

REPORT
ON
INVENTORY OF TREES IN NON-
FOREST AREAS

A PILOT SURVEY IN 25 VILLAGES
OF
WEST BENGAL

FOREST SURVEY OF INDIA
EASTERN ZONE
CALCUTTA
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PREFACE

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 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, roadside plantations, village woodlots, block plantations, plantations done along canals, railway lines, ponds and others. This report, prepared by Eastern Zone, Calcutta, pertains to pilot survey undertaken in 25 villages of West Bengal State.

The purpose of the pilot survey was to determine the optimum sample size for the state for the main survey. During the course of conducting the pilot survey a lot of data regarding tree species, their categories and their diameter were collected.

The geographical area of West Bengal state is 88752 sq.km. The total non-forest area of the state is 76873 sq.kms. During the pilot survey of 25 villages the total coverage of survey area was 49.44 sq.km. Out of the total species inventoried, 43 species on the basis of their predominance and commercial importance have been presented separately. Other species have been grouped together as miscellaneous.

The total number of trees enumerated were 1,25,634 i.e. 25.41 trees / ha. Miscellaneous species has been found to have the largest representation with 27% trees followed by Mangifera indica(12%), Eucalyptus species (11 %), Acacia auriculliformis (10%), etc.

The inventory survey and data processing work was carried out by Forest Survey Of India, Eastern Zone, Calcutta and Headquarters office Dehradun. 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. It is hoped that this report will be of use, not only to the State Forest Department of West Bengal but also to others.

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Director.

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CHAPTER : I

INTRODUCTION AND DESCRIPTION OF DISTRICTS

1.1 INTRODUCTION :

West Bengal occupies a crucial place in India by virtue of its unique location within three international frontiers. Its rich variegated cultural pattern and dynamism has always fascinated people both at home and abroad. The present report in respect of the inventory of non-forest areas is the first venture of its kind. The results appended below are based on a pilot survey of 25 villages distributed over various agro-ecological regions of the State of West Bengal conducted during the period 1991- 1993.

1.2 SITUATION AND BOUNDARIES :

The State is bounded on the east by Bangladesh and Assam, on the west by Bihar and Orissa, on the north by Nepal and Bhutan and on the south by the Bay of Bengal. It is located between 21°30'N and 27°12'N latitudes at the head of the Bay of Bengal and between 85°50'E and 89°52'E longitudes.

1.3 PHYSICAL FEATURES :

West Bengal's physiography has two natural divisions : the Himalayan north and the fertile alluvial Gangetic plain stretching to its south. The topography of the northern territory varies from a maximum elevation of 3660 metres at Sandakphu in Darjeeling district to an elevation of 89 metres in the low-lying areas in Jalpaiguri and Cooch Behar districts, watered by the swift-flowing rivers like Teesta, Torsa and Jaldhaka. The deltaic structure at the Sundarbans estuary is another feature of interest. In the south-west, the land gets more and more slopy and undulating, ultimately merging into the Chotanagpur plateau structure in Purulia district.

1.4 CLIMATE :

Moist wind from the Bay of Bengal makes the climate of the State highly humid, specially in the rainy season; but in cold weather, from September to February, the climate over the entire State is exceedingly pleasant.

1.4.1 ANNUAL RAINFALL:

(in millimetres)				
	Normal	<--- 1990	Actual 1991	---> 1992
Sub-Himalayan WestBengal :				
Darjeeling	3212	3810	3843	2729
Jalpaiguri	4136	3434	3903	2820
Cooch Behar	3193	3157	3064	2354
Dinajpur(N&S)	1802	2377	2186	1523
Malda	1498	1526	1940	1294
Gangetic West Bengal :				
Murshidabad	1338	1538	1429	1030
Nadia	1401	1685	1386	1071
Birbhum	1234	1542	1348	1069
Burdwan	1271	1557	1443	1019
Hooghly	1516	1571	1845	1057
Bankura	1271	1640	1587	1149
Purulia	1365	1811	1231	1267
Midnapore	1428	2152	1584	1466
Howrah	1676	1953	1651	1210
24-Parganas(N&S)	1579	2208	1718	1493

- Source: 1. Directorate of Agriculture, Agricultural Meteorological Section, Govt.of West Bengal.
 2. Meteorological Department, Govt.of India,
 3. Economic Review ,1993-94, Govt.of West Bengal.
 4. Statistical Hand Book, 1992, Govt.of West Bengal.

1.4.2 MAXIMUM AND MINIMUM TEMPERATURE IN WEST BENGAL :

(in celsius)

Station	1989		1990		1991	
	Max	Min	Max	Min	Max	Min
Hill Stations						
Kalimpong	25	7	28	8	30	4
Darjeeling	35	15	30	2	34	3
Jalpaiguri	NA	NA	NA	NA	39	10
Coochbehar	39	6	36	8	36	4
Malda	43	9	41	9	40	5
Gangetic West Bengal						
Calcutta	42	8	37	9	39	10
Krishnagar	43	8	36	8	33	7
Berhampur	44	8	40	9	39	7
Burdwan	44	3	41	8	44	5
Suri	44	7	41	7	42	8
Bankura	42	18	37	13	39	7
Midnapore	43	9	38	8	44	10
Purulia	43	4	42	10	44	8

Source: 1) Directorate of Regional Meteorological Centre,
2) Statistical Handbook, 1992, Bureau of Applied Economics and Statistics, Govt. of West Bengal.

1.5 RIVER SYSTEM :

Bhagirathi is the only channel left to West Bengal, which receives water from the Ganges. The channel is of vital importance not only to West Bengal but also to the whole of India, as on its bank stands Calcutta, one of the largest port of India. The chief rivers of West Bengal are Hooghly, Damodar, Mayurakshi, Kangsabati, Rupnarain and Teesta.

1.6 AGRICULTURE :

Agriculture plays a pivotal role in the state's income and nearly three out of four persons in the State are directly or indirectly involved in agriculture. About 45 per cent of the gross cropped area of the state has been brought under irrigation. With an area of 5,719 thousand hectares, rice production went up to 11,954 m.tonnes in 1991-92. The State occupies a leading position among the principal rice growing states of India by contributing 16.2 per cent of the total production of rice. The total foodgrain production has attained an all time record production of 128 lakh tonnes in 1991-92. The State accounted for 63.4 per cent of the country's jute, including mesta, in 1991-92 and 21.8 per cent of tea production in 1991(calendar year). Other important crops, include potatoes, oilseeds, betel-vine, tobacco, wheat, barley and maize.

1.7 INDUSTRY AND MINERALS :

West Bengal was one of the major industrial States in the country with 8,900 registered working factories in 1990. The number of small scale industrial units registered with the Directorate of Cottage and Small Scale industries during 1991-92 stood at 27,434. Besides the alloy steel plant at Durgapur, there are two more steel plants, one at Durgapur and twenty three other mini steel plants in the state, and the other in Burnpur, both located in the Burdwan district. Major industries, among others, include engineering, automobiles, chemicals, pharmaceuticals, aluminium, ceramics, leather, footwear, bonemeal, bicycle, jute, cotton, textiles, tea, paper, glass and timber-processing. In addition, central public sector undertakings including coal, locomotive, cable, fertilizer, shipbuilding and ordinance factories are located within the State. The State Government in its turn has set up public sector undertakings like tea, fruit and vegetable processing, sugar, dairy and poultry, chemicals and phyto-chemicals, agro-textile, sugarbeet, silicate and glass, plywood, electro-chemical, electro-medical and allied industrial development, including mineral development. Coal and china clay are two important minerals found extensively in the State.

1.8 IRRIGATION AND POWER :

Important multipurpose irrigation schemes implemented since 1947, include, among others, Barrage and Irrigation System of the Damodar Valley, Mayurakshi Irrigation and Kangsabati Projects. The Subarnarekha Barrage Project in Midnapore district has also started. Irrigation schemes already completed include the Teesta-Mahananda link canal(in Jalpaiguri district), Hinlow irrigation scheme (in Birbhum district),Sohajare scheme (in Bankura district), Terageria and Turga irrigation scheme (in Purulia district). Power supply in West Bengal is currently done by the West Bengal Power Development Corporation Limited, West Bengal State Electricity Board,Calcutta Electricity Supply Corporation and Durgapur Projects Limited.

In 1991-92 the power generation capacity (excluding, DVC,NTPC, and DPL) stood at 10,465 MW. Besides ,WBSEB has got gas turbines of 100 MW capacity, hydel units of 14 MW capacity and diesel units of 15.5 MW capacity. With the commissioning of a 67.5 MW unit under CESC and 210 MW unit under WBPDC since September 1990, it has been possible to make a positive break in the nominal strength of power capacity in the state from 1986. During the calendar year 1992, generation of energy (excluding DVC, NTPC etc.) stood at 10,947 MW.

