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Forest Survey of India  
25 Subhash Road, Dehra Dun



**GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT  
AND FORESTS**

(Department of Forests and Wildlife)

REPORT ✓  
ON  
FOREST RESOURCES OF  
SANTHAL PARGANAS AND PART OF BHAGALPUR  
(Santal) (Bhagalpur)  
DISTRICTS OF BIHAR

**FOREST SURVEY OF INDIA  
EASTERN ZONE  
1985.**

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MINISTRY OF ENVIRONMENT AND FORESTS  
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EASTERN ZONE

1985

# CONTENTS

<u>CHAPTER : I : BACKGROUND INFORMATION</u>	<u>Para</u>	<u>Page</u>
Need for survey	1	1
Name of districts covered by the report	1 1	1
Situation and boundaries	1 2	1
Location	1 3	1
Administrative units and areas	1 4	2
Geographical area by District and Forest Division	1 4 1	2
Forest area by District and Forest Division	1 4 2	2
Locality factor	2	2
Climate	2 1	2
Temperature	2 1.1	2
Rainfall	2 1 2	3
Relative humidity	2 1 3	4
Topography	2 2	4
Altitude mountain ranges and aspect	2 2 1	4
Slope (River system)	2 2 2	5
Drainage	2 2 3	5
Geology, rock and soil	2 3	6
General description of rock system and soils	2 3 1	6
Mineral resources of Santhal Parganas	2 3 2	7
Land use pattern and assessment of condition of land erosion status.	3	8
People and their socio-economic condition	4	8
Forests	5	11
Classification by types and composition	5 1	11
Legal status	5 2	13
Demarcation and forest settlement	5 3	13
Rights and privileges	5 4	13
Management practices of forests	5 5	14
Area covered under Working Plan	5 5 1	14
Short details of management	5 5 2	14
Past system	5 5 2 1	14
Present system of management	5 5 2.2	15
Exploitation	5 5 3	17
Disposal through right holders and concessionists	5.5 3 1	17
Disposal through lessees	5 5 3 2	18
Disposal through Departmental Agency	5 5 3 3	18
Forest Resources Information	6	19
Dumka Division	6 1	20
Deoghar Division within Santhal Parganas District	6 2	20
Deoghar Division in Bhagalpur District	6 3	21

	<u>Para</u>	<u>Page</u>
<u>CHAPTER:II: INVESTIGATION &amp; METHODOLOGY</u>		
Objectives including precision	2.1	22
Aerial reconnaissance	2.2	22
Photointerpretation and mapping	2.3	22
Inventory Design:	2.4	23
Pilot survey	2.4.1	23
Sampling Design	2.4.2	24
Field work	2.5	24
Instructions for field work	2.5.1	24
<u>CHAPTER:III: DATA ANALYSIS</u>		
General	3.1	25
Manual processing	3.2	25
Processing on unit record machines	3.3	25
Processing on the Electronic Computer	3.4	25
Calculation of area	3.5	26
Tree volume study	3.6	27
Volume studies	3.7	27
<u>General volume equation</u>	3.7.1	27
<u>Local volume equation</u>	3.7.2	28
Volume of trees enumerated	3.7.3	28
Plot volume	3.7.4	28
Volume per hectare by forest type	3.7.5	28
Stem tables	3.8	29
Dumka Division	3.8.1	30
Deoghar Division in Santhal Parganas Distt.	3.8.2	31
Deoghar Division in Bhagalpur District	3.8.3	32
Dumka Division	3.9.1	33
Deoghar in Santhal Parganas District(Sal Stratum)	3.9.2	35
Deoghar in Bhagalpur District	3.9.3	36
Local volume tables	3.10	37
Estimation of total growing stock	3.11	39
Total volume	3.12	39
Estimation of error	3.13	40
<u>CHAPTER:IV: GROWING STOCK AND YIELD</u>		
Area under present management	4.1	41
Area considered exploitable under present survey	4.2	41
Deoghar Forest Division	4.2.1	43
Dumka Forest Division(including Sahebganj Forest Division)	4.2.2	43
Estimation of yield from different Divisions.	4.3	44
Yield according to utility classes	4.4	44

	<u>Para</u>	<u>Page</u>
<u>CHAPTER:V: LOGGING AND</u> <u>ACCESSIBILITY STUDIES</u>		
Objectives	5.1	46
Extraction routes	5.2	46
Existing logging practices	5.3	48
Terrain classification	5.4	49
Proposed logging practices including road planning	5.5	49
<u>CHAPTER:VI: CONSUMPTION STUDIES</u>		
Objectives	6.1	50
Consumption by large industries	6.2	50
Consumption of small industries	6.3	50
Household consumption	6.4	51
Fuelwood consumption	6.5	52
Demand according to utility classes	6.6	54
Wood balance	6.7	55
Consumption of bamboo	6.8	55
Conclusion	6.9	56
<u>CHAPTER:VII : ECOLOGICAL CHANGES</u> <u>AND STATUS OF FLORA</u> <u>AND FAUNA</u>		57
<u>CHAPTER:VIII: PHOTOINTERPRETATION</u> <u>AND REMOTE SENSING</u> <u>STUDIES.</u>		61
<u>CHAPTER:IX : PLANTATION ACTIVITIES</u> <u>IN FORESTS WITH</u> <u>SPECIAL REFERENCE TO</u> <u>SOCIAL FORESTRY.</u>		62
<u>CHAPTER: X : CONCLUSIONS AND</u> <u>RECOMMENDATIONS</u>		
Main results and conclusions	10.1	64
Variation from past study	10.2	65
Final recommendations and proposals	10.3	66
<u>B I B L I O G R A P H Y :</u>		67



