0.00	361.75	0.14	0.001
17	Salvadora spp.	157.17	249.29	358.06	1105.17	1869.69	0.72	0.007
18	Syzygium cumini	295.47	376.47	796.00	473.96	1941.90	0.74	0.007
19	Tamarix aphylla	111.07	87.94	318.96	355.47	873.44	0.33	0.003
20	Zizyphus spp.	1561.00	1046.14	816.10	315.61	3738.85	1.43	0.014
21	Misc. spp.	1349.33	1149.04	1293.70	1459.54	5251.60	2.01	0.020
	Total	83669.15	61904.10	63051.20	52415.27	261039.72	100.00	0.984
	% age	32.05	23.71	24.15	20.08	100.00		
	Vol./ha.	0.316	0.233	0.238	0.198	0.984		

Table No. 5

Distribution of total volume (cum.) - categorywise and dia-classwise
(All species combined)

Rural area of GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Category	10-20	20-30	30-40	40+	Total	% age
1	I	61221.53	46030.90	49177.24	42392.31	198821.97	76.17
2	II	4053.72	8336.48	5314.64	2604.57	20309.42	7.78
3	III	4902.86	6428.70	8040.95	6076.23	25448.74	9.75
4	IV	13002.89	873.27	298.85	789.57	14964.57	5.73
5	V	238.84	205.39	199.42	552.59	1196.23	0.46
6	VI	0.00	0.00	0.00	0.00	0.00	0.00
7	VII	249.31	29.36	20.11	0.00	298.78	0.11
8	VIII	0.00	0.00	0.00	0.00	0.00	0.00
	Total	83669.15	61904.10	63051.20	52415.27	261039.72	100.00
	% age	32.05	23.71	24.15	20.08	100.00	

Table No. 6

Distribution of total volume (cum.) - specieswise and categorywise
(All dia-classes combined)

Rural area of GURGAON DISTT. : 2651.79 Sq. km.

S.No.	Name of Species	I	II	III	IV	V	VI	VII	VIII	Total	% age
1	Acacia catechu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Acacia nilotica	42593.77	7352.96	0.00	1660.04	359.95	0.00	217.11	0.00	52183.82	19.99
3	Acacia spp.	122.83	37.73	2974.61	53.15	0.00	0.00	0.00	0.00	3188.32	1.22
4	Acacia tortilis	531.05	1214.39	34.28	38.45	0.00	0.00	77.50	0.00	1895.67	0.73
5	Albizia spp.	3361.06	77.60	80.11	0.00	4.94	0.00	0.00	0.00	3523.70	1.35
6	Azadirachta indica	34345.68	514.56	0.00	20.11	184.84	0.00	0.00	0.00	35065.19	13.43
7	Dalbergia sissoo	21353.44	640.31	0.00	0.00	0.00	0.00	0.00	0.00	21993.75	8.43
8	Eucalyptus spp.	31861.19	8345.09	0.00	11168.59	0.00	0.00	0.00	0.00	51374.87	19.68
9	Ficus spp.	12133.14	25.05	1983.56	443.84	553.04	0.00	0.00	0.00	15138.63	5.80
10	Mangifera indica	2009.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2009.15	0.77
11	Melia azedarach	7365.73	54.53	0.00	0.00	6.29	0.00	0.00	0.00	7426.55	2.84
12	Morus spp.	3328.87	14.64	0.00	0.00	0.00	0.00	0.00	0.00	3343.51	1.28
13	Populus spp.	31.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.69	0.01
14	Prosopis cineraria	0.00	156.30	14587.93	653.50	0.00	0.00	0.00	0.00	15397.73	5.90
15	Prosopis juliflora	32144.15	1635.79	536.35	24.38	85.06	0.00	4.17	0.00	34429.90	13.19
16	Psidium guvava	361.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	361.75	0.14
17	Salvadora spp.	0.00	0.00	994.40	875.29	0.00	0.00	0.00	0.00	1869.69	0.72
18	Syzygium cumini	1890.17	51.72	0.00	0.00	0.00	0.00	0.00	0.00	1941.90	0.74
19	Tamarix aphylla	734.84	98.73	39.87	0.00	0.00	0.00	0.00	0.00	873.44	0.33
20	Zizyphus spp.	495.46	16.76	3224.51	0.00	2.12	0.00	0.00	0.00	3738.85	1.43
21	Misc. spp.	4158.00	73.26	993.11	27.22	0.00	0.00	0.00	0.00	5251.60	2.01
	Total	198821.97	20309.42	25448.74	14964.57	1196.23	0.00	298.78	0.00	261039.72	100.00
	% age	76.17	7.78	9.75	5.73	0.46	0.00	0.11	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	1116.38
3.	Bhandari	677.00
4.	Dhatoo	583.00
5.	Boudkalan	2353.00
6.	B. Busna	348.00
7.	B. Tauru	184.94
8.	Dachaur	2728.00
9.	Dighal	2210.00
10.	Dobhi	2896.00
11.	Gorakhpur	4370.00
12.	Gurauthi	1720.00
13.	Haliaki	480.00
14.	Kahnaur	2762.00
15.	Khandakheri	2324.00
16.	Kharkhara	979.00
17.	Kona	266.28
18.	Kuramanwali	1479.00
19.	K.Lakhasingh	140.00
20.	Lalheri	267.09
21.	Mammonmaira	199.51
22.	Mohammedpur	1731.00
23.	Nandgaon	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.	Sonipat	348	11
	Total	7073	241