Total number of mouzas electrified increased from 27,584(1990-91) to 29,020(1991-92) covering 73.69 per cent of total mouzas. The number of pump-sets energized increased to 92,394(1991-92) from 89,176(1990-91). Under the Kutirjyoti and Lokdeep scheme as many as 48,939 households were electrified as on 31 October 1992.

1.9 FORESTS :

The forests cover about 13.40 percent of the total area and lie chiefly in the districts of Darjeeling, Jalpaiguri, 24 Parganas(South), Midnapore, Bankura,Purulia district and in some parts of Burdwan and Birbhum districts. Stray and scattered forests are present in Murshidabad, Nadia, Malda and West Dinajpur districts.The principal forest products are timber, firewood and charcoal. Jaldapara Sanctuary in the State is famous for the one horned Rhinoceros inhabiting the area, while Sundarbans Tiger Reserve and National Park is famous for the Royal Bengal Tiger.

1.10 DISTRICTS :

There are at present eighteen districts in West Bengal, viz., Bankura, Birbhum, Burdwan, Calcutta, Cooch Behar, Darjeeling, Hooghly, Howrah, Jalpaiguri, Malda, Midnapore, Murshidabad, Nadia, Purulia, 24 Parganas (South), 24 Parganas (North), Dinajpur(N) and Dinajpur(S).

1.11 DISTRICTWISE AREA, POPULATION & POPULATION DENSITY :(1991 CENSUS)

Sl. No.	District	Area (sq. km.)	Population (laks)	Density of population per sq.km.	Forest area (sq.km.)	Non-forest area (sq.km.)
1.	Jalpaiguri	6227	28.01	450	1790	4437
2.	Coochbehar	3387	21.71	641	57	3330
3.	Darjeeling	3149	13.00	413	1204	1945
4.	Dinajpur(N&S)	5358	31.28	584	18	5340
5.	Malda	3733	26.37	706	20	3713
6.	Murshidabad	5324	47.40	890	8	5316
7.	Nadia	3927	38.52	981	13	3914
8.	24 Prgs.(N)		72.82	1779		
		14136			4263	9873
9.	24 Prgs.(S)		57.15	574		
10.	Calcutta	104	44.00	23,784	-	104
11.	Howrah	1467	37.30	2,543	-	1467
12.	Hooghly	3149	43.55	1,383	3	3146
13.	Midnapore	14081	83.32	592	1709	12372
14.	Bankura	6882	28.05	408	1482	5400
15.	Purulia	6259	22.24	355	876	5383
16.	Burdwan	7024	60.50	861	277	6747
17.	Birbhum	4545	25.56	562	159	4386
	Total of State	88752	680.78	767	11879	76873

Source : Census of India, 1991, Series-1, Paper 2 of 1992 Census.

N.B. Non forest area = Geographical area - Forest area (roughly).

CHAPTER :II

DESIGN AND METHODOLOGY

2.1 OBJECTIVE :

The main objective of the field inventory in non-forest (rural) area is to estimate the growing stock of the standing trees in terms of tree density of major species occurring in the surveyed areas. The results of the survey at State level should be at the precision of $\pm 10\%$ at 95% probability level.

Since the present report pertains only to a pilot survey of non-forest areas carried out in West Bengal, the precision is not expected to be within any prescribed limit. The desired precision can be expected only during the course of final inventory.

2.2 SAMPLING DESIGN :

A random sampling with villages as sampling units has been adopted. A list of villages in each district is prepared from the District Census Hand Book and a pilot survey was conducted by taking one or two villages in one District. In West Bengal, 25 villages were selected for the pilot survey. A list of villages selected for the pilot survey is given at Table-6. The purpose of the pilot survey was to determine the required number of optimum sample size.

The villages selected for pilot survey were taken up one by one for carrying out complete enumeration of all the trees of 10 cm. and above diameter at DBH(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 has been processed for calculation of sample size for the whole State by using the formula:

$$n = \frac{\left(\frac{(1.96)(C.V.)}{10}\right)^2}{1 + \frac{1}{N}\left(\frac{(1.96)(C.V.)}{10}\right)^2}$$

where C.V. = Co-efficient of variation

$$= \frac{s}{\bar{X}} \times 100 = 87.13$$

\bar{X} = Mean of the variable tree/ha. = 23.14

s = Standard deviation of tree/ha. = 20.17

N = total number of villages in the State = 41112

For large N, the value of $\frac{1}{N}\left(\frac{(1.96)(C.V.)}{10}\right)^2$ is insignificant and

the above formula for sample size will be equal to

$$\begin{aligned} n &= \left(\frac{(1.96)(C.V.)}{10}\right)^2 \\ &= \left(\frac{(1.96)(87.13)}{10}\right)^2 \\ &= 291 \end{aligned}$$

The sample size obtained for the State of West Bengal has come out to be 291 villages. (Ref. Table No.8). The present report is based on the data from 25 villages of the pilot survey which may throw some likely indication of the type of dominant species, categories and diameter classes. The name of the villages, area, population etc. are summarized in Table No.6.

2.3 DATA COLLECTION :

In each selected village, complete enumeration of all trees having diameter 10 cm. and above has been done. Dead trees having utility less than 70% and all trees less than 10 cms. Diameter were ignored. The enumeration of trees commenced from NE quadrant of the village and proceeded in clockwise direction. However, in South Bengal, trees down to 5 cm.dia.were

2) The inventory in rural areas was confined to the areas within the bounds of the villages excluding the forest areas within such village areas which are defined in the manual.

3) The following two forms have been designed for data collection:

- i) District Tree form(DTF)
- ii) Village Tree enumeration Form(VTEF)

The DTF gives the general information of the district and the number of trees according to category of plantation/tree in the sample villages. The VTEF gives the diameter, height and clear bole length of each tree enumerated in the sample village. Trees were enumerated starting from 5cm. d.b.h.(o.b.) in all the districts except the North Bengal districts where trees were enumerated from 10 cm.d.b.h.(o.b.) upwards.

2.4 CATEGORIES OF PLANTATION /TREES :

Complete enumeration of trees was carried out and recorded against the following categories as per manual :

- i) Farm forestry :
Trees along with farm bunds and in small patches down to 0.1 ha.in area.
- ii) Roadside plantations:
Trees planted along roads (NH, SH, village roads etc.)
- iii) Village woodlot:
Naturally growing trees on private/community land.
- iv) Block plantations:
Patches covering an area of more than 0.1 ha. and not falling in any of the above categories.
- v) Ponds:
For trees planted in or around water ponds.
- vi) Railway lines:
For trees planted along the Railway sides.
- vii) Canals:
For trees planted along canal banks.
- viii) Rest:
Trees not falling in any of the above categories.

2.5 DATA PROCESSING :

The following steps were followed during data processing of non-forest areas:

- i) Major species in each district were identified and the rest of the species were merged and classified as 'other species'.
- ii) Village-wise stem distribution was carried out according to the species, diameter class and category of trees.
- iii) All villages in the same district were clubbed together and districtwise number of stems per hectare by diameter class and category of trees were calculated.
- iv) From the above table the total number of stems by district and category of trees was estimated.
- v) The districts of West Bengal were classified according to agro-ecological zones and the stem/hectare distribution by species and agro-ecological regions was also determined.

2.6 AGRO- ECOLOGICAL REGIONS OF WEST BENGAL :

West Bengal has five agro-ecological regions. Their locations and details are furnished in the Map. The agro-ecological regions are briefly described below :

Region I (Code-12): SUB HUMID ECO SYSTEM :

Eastern (Chhotanagpur) plateau and Eastern ghats, Hot Subhumid Ecoregion with Red and Lateritic soils and growth period of 150-180 to 210 days.

Region II (Code-13): SUB HUMID ECO SYSTEM :

Eastern plains, Hot Subhumid (moist) Ecoregion with alluvium derived soils and growth period between 180 and 210 days.

Region III (Code-15): HUMID PERHUMID ECO SYSTEM :

Bengal and Assam plains, Hot Sub humid (Moist) to Humid inclusion of (Perhumid) Ecoregion, with alluvium derived soils and growth period more than 210 days.

Region IV (Code-16): HUMID PER HUMID ECO SYSTEM :

Eastern Himalayas, Warm Perhumid Ecoregion with Brown and Red hill soils and growth period more than 210 days.

Region V (Code-18): COASTAL ECO SYSTEM :

Eastern coastal plains, Hot Subhumid to Semi-arid Ecoregion, with coastal alluvium derived soils and growth period between 90-210+ days.