# LIST OF TABLES

<u>Table No.</u>	<u>P a r t i c u l a r s</u>	<u>Division</u>	<u>Stratum</u>	<u>Page No.</u>
1.1.1	Stems/ha. by species and dia. class (in cm)	Dumka	Sal	68
1.1.2	-do-	Dumka	Misc.	70
1.2.1	-do-	Deoghar	Sal	73
1.2.2	-do-	-do-	Misc.	74
1.3.1	-do-	Deoghar in Bhagalpur Dist.	Sal	75
1.3.2	-do-	-do-	Misc.	76
2.1.1	Total stems (in '000 Unit)	Dumka	Sal	77
2.1.2	-do-	Dumka	Misc.	79
2.2.1	-do-	Deoghar in Santhal Pgs. Dist.	Sal	82
2.2.2	-do-	-do-	Misc.	83
2.3.1	-do-	Deoghar Div. in Bhagalpur Dist.	Sal	84
2.3.2	-do-	-do-	Misc.	85
3.1.1	Volume/ha. by species and dia. class	Dumka	Sal	86
3.1.2	-do-	Dumka	Misc.	88
3.2.1	-do-	Deoghar in S. Pgs. Distt.	Sal	91
3.2.2	-do-	-do-	Misc.	92
3.3.1	-do-	Deoghar in Bhagalpur Dist.	Sal	93
3.3.2	-do-	-do-	Misc.	94
4.1.1	Total volume ('000m <sup>3</sup> ) by species and dia. class (cm.)	Dumka	Sal	95
4.1.2	-do-	Dumka	Misc.	97
4.2.1	-do-	Deoghar in Santhal Pgs. Distt.	Sal	100
4.2.2	-do-	-do-	Misc.	100
4.3.1	-do-	Deoghar in Bhagalpur Distt.	Sal	101
4.3.2	-do-	-do-	Misc.	101.

## MAPS AND DIAGRAMS

- (1) Map of India showing the project area in Santhal Parganas District (Bihar).
- (2) Inventory Design.
- (3) Map of Santhal Parganas showing roads rivers.
- (4) Map showing forest areas of Santhal Parganas and part of Bhagalpur District.

## P R E F A C E

The inventory work for assessing the forest resources of Santhal Parganas and part of Bhagalpur District was taken up as a part of the programme of Eastern Zone of the Forest Survey of India for the year 1981-82. ✓

The field work for the inventory was carried out during the period October, 1981 to January, 1982 under the guidance and overall supervision of Shri A.B. Chaudhuri, Joint Director, Eastern Zone. The field work was supervised by Shri K.K. Singh, Deputy Director, Shri B.M. Dev, Asstt. Director and Shri J.N. Bhattacharyya, Assistant Director.

This inventory was carried out under the new methodology and design of the Forest Survey Of India upgraded by conversion of Preinvestment Survey Of Forest Resources in June, 1981. Due to its infancy and other limitations, specially with respect to the shortage of Officers and field staff, all the objectives of the new organisation could not be achieved. The inventory work was confined to forest areas only and detailed study on demand and consumption, logging and accessibility, photo-interpretation and remote sensing, and volume and cull etc. could not be made.

The data collected in the field were processed electronically at the Regional Computer Centre, Jadavpur. The processing of the data and its statistical analysis have been done under the supervision of Shri S.K. Sen, Assistant Director. The report has been compiled by Shri K.K. Singh, Deputy Director in the new draft format of the organisation. The report was scrutinised and modified, where necessary, by Shri S.C. Dey, Joint Director.

The results of the inventory have shown that the status of forests of the area is not encouraging. Large sized trees are very few in number and the general stocking is poor. The forests are unable to meet the huge demand of forest products of the local people, specially with respect to firewood supply. Biotic retrogression has set in over vast areas of forest and the crop require rest and rehabilitation.

Field staff of the Eastern Zone of Forest Survey Of India did hard work in completion of the inventory work of the area in time. The statistical section of the zone kept constant touch with the Regional Computer Centre at Calcutta to get the data processed within reasonable period and the Stenographer section of the zone did good work in typing out the report as quickly and correctly as possible. The hard work put in by all of them is acknowledged. Cooperation extended by Forest Department and other Civil authorities of Government Of Bihar during the course of field inventory is also thankfully acknowledged.

Sd/- ( D.B. Misra )  
DIRECTOR.