Appendix - III

List of species found in Sample villages in Gurgaon District.

S.No.	Botanical name	Common name
1	2	3
1.	Acacia lenticularis	Safed babul. Amiar. Kanti. Gohira
2.	Acacia nilotica	Babul. Kikar. Bawar. Baval
3.	Acacia tortilis	Israeli kikar
4.	Ailanthus altissima	Borpat. Swinde
5.	Ailanthus excelsa	Ardusa. Maharukh. Mahalimla Butazod. Dhella, Peddamman. Arru
6.	Albizia procera	Safed siris/siras. Karha. Karhar. Karhai
7.	Albizia spp.	Hiharu, Morai. Mog. Sundi. Kunis
8.	Azadirachta indica	Neem, Nimbo, Nibbaro. Vepa
9.	Bauhinia spp.	Kachnar. Papri. Jhingora
10.	Cassia siamea	Minjiri, Nellatangedu
11.	Citrus spp.	Nimbu. Lemon
12.	Cordia spp.	Lassora. Bairula. Borala
13.	Dalbergia sissoo	Sisoo. Shisham. Tahli
14.	Delonix regia	Gulmohar, Krishnachura. Golmohan
15.	Emblica officinalis	Amla, Aonla. Amlaki. Nellimara
16.	Eucalyptus spp.	Nilgiri. Safeda
17.	Eugenia caryopayllaea	Kunti. Neeral .
18.	Ficus bengalensis	Baroat. Bad. Fig
19.	Ficus religiosa	Pipal. Pipli, Papada, Pripari
20.	Ficus spp.	Anjar, Akhar, Budita
21.	Holoptelia integrifolia	Abal. Chielbil. Kaneji
22.	Mangifera indica	Am. Amb, Ambo. Mavu. Moru
23.	Melia azedarach	Bijain. Daknia. Betain. Balain
24.	Mitragyna parvifolia	Phaldu. Mundi, Kaiz. Battaganum
25.	Moringa spp.	Sajna. Sohina. Sanjna. Saijna
26.	Morus spp.	Tut. Kimu. Shahtoot

27.	Oroxylum indicum	Tarlu, Tantia, Dumpii, Teta, Pharkot, Jaimangal, Dingorri Telvo, Sona
28.	Parkinsonia aculiata	Dust observer
29.	Phoenix sylvestris	Khajur, Betha
30.	Prosopis cineraria	Jand, Jant
31.	Prosopis juliflora	Juliflora
32.	Psidium guyava	Amrud
33.	Salvadora spp.	Jal, Jhal
34.	Syzygium cuminii	Jamun, Jamoon, Jamak
35.	Tamarindus indica	Imli, Amli, Ambli, Chinch
36.	Tamarix aphylla	France, Farash
37.	Tecomella undulata	Roda, Rohida
38.	Zizyphus mauritiana	Ber, Beri
39.	Zizyphus spp.	