The following table shows the distribution of geographical area of West Bengal by district and agro-ecological region.

Agro-ecological Regions (Area in sq.km.)

District	Geographical area (sq.km)	Code 12	Code 13	Code 15	Code 16	Code 18
Darjeeling	3149	-	-	649	2500	-
Jalpaiguri	6227	-	-	5227	1000	-
Coochbehar	3387	-	-	3387	-	-
Bankura	6882	3750	-	3132	-	-
Midnapore	14081	2500	-	9581	-	2000
Burdwan	7024	1750	-	5274	-	-
Hooghly	3149	-	-	3149	-	-
Purulia	6259	6259	-	-	-	-
Birbhum	4545	1250	-	3295	-	-
24 Prgs(N&S)	14136	-	-	11636	-	2500
Malda	3733	-	500	3233	-	-
Dinajpur(N&S)	5358	-	1000	4358	-	-
Nadia	3927	-	-	3927	-	-
Murshidabad	5324	-	-	5324	-	-
Howrah	1467	-	-	1467	-	-
Calcutta	104	-	-	104	-	-
Total:	88,752	15509	1500	63743	3500	4500

N.B. The above area figures are approximate and tentative.

CHAPTER: III

RESULTS OF THE SURVEY

3.1 TREES COMMONLY MET WITH :

Tables 1 to 3 give the details of the distribution of trees by diameter classes and by categories of species in 25 villages of West Bengal. It is noticed from the raw data that occurrence of major species varies from district to district. In Purulia, Bankura and Midnapore districts, *Azadirachta indica*, *Acacia arabica*, *Terminalia arjuna*, *Shorea robusta*, *Eucalyptus hybrid*, *Mangifera indica*, *Acacia auriculiformis*, *Madhuca latifolia* are some of the more important species while in Darjeeling district, *Albizia* species, *Alnus nepalensis*, *Ailanthus altissima*, *Artocarpus* & *Machilus* are the important tree species. In Malda district, *Mangifera indica*, *Eucalyptus hybrid*, *Acacia auriculiformis*, *Dalbergia sissoo* and *Azadirachta indica* are some of the main species. In Howrah district, *Borassus flabellifer*, *Acacia arabica*, *Cocos nucifera*, *Mangifera indica*, *Acacia auriculiformis* etc. are important. It is to be remembered that the results are based only on a pilot survey and are therefore bound to be tentative in nature. These, however, have indicative value.

3.2 PER HECTARE DISTRIBUTION OF TREES BY DIAMETER CLASS AND CATEGORIES OF TREES :

Table 1 shows that maximum number i.e. about 43% of trees occur in 10-20 cm. diameter class followed by about 21% trees in 05-10 cm. diameter class, then 20% in 20-30 cm. diameter class. It may also be seen that only 6% of trees occurred in 40 cm. and above diameter class.

This table also reveals that in 25 villages of West Bengal, Miscellaneous species has the largest representation i.e. 27% followed by *Mangifera indica* 12%, *Eucalyptus* species 10%, *Acacia auriculiformis* 10%, *Acacia arabica* 7% etc.

From the Table it is also found that the stem/ha. for the species combining all the categories has maximum contribution from Miscellaneous species(6.95), followed by *Mangifera indica*(3.08), *Eucalyptus* species(2.73) and *Acacia auriculiformis*(2.55) etc.

Similarly, it is noticed that trees/ha. is maximum in the diameter class 10-20cm.(11.16), followed by 5.41 in diameter class 05-10cm. , 4.96 in diameter class 20-30 cm. etc. Only 1.62 trees per ha. exist in 40cm. and above diameter class.

The distribution of total number of trees specieswise and categorywise (all diameter class combined) has been presented in Table 2. It is observed that when all the dia classes are combined, the representation of trees in the category "Rest" is the highest i.e. 36% followed by the category "Block Plantation"(17%), "Ponds"(16%), " Village woodlot"(13%)etc.Farm forestry has only 4% contribution. This table also reveals that the stem/ha.is maximum for trees in Category "Rest"(9.04), followed by "Block Plantation"(4.37) and in "Ponds"(4.16)etc.

Table 3 is another form of representation of Table 1 & 2 taking both together. Table A below gives a breakup of trees enumerated in each of the Districts covered :

Table 'A'

No.of stems above 5 cm. by Districts and categories

Dist.	Area of villages surveyed	Farm forestry	Road-side plantations	Village wood lot	Block plantations	Ponds	Railway lines	Cannals	Rest	Total	%
Purulia	371.03	704	-	1409	2839	734	-	-	3075	8761	6.97
Burdwan	773.16	330	2848	-	96	2140	30	68	4686	10198	8.12
Birbhum	231.53	341	352	462	-	263	-	3361	1015	5794	4.61
Midnapore	819.73	2314	3465	11140	14460	11127	-	-	525	43031	34.25
Bankura	482.33	967	-	-	1344	37	-	-	4219	6537	5.23
Murshidabad	263.54	89	204	-	-	-	-	-	5693	5986	4.76
Howrah	66.47	305	-	1592	-	817	-	-	346	3060	2.44
24Pgs	352.07	-	851	-	445	5331	-	4635	7277	18539	14.76
Darjeeling	567.35	-	801	1603	-	-	-	-	1013	3417	2.72
Jalpaiguri	238.00	24	-	-	2418	-	-	-	1303	3745	2.98
Malda	527.00	-	605	-	-	101	-	-	14195	14901	11.86
Dinajpur	252.00	22	468	-	-	-	-	-	1145	1635	1.30
Total	4944.2	5096	9594	16206	21602	20550	30	8064	44492	125634	100.00
%age		4.06	7.64	12.90	17.19	16.36	-	6.40	35.41	100	-

Table B: No.of stems/ha.above 5 cm. by Districts and Categories:

Districts	Area of villages surveyed	Farm forestry	Road side plantation	Village wood lot	Block plantation	Ponds	Railway lines	Canals	Rest	Total
Purulia	371.03	1.90	-	3.80	7.65	1.98	-	-	8.29	23.61
Burdwan	773.16	0.43	3.68	-	0.12	2.77	-	0.10	6.06	13.19
Birbhum	231.53	1/47	1.52	2.00	-	1.14	-	15.00	4.38	25.03
Midnapore	819.73	2.82	4.23	13.59	17.64	13.57	-	-	0.64	52.49
Bankura	482.33	2.00	-	-	2.79	0.08	-	-	8.75	13.62
Murshidabad	263.54	0.34	0.77	-	-	-	-	-	21.60	22.71
Howrah	66.47	4.59	-	23.95	-	12.29	-	-	5.21	46.04
24 Pgs.	352.07	-	2.42	-	1.26	15.14	-	13.00	20.67	52.65
Darjeeling	567.35	-	1.41	2.83	-	-	-	-	1.79	6.03
Jalpaiguri	238.00	0.10	-	-	10.16	-	-	-	5.47	15.73
Maldah	527.00	-	1.15	-	-	0.19	-	-	26.94	28.28
Dinajpur	252.00	0.09	1.86	-	-	-	-	-	4.54	6.29
Total:	4944.20	1.03	1.94	3.28	4.37	4.16	-	1.60	9.00	25.41

The following observations can be tentatively drawn from the above mentioned tables:

There is a preponderance of trees on the canal banks in Birbhum district whereas in Purulia and Bankura, farm forestry and Block plantations are common. In villages covered in Midnapore, trees have been found in block plantations, pond sides and village wood lots. Dinajpur(North & South) districts have predominantly roadside avenues of plantations, whereas Jalpaiguri is characterised by more of block plantations. In 24 Parganas (North & South) districts, canal bank and pond bank trees are more common. In Howrah district, in addition to pond bank trees, some village woodlots and farm forestry plantations have been recorded. It may also be seen that around 34% total enumerated trees are from Midnapore District, followed by 15% from 24 Pgs., 12% from Malda, 8% from Burdwan and 7% from Purulia.

Table B reveals that stem/ha. is maximum for Midnapore(52) and 24 Pgs. District(52) and minimum for Darjeeling(6) and Dinajpur districts(6). A lot of variation may be seen among the figures of districtwise stem/ha. It is again repeated that the above observations are not foolproof as these are based only on limited data of pilot survey.

Table 5 gives the break up of enumerated trees in 25 villages of West Bengal by species and districts. The trees/ha. is maximum in case of the species Misc.(6.95), followed by *Mangifera indica*(3.08), *Eucalyptus* species (2.73), *Acacia auriculiformis*(2.55), *Borassus flabellifer*(1.28), *Acacia arabica*(1.71) etc.

3.3 NUMBER OF TREES :

Based on the data of pilot survey of 25 villages, the stem/ha. for the whole State of West Bengal comes out as 25.41, which comes to approximately 196 million stems for the state of West Bengal.