# C H A P T E R - I

## BACKGROUND INFORMATION

### 1. Need for survey:

The district of Santhal Parganas and the adjoining areas of Bhagalpur District falling under Banka Sub-division were very rich in forest wealth in the past. These forests started vanishing rapidly over the past 2 or 3 decades due to various reasons among which the increase in population and increase in demand for forest produce have been prominent. A general look at the vegetation of the district will reveal that large areas of forests have become denuded resulting into 'ankle deep' and 'knee deep' forests. Large sized trees which are reminiscent of the past glory of the rich forest wealth of the area occur only in some limited patches of Dumka Forest Division and in very stray manner in certain protected places in Deoghar Forest Division. Such rapid recession of forest has been a cause for concern and this inventory has been undertaken to assess the quantity of forest resources existing in the area. The inventory has also been carried out to fulfil the objectives to monitor on a 10 year cycle the changing situation of land and forest resources and to serve the data needs of development planning.

#### 1.1 Name of districts covered by the report:

The report covers the entire district of Santhal Parganas and southern part of Bhagalpur District.

#### 1.2 Situation and Boundaries:

The project area consists of the forests lying within the district of Santhal Parganas and Banka Sub-division of Bhagalpur District. It contains the forest divisions of Dumka, Sahebganj and Deoghar. Sahebganj division has been in existence for the past two years only. The forests lie between 23°45' to 25°0' north latitude and 86°28' to 87°57' east longitude. Two ranges of Deoghar Division fall within Banka Sub-division ;the balance of the forest area dealt in this report fall within Santhal Parganas District.

#### 1.3 L o c a t i o n :

The district of Santhal Parganas is situated in the east of Bihar State and forms the south eastern part of Bhagalpur Civil Division. The Banka Sub-division adjoins the district of Santhal Parganas along its north western boundary.

#### 1.4 Administrative units and areas:

The forests in the report under consideration falls under three administrative divisions-; Dumka Division with Headquarters at Dumka, Deoghar Division with Headquarters at Deoghar and Sahebganj Division with Headquarters at Sahebganj. As already stated in para 1.2, Sahebganj Division has been in existence for past two years only. The forest of Dumka Division are put under five territorial ranges and those of Deoghar Division are put under four territorial ranges each under the charge of one Forest Range Officer. Sahebganj Division has only 3 (three) ranges.

##### 1.4.1 Geographical area by District & Forest Division:

The geographical area of Santhal Parganas District is 14,129 sq.km. and that of Bhagalpur District is 5,656 sq.km. The area of Banka Sub-division of Bhagalpur district within which falls two forest ranges of Deoghar Division is 3021 sq.km. The gross geographical area of Dumka Forest Division is 7520 sq.km. and that of Deoghar Forest Division is 7420 sq.km. The gross geographical area of Sahebganj Forest Division is only 2180 sq.km.

14129  
5656  
19785

##### 1.4.2 Forest area by District and Forest Division:

The total forest area in the district of Santhal Parganas is 1924 sq.km. and that in Bhagalpur District is 454 sq.km. The forest area of Dumka Forest Division is 1,430 sq.km. and that of Deoghar Forest Division is 768 sq.km. The forest area under Sahebganj Forest Division is only 180 sq.km.

1924  
454  
2378 km

#### 2. Locality factor :

##### 2.1 C l i m a t e :

The project area shows three distinct seasons viz. hot, monsoon and cold. The hot season generally lasts from March to May. The Monsoon begins from early June and lasts till September. The North-east Monsoon brings with it the Hathia rains during October which is very beneficial to agricultural crops. The cold season generally continues from the mid of November to February.

##### 2.1.1 Temperature :

The temperature of the terrain is extreme where highest maximum temperature rises upto 45°C. and lowest minimum temperature comes down to 4°C. Mean annual temperature is 26°C.

2.1.2 Rainfall:

The average annual rainfall in Santhal Parganas District is 1377 mm. and in Bhagalpur District is 1166 mm. The monthly rainfall in Santhal Parganas and Bhagalpur District between the period June 1975 to May 1977 is given in the table below to show the variation pattern of rainfall from month to month and from year to year.

STATEMENT SHOWING THE MONTHLY AVERAGE RAINFALL IN MM.

<u>Month</u>	<u>Santhal Parganas</u>	<u>Bhagalpur</u>
June, 1975	132.1	103.1
July, 1975	470.5	327.2
August, 1975	180.4	126.6
September, 1975	236.0	169.0
South west monsoon	1019.0	725.9
October, 1975	85.8	54.9
November, 1975	0.0	0.0
December, 1975	0.0	0.0
North west monsoon	85.8	54.9
January, 1976	0.0	0.3
February, 1976	19.3	12.5
Winter rains	19.3	12.8
March, 1976	0.4	0.0
April, 1976	11.6	0.0
May, 1976	117.2	77.4
Hot weather rains	129.2	77.4
Total for 1975-76	1253.3	871.0
June, 1976	107.0	77.8
July, 1976	224.6	129.5
August, 1976	272.4	224.5
September, 1976	241.6	228.9
South west monsoon	845.6	660.7
October, 1976	22.3	15.3
November, 1976	5.9	9.2
December, 1976	0.0	5.1
North west monsoon	28.2	29.5
January, 1977	5.6	8.3
February, 1977	10.6	1.1
Winter rains	16.2	9.4
March, 1977	0.5	0.3
April, 1977	45.7	25.4
May, 1977	130.3	72.2
Hot weather rains	176.5	97.9
Total for 1976-77	1066.5	797.6