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Appendix-IV

List of the villages Surveyed in Gurgaon District.

S.No.	Name of the village	Name of Tehsil	Area of Village (Ha.)	Map sheet No.
1.	Aklimpur	Ferozpur	80.94	53 E/ 1
2.	Bhadas	-do-	726.00	53 E/ 1
3.	Bhakraji	-do-	687.15	53 A/14
4.	Bichhor	-do-	1691.56	53 E/ 5
5.	Dhadola	-do-	144.07	53 E/ 1
6.	Kherlimuh	-do-	312.82	53 E/ 1
7.	Marora	-do-	927.12	53 E/ 1
8.	Umra	-do-	954.23	53 E 1
9.	Haliaki	Gurgaon	480.00	53 [illegible]/11
10.	Jonisawas	-do-	407.11	53 D/15
11.	Kharkhari	-do-	190.08	53 D/15
12.	Tatarpur	-do-	310.79	53 D/15
13.	Barka Alimuotia	Nuh	497.00	53 E/ 4
14.	Buraka Tauraru	-do-	184.94	53 D/16
	Total		7593.81	

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

Contents

DISTRICT TREE FORM

(ABSTRACT OF ENUMERATION IN SAMPLE VILLAGES)

JOB NO.	CARD DESIGN NO.	STATE	DISTRICT	NO. OF VILLAGES IN THE DISTRICT	NO. OF SAMPLE VILLAGES IN THE DISTT.	TOTAL AREA OF THE VILLAGES IN THE DISTT. (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

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

FARM FORESTY	ROAD SIDE PLANTATION	VILLAGE WOODLOT	BLOCK PLANTATION	PONDS	RAILWAY LINES	CANALS	REST	TOTAL
33-36	37-40	41-44	45-48	49-52	53-58	57-60	61-64	65-70

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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.

16. B. T. and other measurements taken by

17. Quadrant-wise summary of enumerations

QUADRANT No.	DATE OF SURVEY	TOTAL No. OF TREES

Dated :

Signature of
Crew Leader

Diagram etc. of village

गाँव वृक्ष गणन फार्म/VILLAGE TREE ENUMERATION FORM

कार्य संख्या Job No.	कार्ड रूप रेखा Card design	राज्य State	जिला District	प्रतिदर्श गाव Sample Vill	Geographical Area of the Sample Village (Hect.) प्रतिदर्श गाव का भौगोलिक क्षेत्र हैक्टे.
1-3	4-6	7-8	9-10	11-15	16-19

वृक्षों का कुल संख्या Total No. of Trees
42.47

स्पीशीज/जाति SPECIES नाम Name	कोड Code	डी बी एच (सी एम) DBH OB (CM)	वृक्ष की ऊंचाई (मी.) Tree Height (Mt.)	क्लीयर बोल/ स्पष्ट प्रस्तंभ (मी.) Clear Bole (Mt.)	पोष रोपण/वृक्षों का वर्ग Category of Plantation/Trees	स्पीशज/जाति SPECIES नाम Name	कोड Code	डी बी एच ओ बी (सें.मी.) DBH OB (Cm.)	वृक्ष की ऊंचाई (मी.) Tree Height (Mt.)	क्लीयर बोल/ स्पष्ट प्रस्तंभ (मी.) Clear Bole (Mt.)	पोष रोपण/झाड़ी का वर्ग Category of Plantation/Bamboo
	20-22	23-25	26-27	28-29			31-33	34-36	37-38	39-40	14

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हस्ताक्षर दल नायक.....
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नाम दल नायक.....
Name of Crew Leader .....