3.4 TREE SPECIES FOUND IN VARIOUS AGRO- ECOLOGICAL REGIONS:

West Bengal has been divided in 5 agro-ecological regions as mentioned in para 2.6. Details of tree species occurring in different Agro ecological zones are furnished in table No.4.

An analysis of the information available from Table No.4 would lead to the following conclusions :

1. Trees of only one village in the coastal agro-ecological zone (code no.18) was enumerated. As such it would not be proper to draw any conclusion regarding occurrence of tree spp. in the zone from the information of the last column of the table. However, within the particular village viz. Satilapur, the tree density in terms of number of stems per hectare is exceedingly high i.e. 67.13 and there is a preponderance of *Cocos nucifera* (coconut trees) in the village, as expected, followed by *Mangifera indica* (Mango), *Azadirachta indica* (Neem) and *Acacia arabica* (Babul) trees.

2. The number of stems per hectare varies considerably from one agro-ecological region to another. While this is in the region of 26 to 27 per hectare in the Bengal Assam Alluvial humid perhumid ecoregion (code no.15) and in the Western lateritic sub-humid ecoregion (code no.12), the number appears to be 20 to 21 trees/ha and the Eastern Himalayan humid perhumid ecoregion (code no.16) in the region of 8 to 9.

It may be indicated in this connection that in the hills, most of the samples of villages fell in 'forest' or 'Khasmahal' villages. Such villages have very few trees in the habitable portion while the surrounding portion have dense forests within the recorded village area. As it was impossible to enumerate all trees in the surrounding areas, only the inhabited portions of such villages were taken up for enumeration.

3. In the Bengal Assam Alluvial region (Code No.15), a large number of spp (at least 33) have been found. The predominant ones being Tal (*Barassus flabellia*), Babul (*Acacia arabica*), Mango, Khejur (*Phoenix sylvestris*), Akash-moni (*Acacia auriculiformis*), Coconut, Siris, Sissoo, Jeol and Eucalyptus, arranged in order of occurrence. The principal species in the lateritic South Western districts, arranged in order of occurrence in terms of number of stems per hectare, are Palas (*Butea monosperma*), outnumbering the other spp. by a substantial margin, followed by Babla (*Acacia arabica*), Sissoo (*Dalbergia sissoo*), Neem (*Azartichtata indica*), Arjun (*Terminalia arjuna*), Eucalyptus hybrid, Tal (*Borassus flabellifer*) and Kul (*Zizyphus mauritania*).

4. In ecoregion 16, *Cryptomeria japonica*, the exotic that has almost naturalised (although without natural regeneration) in the forests of higher elevations in Darjeeling district, appears to be equally popular in the village areas. The other prevalent species are *Albizzia* spp., *Cassia siamea*, *Gmelina arborea*, *Ailanthus* spp., *Schima wallichii*, *Alnus nepalensis*, *Michelia champaca* and *Betula alnoides*.

The predominant species of the various agro-ecological regions can thus be identified with a fair amount of accuracy from the tabulated data. The conclusions sought to be drawn may be taken as more indicative than conclusive in nature, considering the limited sample size in each agro-ecological region.

3.5 OCCURRENCE OF BAMBOO :

Bamboo in non-forest areas were enumerated along with tree species in all the villages. Occurrence of bamboo species varies from district to district. A picture of occurrence of various bamboo species in different districts as revealed from the pilot survey in 25 villages have been summarized below. The number of bamboo culms per ha. and the total number of bamboo culms in each district (combined for all species) are also given in the following table.

TABLE - 'C'

OCCURRENCE OF BAMBOO SPECIES IN VARIOUS DISTRICTS

Sl.No.	District	Species Name	Number of bamboo culms/ha.
1	Bankura	Bambusa tulda	2.36
2	Midnapore	Unidentified bamboos Bambusa balcooa Dendrocalamus strictus Miscellaneous bamboo species	12.40
3	Burdwan	Bambusa tulda Dendrocalamus strictus	4.04
4	Purulia	Dendrocalamus strictus Misc.bamboo spp.	0.71
5	Birbhum	Dendrocalamus species Dendrocalamus hamiltonii Unidentified bamboo	3.54
6	Murshidabad	Bambusa balcooa Bambusa tulda	5.13
7	Howrah	Misc.bamboo species	21.85
8	24 Parganas (South and North)	Bambusa balcooa Bambusa species	4.52
9	Darjeeling	Bambusa balcooa Dendrocalamus hamiltonii Unidentified bamboos	1.29
10	Jalpaiguri	Bambusa nutans Bambusa balcooa Dendrocalamus strictus Bambusa species Unidentified bamboos	8.45
11	Malda	Bambusa balcooa Unidentified bamboos	10.16
12	Dinajpur (North and South)	Bambusa balcooa Bambusa nutans Dendrocalamus strictus	4.47

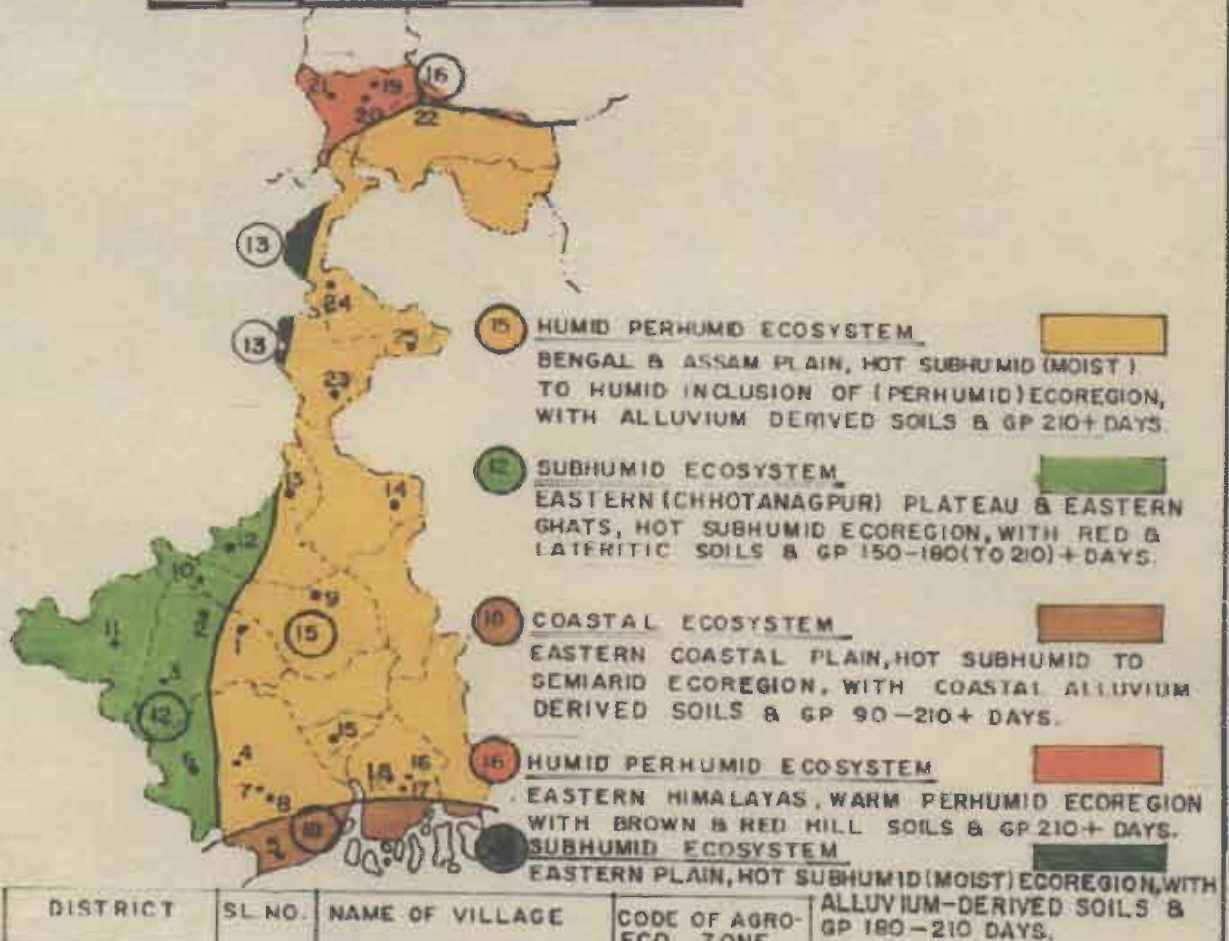
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DISTRIBUTION OF SAMPLE VILLAGES OF WEST BENGAL ACCORDING TO AGRO-ECOLOGICAL ZONE