### 2.1.3 Relative humidity:

Detailed data for relative humidity was not readily available. However, statistical record of Bihar State indicate annual humidity percentage in Dumka at morning (8.30 A.M.) as 59% and in the afternoon (5.30 P.M.) as 50%. This is indicative of basically dry condition of the district and lesser fluctuation of humidity from morning hours to afternoon hours.

## 2.2 Topography :

The district of Santhal Parganas is an upland tract which consists of hilly terrain in central and northern areas and rolling country over most of the balance areas. Plain land is restricted to small pockets in the valleys along the rivers and adjoining areas of West Bengal. The district of Bhagalpur has got both alluvial plains and hilly terrain consisting of small hillocks.

### 2.2.1 Altitude, mountain ranges and aspect:

The hilly tract consists mainly of the ranges of Rajmahal hills which rise abruptly from the plains forming almost a wall of 300 m to 600 m high abutting into the Gangetic valley. It stretches from Sahebganj on the Ganga to Nangal bazar on the Rampurhat road. This range consists of a succession of hills, plateaus, valleys and ravines, the general elevation of which varies from 150 m to 240 m. The high points in this range are Mahyagarh and Sudgosa with elevation of 505 m. to 600 m. Near Berhait lies the central valley of this range. In the interior of this range lies hills, which crowd upon one another with steep and narrow ravines, sharp ridges and small plateaus. In the southern and south eastern part lie broad table lands and the balance area consist of peaks and ridges containing valleys with gentle slope, which gives scope for cultivation.

Another small range of hills known as the Rangarh hills with more rounded and undulating contour occupy an area south of Brahmani river; its highest peak Karakati is prominent.

In the west two parallel ranges the Satgarh group and Sapchla hills contain isolated hillocks. Here and there lie a number of detached hills which rise abruptly in cone shaped contour. Longwas, Makna, Pherljon, Degafia, Pathad and Trikut Pahar are a few hills which deserve mention.

The whole of the western and the south western part of the district appear as a rolling country with long ridges and undulating uplands containing depressions which are rocky and in places covered with scrub jungle. This covers approximately half of the area of the district. The balance area is low land (Tappan Mahihar) forming a narrow and practically continuous strip of alluvial soil about 120 miles long with an area of 500 square miles. This is situated between the hills and the Ganges, skirting the loop line of the eastern Railway in the Rajmahal and Pakur Sub-divisions.

The greater part of the Banka Sub-division consists of alluvial plain and the balance is hilly. The important hills are Mandar, Jesthaur and Jharma. A long chain of hills extend from Jesthaur hill to Chandan from where Chandan river flows. The hills are low and irregularly scattered.

Due to scattered nature of hills all type of aspects occur in the area, but prevalent aspect is South Eastern.

#### 2.2.2 Slope(River system):

The general slope of the country is from the North west to the South east which includes the valley of the Barakar in the western half of the district. South eastern portion of the district is drained by Ajoy and Mor.

#### 2.2.3 D r a i n a g e :

An important river of the district is Gumani which along with Mor drains the Northern part into the Ganges. River Bansloi which rises from Banspahari in the Godda Sub-divisions passes through the northern boundary of Dumka Sub-divisions. This is an important river of the central district.

River Brahmani along with its tributaries Gumro and Ero drains the watershed between the Ramgarh and Damien hills. River Ajoy with its main tributary Pathro coming from the west and Jainti initially drains the north west corner of the Deogarh sub-divisions and thereafter passes through its centre before merging with Bhagirathi.

River Mor drains the central portion of the district beginning initially from the north east corner of the Deogarh sub-divisions. Its important tributaries are Bhubhum, Dhoba, Tipra, Pusaro, Bhamni, Nunbil. A dam has been constructed at Masanjhor in this river.

The important rivers in the Banka Sub-divisions are Chandan, Barua, Katoria-Orhani and Cheer. They all originate from the hills. River Chandan, which is the most important river, originates from Chandan hill, enters Banka from south west and flowing north wards meets the Ganges at Bhagalpur. Barua river originates near Jhajha in Monghyr District and it passes through Banka to meet the Ganges.

All the above rivers are hill streams possessing well defined channels and high banks which swell and become rapid torrents during monsoon and almost dry and gentle streams during the hot season. The Ganges touches the district of Santhal Parganas a few miles of Teligal.

### 2.3 Geology, rock and soil:

#### 2.3.1 General description of rock system and soils:

An ancient crystalline rock called the Archean gneiss cover the greater part of the district in the western and south western parts. It stretches from a few kilometers north of Godda to about 30 kilometres south of Dumka. Towards the east these crystalline rocks are covered with thick flows of volcanic lava which forms the Rajmahal hills that stretches approximately 150 kilometres from near Sakrigali Railway Station southwards along the border of Birbhum District. A narrow strip of lower gondwana rocks skirt the lower formation along its western margin.