Kms 100 50 0 100 200 300 Kms



DISTRICT	SL NO.	NAME OF VILLAGE	CODE OF AGRO-ECO ZONE
BANKURA	1.	BHULA	15
	2.	NIT'YANANDAPUR	12
	3.	MAITIBANDH	12
MIDNAPUR	4.	ARABARI	15
	5.	SATILAPUR	18
	6.	PHULBARIA	12
	7.	INDKURI	15
	8.	LEPSA	15
BURDWAN	9.	JOGESHWARDIHI	12
	10.	MAHESHPUR	12
PURULIA	11.	KALABAHAL	12
BIRDHUM	12.	KAMALPUR	12
	13.	NARAYANBATI	15
MURSHIDABAD	14.	DOMKAL	15
HOWRAH	15.	KHAJURDAHA	15
24 PARGANAS (S)	16.	PHULBARI BAMURIA	15
	17.	DHOSA	15
DARJEELING	18.	KAMRA	15
	19.	TAKDAHA	16
	20.	BAKHIM FOREST	16
JALPAIGURI	21.	SAMSHING KHAS MOHAL	16
	22.	BARADIGHI	16
MALDAH	23.	UTTAR JADUPUR	15
WEST DINAJPUR	24.	MALLIKPUR	15
	25.	DAMAI	15

Table 1 : Distribution of stems by Diameter class (in cm.) & Species in 25 villages of West Bengal.

Area 4944.21 ha

All Categories combined

Sl No.	Name of Species	Spp.		Diameter Class (In cm)							Total	%	Est. trees/ha
		Code		05-10	10-20	20-30	30-40	40-50	50-60	60-70			
1	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Acacia arabica	5	1381	5650	1168	204	29	1	0	0	8433	6.71	1.71
2	Acacia auriculliformis	A06	9393	3073	123	11	0	0	0	0	12600	10.03	2.55
3	Ailanthus altissima	39	0	43	46	11	4	3	1	0	108	0.09	0.02
4	Albizzia species	51	209	2110	938	462	161	36	11	10	3937	3.13	0.8
5	Alnus nepalensis	53	0	317	4	0	0	0	0	0	321	0.26	0.06
6	Artocarpus species	94	0	546	303	146	105	38	13	9	1160	0.92	0.23
7	Azadirachta indica	103	44	2247	540	109	28	16	5	5	2994	2.38	0.61
8	Betula alnoides	126	0	32	24	1	1	0	0	0	58	0.05	0.01
9	Bombax ceiba	131	0	25	19	12	11	1	0	1	69	0.05	0.01
10	Borassus flabellifer	132	0	135	1456	3392	1232	122	8	1	6346	5.05	1.28
11	Butea monosperma	146	0	3599	569	157	20	5	0	1	4351	3.46	0.88
12	Cassia species	189	119	686	36	1	0	0	0	0	842	0.67	0.17
13	Casurina equisetifolia	195	266	150	7	1	0	0	0	0	424	0.34	0.09
14	Cocos nucifera	A10	0	152	4732	1572	22	1	0	0	6479	5.16	1.31
15	Crataeva unilocularis	246	0	4	1	0	0	0	0	0	5	0	0
16	Cryptomeria japonica	256	0	192	454	223	0	0	0	0	869	0.69	0.18
17	Dalbergia sissoo	268	801	1462	291	60	21	6	5	0	2646	2.11	0.54
18	Enterolonbium saman	329	0	95	56	41	25	3	3	1	224	0.18	0.05
19	Eucalyptus hybrid	346	1531	1247	139	6	0	1	0	0	2924	2.33	0.59
20	Eucalyptus species	348	10573	2693	217	9	0	1	1	0	13494	10.74	2.73
21	Ficus species	385	3	9	9	8	4	3	5	9	50	0.04	0.01
22	Gmelina arborea	420	16	44	44	3	0	0	0	0	107	0.09	0.02
23	Holoptalea integrifolia	456	0	24	5	1	0	0	0	0	30	0.02	0.01
24	Lagerstoemea spaciosa	506	0	185	47	4	1	0	0	0	237	0.19	0.05
25	Lannea coromondalica	509	0	950	119	30	7	0	0	0	1106	0.88	0.22
26	Leucaena leucocephala	A30	643	267	35	3	0	0	0	0	948	0.75	0.19
27	Lichi chinensis	A14	0	24	17	1	0	1	0	0	43	0.03	0.01
28	Machilus species	559	0	11	1	0	0	0	0	0	12	0.01	0
29	Madhuca latifolia	561	0	16	1	1	4	10	18	22	72	0.06	0.01
30	Mangifera indica	569	13	5442	3544	1804	1238	1198	895	1115	15249	12.14	3.08
31	Melia azadirachta	583	0	75	16	4	0	0	0	0	95	0.08	0.02
32	Michelia champaca	595	0	69	14	1	0	0	0	0	84	0.07	0.02
33	Ostodes paniculata	652	0	28	2	0	0	0	0	0	30	0.02	0.01
34	Phoenix sylvestris	676	0	365	1885	305	1	0	0	0	2556	2.03	0.52
35	Pongomea pinnata	701	0	65	10	8	1	1	0	2	87	0.07	0.02
36	Pridian guava	A07	0	139	16	0	0	0	0	0	155	0.12	0.03
37	Schima wallichii	794	0	235	127	52	26	10	2	8	460	0.37	0.09
38	Shorea robusta	802	0	114	18	6	4	1	0	1	144	0.11	0.03
39	Spondios pinnata	812	0	30	18	7	2	0	0	0	57	0.05	0.01
40	Syzygium cumini	843	0	97	50	16	6	4	0	0	173	0.14	0.03
41	Tectona grandis	858	2	2	1	0	0	0	0	0	5	0	0
42	Terminalia arjuna	860	43	381	168	105	49	15	3	4	768	0.61	0.16
43	Zizyphus species	930	1	401	74	15	1	1	0	0	493	0.39	0.1
44	Rest of species	944	1738	21765	7208	2319	722	281	145	211	34389	27.37	6.95
Grand Total			26776	55196	24552	11111	3725	1759	1115	1400	125634	100	25.41
Percentage			21.31	43.93	19.54	8.84	2.96	1.4	0.89	1.11	100		
Estimated trees/ha			5.41	11.16	4.96	2.25	0.75	0.36	0.23	0.28	25.41		

Table 2: Distribution of stems by Species & Categories in 25 villages of West Bengal.