The ancient crystalline rocks are collectively called the Archean Gneisses the principal rock of which is granitoid gneiss. It contains inclusions of older dark hornblendic and pyroxenic rock with granolitic structures. It alternates with hornblendic and micaceous schists and contain feldspars of salmon white colour.

Charnockitic rocks have been noticed on the Satgarh hills on the western side of the Mor river which appears to have resulted from the charnockitization of the preexisting rocks by formation of hyperthene, blue quartz and microperthitic feldspar.

The narrow strip of Gondwanas stretches for approximately 140 kms. northwards from Suri in Bengal along the meridian 87°30'. The basal member of the lower Gondwana system is represented in some areas of the Gondwana rocks as Talcher stage. It contains greenish shales and sand stones with local development of boulder bed.

The Barakar consisting of friable feldspathic grits and soft white shales show isolated and exposed patches in coalfields yielding inferior quality of coal. China clay is also found in Rajmahal hills.



The Dubrajpur series comprising of a series of coarse sandstone grits and conglomerates over lay the lower Gondwana. The rocks are generally coarse grained but occasional shale and stones are also found. The coarse members are ferruginous and the common conglomerate consists of quality pebbles in a ferruginous matrix. The rocks are exposed along the western slopes of the Rajmahal hills and rest partly on the Archeans and partly on the Barakars which they repeatedly overlap.

The general colour of soil occurring in the district is brown. The presence of humus at majority of the places is shallow. In some places in the northern part of Dumka Division the depth of humus layer has been found to be medium. The soil consistency in the majority of the cases have been found to be slightly compact with good soil existing in small pockets in the southern most part of Dumka Division; the occurrence of friable soil being rare. The larger part of Dumka Division has sandy loam soil spread in the northern and the southern area. The loam and clay loam soil are found to occur mostly in the Central region. The depth of soil generally varies from medium to deep.

The humus layer has been noticed to be absent in areas of Deoghar Division falling within Bhagalpur District where Sal is the dominant crop with an open canopy density or where the canopy has not been formed, the crop being in regeneration stage.

### 2.3.2 Mineral resources of Santhal Parganas:

China clay Kaolin of fairly good quality is found at Mangal hat, Majkhitola, Pond dongri and Patharghatti in Santhal Parganas. Considerable deposits of fire clay which is used for the manufacture of firebricks and refractories, are found near Dukatia occurring in association with coal seams in the Gondwana rocks.

Inferior quality of coal occur in these seams in isolated patches along with the western fringe of Rajmahal hills near Hura, Ghuporbhita, Ranchward, Mahuagri and Brahmani. Non-cooking coal with relatively low ash also occur in isolated patches near Jainti Saharjuri and Kundit-Kuria in Deoghar.

Copper is associated with lead, zinc sulphide minerals occur in several localities in the district, although they have been investigated by G.S.I. and found not to be commercially viable. Ochres have also been found to occur in the clay deposits of Rajmahal hills.

3. Land use pattern and assessment of condition of land erosion status:

A general look to the area of the district indicate: fair extent of waste land lying here and there with barren and rocky hills standing in places. The extent of barren and rocky hills and undulating tract devoid of top soil occupies fairly large area of the district and are indications of long period of process of soil erosion in the form of wind erosion and sheet erosion.

A table showing land use pattern of the two districts as on 1974-75 is given below:-

Statistics showing classification of Land areas in Santhal Parganas & Bhagalpur Districts:

Categories of land	Santhal Pgs. in '000 ha.	Bhagalpur in '000 ha.
Total area as per village paper	1422	560
Forest land	144	43
Barren land	85	67
Non-agricultural land	108	52
Permanent pasture and other grazing lands.	60	3
Cultivable waste other than fallow lands.	94	15
Land under miscellaneous trees and groves.	12	3
Other fallow lands	145	22
Current fallow	184	42
Net area sown	591	314
Area sown more than once	88	102

4. People and their socio-economic condition:

The earlier inhabitants of the district were the Maler(Sauria ) with Mal Paharias and Kumarbhag who were principally Jungle people who lived by hunting and eating produce of the forests growing very little through cultivation. Later the Santhals, who were brought from Birbhum area to clear jungles and drive away wild beast, settled in the low hills and valleys of the district and started cultivations.

The population of the district is mainly agricultural and contains a high concentration of the tribal group called " Santhals ". The name Santhal Parganas derive its origin from the fact that the district is a stronghold of Santhals.

The Santhals have a considerable degree of distinctiveness and maintain their identity separately much different from the communities living around them. The social and religious functions of the Santhals living by the side of the forests are intermixed with ~~the~~ existence of forests and a number of their functions are only held in forest areas.