All Diameter Class combined											Area		4944.21 ha	
Sl No.	Name of Species	Spp.	Category of Trees								Total	%	Est. trees/ha	
		Code	I	II	III	IV	V	VI	VII	VIII				
1	1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Acacia arabica	5	596	898	546	197	1488	0	2639	2069	8433	6.71	1.71	
2	Acacia auriculliformis	A06	436	4277	379	6016	183	0	1194	115	12600	10.03	2.55	
3	Ailanthus altissima	39	0	0	101	0	0	0	0	7	108	0.09	0.02	
4	Albizia species	51	139	107	375	1611	852	20	145	688	3937	3.13	0.8	
5	Alnus nepalensis	53	0	14	307	0	0	0	0	0	321	0.26	0.06	
6	Artocarpus species	94	11	1	232	1	62	0	0	853	1160	0.92	0.23	
7	Azadirachta indica	103	209	13	1265	93	710	0	3	701	2994	2.38	0.61	
8	Betula alnoides	126	0	30	28	0	0	0	0	0	58	0.05	0.01	
9	Bombax ceiba	131	1	3	13	1	2	0	0	49	69	0.05	0.01	
10	Borassus flabellifer	132	328	5	932	27	2216	0	38	2800	6346	5.05	1.28	
11	Butea monosperma	146	5	0	45	2	159	0	0	4140	4351	3.46	0.88	
12	Cassia species	189	0	114	0	712	1	0	1	14	842	0.67	0.17	
13	Casurina equisetifolia	195	0	12	0	188	5	0	217	2	424	0.34	0.09	
14	Cocos nucifera	A10	137	1	2023	0	3383	0	7	928	6479	5.16	1.31	
15	Crataeva unilocularis	246	0	0	0	0	0	0	0	5	5	0	0	
16	Cryptomeria japonica	256	0	694	163	0	0	0	0	12	869	0.69	0.18	
17	Dalbergia sissoo	268	294	524	13	21	225	0	1052	517	2646	2.11	0.54	
18	Enterolonbium saman	329	3	0	129	0	74	0	0	18	224	0.18	0.05	
19	Eucalyptus hybrid	346	252	273	154	1348	26	0	474	397	2924	2.33	0.59	
20	Eucalyptus species	348	751	1536	282	10786	118	0	0	21	13494	10.74	2.73	
21	Ficus species	385	5	0	1	0	7	0	0	37	50	0.04	0.01	
22	Gmelina arborea	420	10	0	1	1	6	0	10	79	107	0.09	0.02	
23	Holoptalea integrifolia	456	0	0	0	0	0	0	0	30	30	0.02	0.01	
24	Lagerstoemea spaciola	506	0	0	0	0	0	0	0	237	237	0.19	0.05	
25	Lannea coromondalica	509	74	0	252	0	49	0	0	731	1106	0.88	0.22	
26	Leucaena leucocephala	A30	0	63	0	32	31	0	715	107	948	0.75	0.19	
27	Lichi chinensis	A14	0	0	0	0	0	0	0	43	43	0.03	0.01	
28	Machilus species	559	0	0	10	0	0	0	0	2	12	0.01	0	
29	Madhuca latifolia	561	1	0	11	2	1	0	0	57	72	0.06	0.01	
30	Mangifera indica	569	88	36	1130	10	1875	0	8	12102	15249	12.14	3.08	
31	Melia azadirachta	583	3	4	0	29	0	0	0	59	95	0.08	0.02	
32	Michelia champaca	595	0	49	31	0	0	0	0	4	84	0.07	0.02	
33	Ostodes paniculata	652	0	0	26	0	0	0	0	4	30	0.02	0.01	
34	Phoenix sylvestris	676	0	10	0	0	1106	0	142	1298	2556	2.03	0.52	
35	Pongomea pinnata	701	4	0	25	0	5	0	0	53	87	0.07	0.02	
36	Pridian guava	A07	0	1	0	0	12	0	0	142	155	0.12	0.03	
37	Schima wallichii	794	0	0	451	0	0	0	0	9	460	0.37	0.09	
38	Shorea robusta	802	0	0	0	0	0	0	0	144	144	0.11	0.03	
39	Spondios pinnata	812	5	0	8	0	9	0	0	35	57	0.05	0.01	
40	Syzygium cumini	843	0	0	0	0	71	0	6	96	173	0.14	0.03	
41	Tectona grandis	858	0	0	5	0	0	0	0	0	5	0	0	
42	Terminalia arjuna	860	301	1	100	3	95	0	51	217	768	0.61	0.16	
43	Zizyphus species	930	0	0	213	0	11	0	0	269	493	0.39	0.1	
44	Rest of species	944	1443	928	6955	522	7768	10	1168	15595	34389	27.37	6.95	
Grand Total			5096	9594	16206	21602	20550	30	7870	44686	125634	100	25.41	
Percentage			4.06	7.64	12.9	17.19	16.36	0.02	6.26	35.57	100			
Estimated trees/ha			1.03	1.94	3.28	4.37	4.16	0.01	1.59	9.04	25.41			

Table 3 : Distribution of stems by Diameter class (In cm.) & Category in 25 villages of West Bengal.

		Area 4944.21 ha										
<u>All Species combined</u>												
SI No.	Category of Trees	Diameter Class (In cm)								Total	%	Est. trees/ha
		05- 10	10 - 20	20-30	30-40	40-50	50-60	60-70	70 +			
1	1	2	3	4	5	6	7	8	9	10	11	12
1	Farm Forestry	1553	2554	518	298	130	37	5	1	5096	4.06	1.03
2	Roadside Plantations	4372	4209	740	213	14	10	9	27	9594	7.64	1.94
3	Village Woodlot	371	9104	4188	1804	534	128	43	34	16206	12.9	3.28
4	Block Plantations	16396	4203	693	223	70	13	1	3	21602	17.19	4.37
5	Ponds	425	9043	7096	3132	642	130	43	39	20550	16.36	4.16
6	Railway Lines	0	10	7	12	1	0	0	0	30	0.02	0.01
7	Canals	3442	3633	650	114	27	1	2	1	7870	6.26	1.59
8	Rest	217	22440	10660	5315	2307	1440	1012	1295	44686	35.57	9.04
Total		26776	55196	24552	11111	3725	1759	1115	1400	125634	100	25.41
Percentage		21.31	43.93	19.54	8.84	2.96	1.4	0.89	1.11	100		
Estimated Trees/ha		5.41	11.16	4.96	2.25	0.75	0.36	0.23	0.28	25.41		

Table 4 : Distribution of stems by Species in various Agro Ecological Zones In 25 villages of West Bengal.

All Diameter Class and all Categories combined										Area	4944.21 ha
Sl No.	Name of Species	Species	Agro Ecological Zones				Total	Percentage	Estimated		
		Code	SHCN	HAPB	HEH	ECP				trees/ha	
1	2	3	4	5	6	7	8	9	10		
1	Acacia arabica	5	861	6053	0	1519	8433	6.71	1.71		
2	Acacia auriculiformis	A 06	3872	8379	3	346	12600	10.03	2.55		
3	Ailanthus altissima	39	0	0	108	0	108	0.09	0.02		
4	Albizia species	51	118	1622	1630	567	3937	3.13	0.8		
5	Alnus nepalensis	53	0	0	321	0	321	0.26	0.06		
6	Artocarpus species	94	5	753	157	245	1160	0.92	0.23		
7	Azadirachta indica	103	617	851	0	1526	2994	2.38	0.61		
8	Betula alnoides	126	0	0	58	0	58	0.05	0.01		
9	Bombax ceiba	131	20	49	0	0	69	0.05	0.01		
10	Borassus flabellifer	132	544	5482	0	320	6346	5.05	1.28		
11	Butea monosperma	146	4059	292	0	0	4351	3.46	0.88		
12	Cassia species	189	0	159	683	0	842	0.67	0.17		
13	Casurina equisetifolia	195	0	424	0	0	424	0.34	0.09		
14	Cocos nucifera	A 10	0	1743	0	4736	6479	5.16	1.31		
15	Crataeva unilocularis	246	0	5	0	0	5	0	0		
16	Cryptomeria japonica	256	0	0	869	0	869	0.69	0.18		
17	Dalbargia sissoo	268	1084	1561	1	0	2646	2.11	0.54		
18	Enterolonbium saman	329	0	224	0	0	224	0.18	0.05		
19	Eucalyptus hybrid	346	492	2432	0	0	2924	2.33	0.59		
20	Eucalyptus species	348	883	11739	0	872	13494	10.74	2.73		
21	Ficus species	395	18	32	0	0	50	0.04	0.01		
22	Gmelina arborea	420	0	25	82	0	107	0.09	0.02		
23	Holoptalea integrifolia	456	30	0	0	0	30	0.02	0.01		
24	Lagerstoemea spaciola	506	0	237	0	0	237	0.19	0.05		
25	Lannea coromondalica	509	0	1045	61	0	1106	0.88	0.22		
26	Leucaena leucocephala	A 30	0	948	0	0	948	0.75	0.19		
27	Lichi chinensis	A 14	0	43	0	0	43	0.03	0.01		
28	Machilus species	559	0	0	12	0	12	0.01	0		
29	Madhuca latifolia	561	72	0	0	0	72	0.06	0.01		
30	Mangifera indica	569	108	13101	26	2014	15249	12.14	3.08		
31	Melia azadirachta	583	0	31	64	0	95	0.08	0.02		
32	Michelia champaca	595	0	0	84	0	84	0.07	0.02		
33	Ostodes paniculata	652	0	0	30	0	30	0.02	0.01		
34	Phoenix sylvestris	676	0	2556	0	0	2556	2.03	0.52		
35	Pongomea pinnata	701	87	0	0	0	87	0.07	0.02		
36	Pridian guava	A 07	20	124	11	0	155	0.12	0.03		
37	Schima wallichii	794	0	0	460	0	460	0.37	0.09		
38	Shorea robusta	802	113	31	0	0	144	0.11	0.03		
39	Spondios pinnata	812	35	22	0	0	57	0.05	0.01		
40	Syzygium cumini	843	0	173	0	0	173	0.14	0.03		
41	Tectona grandis	858	0	2	0	3	5	0	0		
42	Terminalia arjuna	860	631	137	0	0	768	0.61	0.16		
43	Zizyphus species	930	469	24	0	0	493	0.39	0.1		
44	Rest of species	944	4711	16631	2502	10545	34389	27.38	6.95		
Grand Total			18849	76930	7162	22693	125634	100	25.41		
Percentage			15	61.23	5.7	18.06	100				
Estimated trees/ha *			20.42	26.74	8.89	67.13	25.41				

* No. of trees per ha. in Agroecological zone = Total no. of enumerated trees in the respective zone/ Total area of the same zone.

Note:

SHCN - Semi Humid Chhota Nagpu
HAPB- Humid Alluvial Plain Bengal
HEH- Humid Eastern Himalaya
ECP - Eastern Coastal Plain

Table 5 : Distribution of stems by Species & Districts In 25 villages of West Bengal.

Area 4944.2 1 ha

All Diameter Classes and All Categories combined

SI No.	Name of Species	Spp. Code	Name of the District											Total	% trees/ha	Est. trees/ha	
			Ban- kura	Midna- pore	Burd- wan	Puru- lla	Bir- bhum	Murshi- dabad	Howrah	24 Pgs	Darjee- ling	Jalpai- guri	Maldah				West Dinajpur
1	1	2	3	4	5	6	7	8	9	10	11	12	13				
1	Acacia arabica	5	144	1802	583	25	819	839	287	3921	0	0	0	13	8433	6.71	1.71
2	Acacia auriculiformis	A06	160	5641	2211	2563	1494	10	14	0	0	3	270	234	12600	10.03	2.55
3	Ailanthus altissima	39	0	0	0	0	0	0	0	0	108	0	0	0	108	0.09	0.02
4	Albizia species	51	0	821	386	0	189	54	0	857	38	1592	0	0	3937	3.13	0.8
5	Alnus nepalensis	53	0	0	0	0	0	0	0	0	321	0	0	0	321	0.26	0.06
6	Artocarpus species	94	0	293	0	0	0	401	0	0	79	78	0	309	1160	0.92	0.23
7	Azatea indica	103	166	1836	0	459	135	0	0	0	0	0	398	0	2994	2.38	0.61
8	Betula alnoides	126	0	0	0	0	0	0	0	0	58	0	0	0	58	0.05	0.01
9	Bombax coiba	131	0	0	0	20	0	0	0	0	0	0	0	49	69	0.05	0.01
10	Borassus flabellifer	132	537	767	1646	0	143	155	1120	1760	0	0	218	0	6346	5.05	1.28
11	Butea monosperma	146	1337	0	0	3014	0	0	0	0	0	0	0	0	4351	3.46	0.88
12	Cassia species	189	0	0	159	0	0	0	0	0	0	683	0	0	842	0.67	0.17
13	Casurina equisetifolia	195	0	0	0	0	0	0	0	424	0	0	0	0	424	0.34	0.09
14	Cocos nucifera	A10	0	4744	0	0	0	0	148	1587	0	0	0	0	6479	5.16	1.31
15	Crataeva uniojcularis	246	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0
16	Cryptomeria japonica	256	0	0	0	0	0	0	0	0	869	0	0	0	869	0.69	0.18
17	Dalbergia sissoo	268	0	0	747	0	1224	0	0	0	0	1	372	302	2646	2.11	0.54
18	Enterolobium saman	329	0	0	0	0	0	0	224	0	0	0	0	0	224	0.18	0.05
19	Eucalyptus hybrid	346	1935	0	95	0	709	6	0	9	0	0	170	0	2924	2.33	0.59
20	Eucalyptus species	348	0	12433	0	660	0	0	0	401	0	0	0	0	13494	10.74	2.73
21	Ficus species	385	0	0	0	0	31	0	0	0	0	0	0	19	50	0.04	0.01
22	Gmelina arborea	420	0	0	0	0	25	0	0	0	0	82	0	0	107	0.09	0.02
23	Holoptelea integrifolia	456	30	0	0	0	0	0	0	0	0	0	0	0	30	0.02	0.01
24	Lagorstoemea spaciola	506	0	0	0	0	0	0	0	0	0	0	237	0	237	0.19	0.05
25	Lannea coromondalica	509	0	0	0	0	25	609	407	0	0	61	4	0	1106	0.88	0.22
26	Leucaena leucocephala	A30	0	0	0	0	0	61	0	887	0	0	0	0	948	0.75	0.19
27	Lichi chinensis	A14	0	0	0	0	0	43	0	0	0	0	0	0	43	0.03	0.01
28	Machilus species	559	0	0	0	0	0	0	0	0	12	0	0	0	12	0.01	0
29	Madhuca latifolia	561	0	0	0	72	0	0	0	0	0	0	0	0	72	0.06	0.01
30	Mangifera indica	569	141	2252	440	0	0	666	155	968	0	26	10452	149	15249	12.14	3.08
31	Melia azadirachta	583	0	0	0	0	0	0	0	0	0	64	0	31	95	0.08	0.02
32	Michelia champaca	595	0	0	0	0	0	0	0	0	84	0	0	0	84	0.07	0.02
33	Ostodes paniculata	652	0	0	0	0	0	0	0	0	30	0	0	0	30	0.02	0.01
34	Phoenix sylvestris	676	0	0	0	0	0	0	0	2556	0	0	0	0	2556	2.03	0.52
35	Pongomea pinnata	701	0	0	0	87	0	0	0	0	0	0	0	0	87	0.07	0.02
36	Pridian guava	A07	0	0	121	0	0	0	0	0	0	11	0	23	155	0.12	0.03
37	Schima wallichii	794	0	0	0	0	0	0	0	0	460	0	0	0	460	0.37	0.09
38	Shorea robusta	802	87	57	0	0	0	0	0	0	0	0	0	0	144	0.11	0.03
39	Spondios pinnata	812	0	0	0	0	57	0	0	0	0	0	0	0	57	0.05	0.01
40	Syzygium cumini	843	0	0	0	0	0	21	0	137	0	0	0	15	173	0.14	0.03
41	Tectona grandis	858	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0
42	Terminalia arjuna	860	244	0	0	463	0	0	0	61	0	0	0	0	768	0.61	0.16
43	Zizyphus species	930	241	0	0	252	0	0	0	0	0	0	0	0	493	0.39	0.1
44	Rest of species	944	1545	12380	3810	1146	943	3121	705	4966	1358	1144	2780	491	34389	27.38	6.95
	Grand Total		6567	43031	10198	8761	5794	5986	3060	18539	3417	3745	14901	1635	125634	100	25.41
	Percentage		5.23	34.25	8.12	6.97	4.61	4.76	2.44	14.76	2.72	2.98	11.86	1.3	100		

TABLE NO. = 6

Abstract showing the villages surveyed in different districts with population, area, ecological zone and number of trees enumerated.

District	Police Station	Name of the Village	J.L.No.	Population 1981	Code of Region	No. of House holds.	Area of the village(ha.)	Forest area of the vill.	Non forest area in ha.	No. of trees enumerated
Sankura	Sonamukhi	Bhula	72	332	15	75	856.87	570.61	286.26	3216
	Eorjora	Miyanandapur	199	644	12	95	157.67	40.47	117.2	1305
	Khaira	Maily Bandin	101	222	12	33	230.63	151.76	78.87	2046
Midnapur	Saiboni	Araban	333	55	15	13	193.69		193.69	8399
	Ramnagar	Salitapur	196	2877	18	435	338.02		338.02	22693
	Jnargram	Phulberia	397	32	12	5	21.68	4.05	17.63	226
Euroyan	Keshpur	Indkuri	62	155	15	31	111.82	91.46	20.36	8567
	Keshpur	Lepsa	377	616	15	117	296.57	46.54	250.03	3146
	Margaikato	Jogeshwardini	111	3211	15	531	606.67		606.67	8312
Purulia	Sabanpur	Maneshpur	24	593	12	131	168.51	2.02	166.49	1895
	Flura	Khulabahal	47	388	12	159	371.03		371.03	8761
	Sun	Kamalpur	4	652	12	152	172		172	4652
Sirbhum	Rampurhat	Narayānbali	3	201	15	450	59.53		59.53	1169
	Domkal	Domkal	42	1552	15	290	263.54		263.54	5934
	Amla	Khajurdaha	97	904	15	144	66.47		66.47	3059
Murshidabad	Ehangar	Phulbari-Bamuria	98	549	15	87	53.82		53.82	3496
	Joynagar	Dhōsa	81	135	15	222	233.5		233.5	9914
	Baruipur	Kamra	28	1619	15	247	64.75		64.75	5157
Darjeeling	Rangliol	Takdah	18	2352	16	433	411	8	403	1442
	Kalimpong	Bakhim forest	39	444	16	72	369	313.65	55.35	51
	Garubathan	Samsing khasmahal	35	1672	16	317	553	444	109	1924
Jalpaiguri	Mitali	Baradighi	23	330	16	71	238		238	3745
	Maldah	English Bazar	88	1809	15	285	527		527	14901
	West Dinajpur	Raniganj	8	938	15	147	194		194	977
Balurghat	Balurghat	Damai	20	92	15	18	58		58	658

Table No. 7

Botanical name and Local name of the species used in the report.