Though a large majority of the population of the districts depend on agriculture yet a good section of the people has also moved to the industrial belt around Jamshedpur for their livelihood. The agricultural production is much below the expected level and modern methods of cultivation though in the process of induction in the area, has not yet infiltrated in the interior villages.

Out of total population of 31,86,908 persons as per 1971 Census in the Santhal Pargana District, the Scheduled Tribe population is 11, 54, 281 and population of Scheduled Caste is 2,29,035. Out of every 1000 persons, 942 persons stay in villages and 58 persons stay in urban area. Literacy is only 15% of the total population of the district.

Density of population per sq.km. is 226. Though the local population enjoy a lot of right and privileges inside the forest areas still villagers have natural tendency of illegally removing forest produce from the forest areas and selling the same in the local huts for cash earning specially during non-harvesting season. The allurements of modern life from industrial areas near about and attraction for better living has made a section of population greedy and this has resulted into increased incidence of pilferage of forest produce as this is a very easy method of earning cash money with little effort. Nearly 25% of the population of the district lives below the poverty line and naturally this population has got a tendency to resort to various illegal actions at times of distress.

A table showing the total population of the two districts classified into livelihood classes is given below :::-----

## STATEMENT SHOWING THE TOTAL POPULATION CLASSIFIED INTO LIVELIHOOD CLASSES ACCORDING TO 1971 CENSUS

District	Area in sq.km.	Total population.	Literate and educated persons.	Total workers.	As Cultivator.	As agricultural labourers.	Livestock, Forestry, Fishing, Hunting and Plantation Orchards & allied activities.	Mining & Quarrying.
1.	2.	3.	4.	5.	6.	7.	8.	9.
Bhagalpur	5,656.0	2,091,103	449,701	6,69,553	2,41,142	3,10,550	7,606	456
Santhal Parganas.	14,129.0	3,186,908	507,693	10,41,958	6,30,212	2,64,470	16,870	2,280
District	At House-hold industry.	In manufaturing other than House-hold industry.	In construc-tion.	In Trade & commerce.	In Trans-port storage & communi-cations.	In other services.	Non-workers.	
Bhagalpur	26,287	13,365	2,306	23,038	9,393	35,410	14,21,550	
Santhal Parganas.	31,620	16,163	2,534	24,702	13,9081	39,190	21,44,950	

## 5. F o r e s t s :

### 5.1 Classification by types and composition:

The following are the main type of forests existing in the area:-

- i) Tropical Dry Peninsular Sal forests  
5B/C1 C(i)
- ii) Northern Tropical Dry Mixed Deciduous forests 5B/C2(vii)
- iii) Tropical Dry Deciduous Scrub Forests  
5B/DSI (ii)

#### Tropical Dry Peninsular Sal forests:

Sal is the dominant species and occurs in association with some dry miscellaneous species. Almost pure Sal exists on low hillocks and lower reaches of hills. The trees are mostly stunted and malformed and are in pole to mid mature stage with very few mature trees which occur in valley bottom in the interior. This forest type occurs mostly on the northern aspects of hills where the slope is moderate to steep. The crop in the valley is of better quality than on hills where it has to face adverse climatic and soil factors. In Deoghar Division Sal occurs practically pure on plains, low hillocks and lower reaches of hills.

The common associates in the top canopy are Terminalia tomentosa, Terminalia belerica, Adina cordifolia, Buchanania lanzan, Lagerstroemia parviflora etc. The undergrowth consists mainly of Zizyphus xylopyra, Wrightia tinctoria, Casuarina spp., Croton oblongifolius, Embllica officinalis, Thespesia lampas etc. Amongst the climbers Butea superba (Spatholobus roxburghii) Smilax species, Ventilago maderaspatana, Bauhinia vahlii, Millettia auriculata, Combretum decandrum and Acacia species are common.

Sal forests cover major portion of Deoghar Forest Division where even with maltreatment the forest is seen to exist as "Jhati" forest or "rooted" waste. But in Dumka Forest Division where degree of biotic interference is high, Sal has vanished altogether and is replaced by dry deciduous scrub forests or reduced to blank areas.

Northern Tropical Dry Mixed Deciduous forests with  
Bamboo in the Understorey:

This type occurs where the soil is shallow and degraded both in the hills as well as in plains. Due to adverse biotic factors this type of forest is gradually replacing Sal in the plains. In Deoghar Division miscellaneous forest of poor quality occur in higher reaches above the Sal forests. In the Dumka Division, the forest ranges from fair to poor quality.

The miscellaneous species occupying the upper storey are Anogeissus latifolia, Mitragyna parvifolia, Terminalia tomentosa, Hymenodictyon excelsum, Scheeleichera oleosa, Lagerstroemia parviflora, Pterocarpus marsupium, Diospyros melanoxylon, Aegle marmelos, Bridelia retusa, Adina cordifolia, Buchanania lanzan, Boswellia serrata, Stereospermum suaveolens, Madhuca latifolia, Acacia catechu etc. with occasional Sal.

Undergrowth consists of Holarrhena antidysenterica, Carissa spinarum, Flacourtia ramonssi, Randia dumetorum, Helicteres isora, Alangium lamarckii, Streblus asper. The climbers consists of Bauhinia vahlii, Acacia scandense, Cissampelos pareira, Combretum decandrum.

Bamboo (Dendrocalamus strictus) occurs mostly in the Old Reserve and on Trikut Pahar, Dighamia pahar, in Kasbawasia block and Ranibahal beat of Hizla Range. Good quality bamboo occurs only in Old Reserve and in other areas congestion and malformation appears to be common due to prolonged maltreatment and over-exploitation. In general bamboo is in way to extinction.

Tropical Dry Deciduous Scrub Forests:

This type represents degraded form of forests and occurs due to adverse biotic as well as edaphic factors. The trees are stunted and malformed. Thorny species are common in these areas. Flacourtia indica, Carissa spinarum, Randia species, Euphorbia species, Acacia spp., Zizyphus spp., Mimosa spp., are common. Other species common in the area are Boswellia serrata, Anogeissus latifolia, Aegle marmelos, Butea monosperma, Diospyros melanoxylon, Madhuca indica. Shrub spp. are Nyctanthes arborescens, Woodfordia fruticosa, Casuarina spp.



5.2 Legal status:

The forests of the districts have the following status: -

= = = = =		= = = = =			= = = = =	
District	Division	R.F. in km <sup>2</sup>	R.F.in km <sup>2</sup> Demarca- ted.	Undemar- cated.	Total (km <sup>2</sup> )	
Santhal Pgs:	Dumka	102.43	431.09	896.26	1429.78	
	Sahebganj	-	133.62	46.49	180.11	
	Deoghar	-	302.78	11.22	314.00	
Bhagalpur	Deoghar	24.93	428.95	-	453.88	
		127.36	1296.44	953.97	2377.77	
= = = = =		= = = = =			= = = = =	

5.3 Demarcation and forest settlement:

The major portion of the forests lying within these districts fall under protected forests. Most of which have come under the management of the Forest Department after vesting of forests with the Government under Bihar Private Forests Act, 1947 and subsequently under Bihar Land Reform Act, 1950. A great part of these Government forests have been demarcated and thereafter notified for reservation. 396.715 sq.km. of protected forests also came under the management of the Forest Department from the Damin-koh Govt. Estate.

5.4 Rights and privileges:

The forests of the district are heavily burdened with right and hence have been over exploited. Besides, the Paharias indulge wantonly in "Kuraon" a form of shifting cultivation which has greatly depleted the forests. In Deoghar Division, the forests lying in the Sub-division of Deoghar and Jamtara, within the district of Santhal Parganas, are burdened with rights where right holders coupes are laid villagewise.

In Dumka Division nature of rights vary from area to area except in the seven blocks of Godda - Damin which have been reserved without any rights. The general rights accepted includes removal of dead trees, trees below 2' girth (misc.) of unlisted species and collection of minor forest produce for domestic consumption. Selling of minor forest produce at the authorised forest huts is also allowed.

5.5 Management Practices of forests:

5.5.1 Area covered under Working Plan:

The reserved and the demarcated protected forests, are being managed according to the prescriptions of the relevant Working Plans. Working Plans exist for the Dumka and Deoghar Division. Sahebganj Division has been in-existence since the last two years only and for the purpose of this report has been included under Dumka Forest Division.

5.5.2 Short details of management:

5.5.2.1 Past system:

In the past, the old reserved forests were being worked under coppice with standard system with a rotation of 30 to 40 years. Selection fellings in a cycle of 20 years were also tried in areas where the above system could not be followed like the forest crops on plateaus and ridges falling within the old reserve.

The old protected forests which were heavily right burdened were earlier being worked under simple coppice system with a rotation of 10 to 20 years which was subsequently modified to a rotation of 30 to 40 years and managed under Coppice with standards.

The vested protected forests were earlier managed under simple coppice system with a rotation varying from 10 to 40 years. This system was later changed to coppice with standards.

In the undemarcated protected forests the yield was fixed empirically and trees of 120 cm. to 135cm. girth were felled. In Deoghar Division the forests were earlier managed under fixed value tickets through vendors along with coppice system for the reserved forest. Subsequently, the whole area was managed under coppice system with rotations varying from 10 to 40 years. With rapid destruction of forests, at present the forests are being worked under both coppice Working Circle and Rehabilitation Working Circle.

Bamboo overlapping Working Circle were also in existence for management of bamboo forests both in Dumka and Deoghar Forest Divisions.

#### 5.5.2.2 Present system of management:

Due to excessive biotic interference, considerable portion of the forest area has become derelict and blank. As a result, the forests are now being managed with the primary objective of protection, improvement and maintenance of forest cover. In both the divisions the areas which were exploited in the previous plan under Coppice with Standard Working Circle has been considerably reduced in order to provide rest and protection to the forest crop for its rehabilitation. Forest will be exploited to meet the bonafide requirement of the local population first and thereafter for the purpose of meeting the commercial and industrial needs.