Sl.No.	Name of the species	Spp.	
		Code	Local Name
1	2	3	4
1	<i>Acacia arabica</i>	5	Bable, Babul
2	<i>Acacia auriculiformis</i>	A06	Akasmani
3	<i>Ailanthus excelsa</i>	40	Gokul
4	<i>Albizzia species</i>	51	Siris
5	<i>Alnus nepalensis</i>	53	Utis
6	<i>Artocarpus species</i>	94	Kathal
7	<i>Azadirachta indica</i>	103	Neem
8	<i>Betula alnoides</i>	126	
9	<i>Bombax ceiba</i>	131	Sumul
10	<i>Borassus flabellifer</i>	132	Tal
11	<i>Butea monosperma</i>	146	Palash
12	<i>Cassia species</i>	189	Minjri, Sonari, Amaltha
13	<i>Casurina equisetifolia</i>	195	Jhau
14	<i>Cocos nucifera</i>	A10	Narket Narial
15	<i>Crataeva unilouulars</i>	246	Barun
16	<i>Cryptomeria japonica</i>	256	Dhupi
17	<i>Dalbargia sissoo</i>	268	Sisoo
18	<i>Enterolonbium saman</i>	329	Raintree
19	<i>Eucalyptus hybrid</i>	346	Eucalyptus, Nilgri
20	<i>Eucalyptus species</i>	348	Eucalyptus, Nilgri
21	<i>Ficus species</i>	385	Dumur, Bat, Aswatha
22	<i>Gmelina arborea</i>	420	Gamar
23	<i>Holoptalea integrifolia</i>	456	Salla
24	<i>Lagerstoemea spaciola</i>	506	Jarul, Ajhar
25	<i>Lannea coromondalica</i>	509	Jia, Doka
26	<i>Leucaena leucocephata</i>	A30	Subabul
27	<i>Lichi chinensis</i>	A14	Lichu, Lichi
28	<i>Machilus species</i>	559	Kawala
29	<i>Madhuca latifolia</i>	561	Mahua
30	<i>Mangifera indica</i>	569	Am
31	<i>Melia azadirachta</i>	583	Ghora Neem
32	<i>Machelia champaca</i>	595	Champ
33	<i>Ostodes paniculata</i>	652	Bepari
34	<i>Phoenix sylvestris</i>	676	Khajur
35	<i>Pongomea pinnata</i>	701	Karanj
36	<i>Psidium guava</i>	A07	Piara, Amruth
37	<i>Schima wallichii</i>	794	Chalauni
38	<i>Shorea robusta</i>	802	Salla
39	<i>Spondios pinnata</i>	812	Amra
40	<i>Syzygium cumini</i>	843	Jam, Jamun
41	<i>Tectona grandis</i>	858	Segun, Sagwan
42	<i>Terminalia arjuna</i>	860	Arjun
43	<i>Zizyphus species</i>	930	KUL, Ber
44	Rest of species	944	Others

Table No.8
Data used for sample size determination

District	Village	Non-forest area (ha.)	Trees above 10 cm. dia.	Stem/ha.(above 10 cm.dia.)
Bankura	Nityanandapur	117.20	1305	11.13
	Maity Bandh	78.87	2046	25.94
	Bhula	286.26	1728	6.04
Darjeeling	Takdah	403.00	1442	3.58
	Samsing Khasmahal	109.00	1924	17.65
	Bakhim forest	55.35	51	0.92
Howrah	Khajurdaha	66.47	3054	45.94
Murshidabad	Domkal	263.54	5917	22.45
24 Prgs.(South)	Kamra	64.75	5157	79.64
	Dosa	233.50	6835	29.27
	Phulbaria Bamunia	53.82	3448	64.06
Malda	Uttar Jadupur	527.00	14901	28.27
D.Dinajpur	Damai	58.00	658	11.34
U.Dinajpur	Mallikpur	194.00	977	5.04
Jalpaiguri	Baradighi	238.00	3745	15.73
Midnapur	Satilapur	338.02	21577	63.83
	Phulbaria	17.63	226	12.82
	Arabari	193.69	2657	13.71
	Lepsa	250.03	2403	9.61
	Indkuri	20.36	840	41.25
Birbhum	Kamalpur	172.00	3607	20.97
Burdwan	Jageswardih	606.67	5783	9.53
	Maheshpur	166.49	1886	11.32
Purulia	Khulabahal	371.03	5905	15.91
Birbhum	Narayanbati	59.53	761	12.78
		4944.21	98833	578.73

NO. of sample villages
n = 25

$$\sum X = 578.73 \quad s^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{n}}$$

$$\bar{X} = 23.1492$$

$$\sum X^2 = 23572.14$$

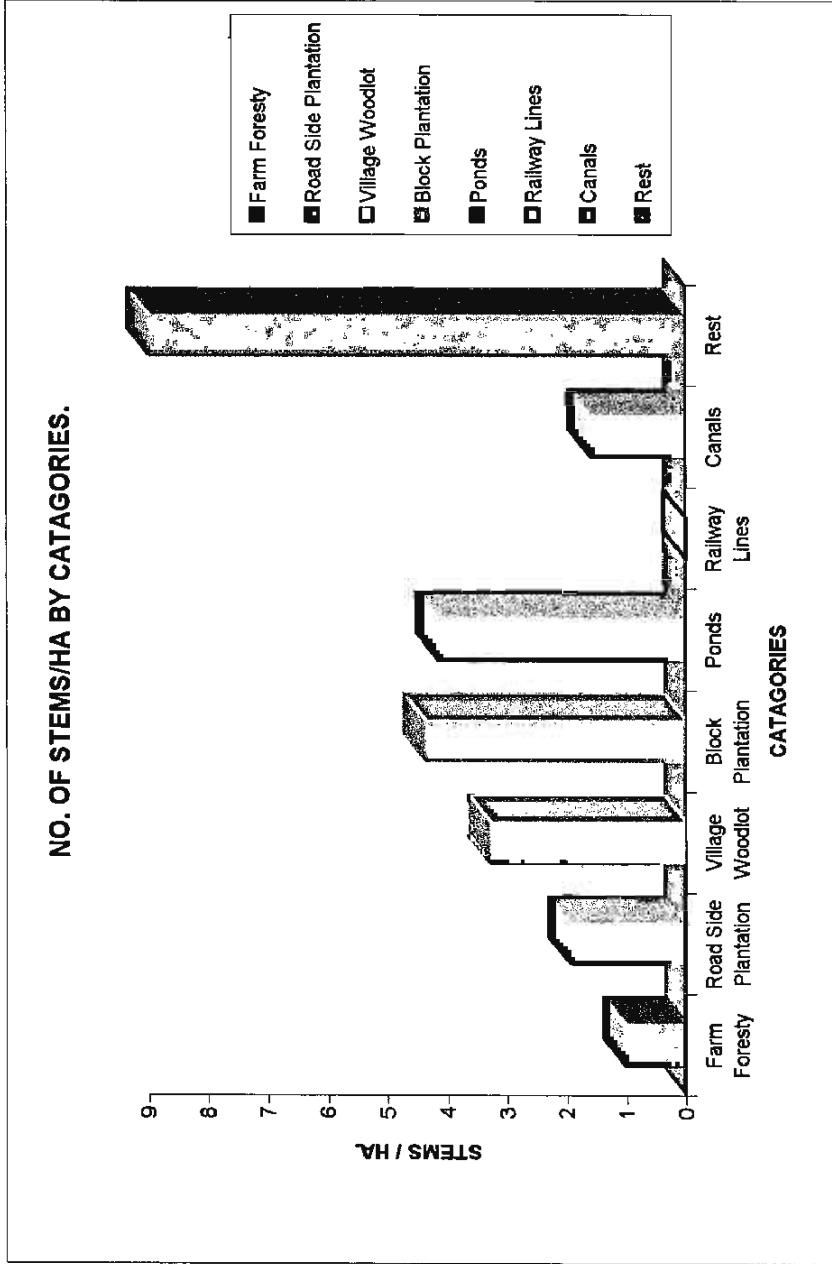
$$= 407.00$$

NO. of villages to be surveyed

$$s = 20.17$$

$$= \left\{ \frac{(1.96)(87.13)}{10} \right\}^2 = 291.64$$

$$C.V. = \frac{s}{\bar{X}} \times 100 = 87.13$$



PERCENTAGE OF NON FOREST AREA BY DISTRICTS.

- JALPAIGURI
- ▨ COOCHBIHAR
- DARJEELING
- DINAJPUR(N&S)
- MALDA
- MURSHIDABAD
- NADIA
- 24-PARGANAS(N&S)
- CALCUTTA
- HOWRAH
- HOOGLY
- MIDNAPUR
- BANKURA
- PURULIA
- BURDWAN
- BIRBHUM