The following is the distribution of area into various Working Circles as per current Working Plans:-

Sl. No.	Item.	Area within Dumka Division for demarcated & R.F.& P.F. only (km <sup>2</sup> )*	Area within Deoghar Division (km <sup>2</sup> )
1.	Coppice with standard Working Circle.	244.14	333.89
2.	Bamboo(overlapping Working Circle).	-	-
3.	Rehabilitation-cum Soil Conservation Working Circle.	351.78	434.11
4.	Plantation Working Circle.	65.57	-
5.	Avenue Working Circle	-	-
Total for the Division:		661.49	768.00

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\* Balance areas of Dumka Forest Division which mainly fall under un-demarcated forests represent poor crop varying from Jhāti forests to blank area- fit for inclusion in Item 3 & 4 above.

(i) Coppice with standard Working Circle:

Mainly Sal forest mixed with miscellaneous species which can be economically exploited has been allotted to this Working Circle. The main object of exploitation will be to meet the demands of the right holders. The rotations adopted in Dumka Division have been 30 years, 40 years and 60 years. The 30 years rotation has been fixed to meet mainly the general wood requirements of the right holders which are heavy. This is expected to yield only pole sized timber and fuelwood.

The higher rotation of 40 and 60 years have been fixed to meet the commercial requirements and the demand for large sized timber of the right holders as well as other consumers. The rotation fixed for Deoghar Forest under this Working Circle is 15 years and 10 years depending on the quality of the crop.

The growth statistics available in the present Working Plan of Dumka Division shows that valley Sal is expected to attain an average diameter of 15.24 cm. at the age of 30 years and an average diameter of 19.74cm. at the age of 40 years. These sizes have been considered as adequate for meeting the requirements of firewood and pole of the local villagers. In Deoghar Division the average diameter attained by Sal at the age of 30 and 40 years are 17.75 cm. and 20.25cm. respectively.

(ii) Rehabilitation-cum-Soil Conservation Working Circle:

To rehabilitate the rooted waste through protection and to conserve soil and moisture regime considerable area has been allotted to this Working Circle. The methods to be adopted will be mainly fencing and cutting back of the rooted waste and adoption of Soil Conservation measures and raising plantation in small and scattered blank areas.

(iii) Plantation Working Circle(Dumka Division only):

This Working Circle has been constituted with the object of rapidly afforesting the blank areas specially the areas where shifting cultivation has been practised.

(iv) Bamboo Overlapping Working Circle(Dumka Division only)

There also exists a Bamboo(overlapping)Working Circle for management of bamboo forests with the object of meeting the local demand and making the surplus available for use as building and paper pulp materials.

(v) Avenue Working Circle:

This include stretches of P.W.D.roads lying in the district where sufficient fringe areas are there to take up successful road side plantation. A regular scheme for plantation and harvesting the mature and overmature trees has also been prepared. If the results are encouraging then this scheme will be extended to other roads, canal banks and other areas where strip plantation is possible.

5.5.3 Exploitation :

The forest produce of the area is exploited through three agencies :-

- 1) Through the right holders and concessionist.
- 2) Through the lessees.
- 3) Through Departmental agency.

5.5.3.1 Disposal through right holders and concessionists:

92% of the total population of the two districts live in rural areas, majority of whom earn their livelihood as cultivators and agricultural labourers. Their lives have always been traditionally and intimately linked with the forests and their produce. This is specially so with respect to the tribal population which constitute about 34.20% of the total population.

During earlier times, due to wide distribution of forest and heavy reliance of the people on the forest produce for their livelihood, certain traditional rights on the forest produce were allowed to the local population for their bonafide use. These traditional rights were allowed to continue even though with the increase in population these rights became a heavy burden on the forests. Frequent misuse of these rights has also greatly and adversely affected the forest wealth of the project area.

The requirements of the right holders and concessionists are satisfied first from the forest and thereafter the balance is sold through auction of annual coupes. In the district of Santhal Parganas, where these rights exists in majority of the forest areas, the villagers are permitted to remove free of cost, for their own bonafide use trees other than the reserved trees. They are also sometimes permitted to remove the reserved trees, for their bonafide use, on payment of half the ordinary schedule of rates from annual coupes.

No details regarding the quantity of fuelwood, pole and timber allowed to these right holders and concessionists from the forests of the project area were available at Divisional Offices.

### 5.5.3.2 Disposal through lessees:

The surplus forest products are sold to the lessees through auction of annual coupes. The following give the volumes of timber and other forest products sold from the annual coupes through auction during 1978-79, 1979-80 and 1980-81 in the various divisions of the project area as per records available from the Divisional Offices:

#### DUMKA DIVISION

Year	Timber in m3	Firewood in m3	Bamboo in M.T.	Kend leaf in stand- ard bags in nos.	Sabai Grass in M.T.
1978-79	5968.00	3832.00	989	38156	999.111
1979-80	2985.00	2710.00	900	38156	-
1980-81	3270.00	2790.00	500	18104	-

#### DEOGHAR DIVISION

1978-79	2095.49	2963.41	-	4004154	-
1979-80	4134.34	5264.20	-	4008320	-
1980-81	7250.67	8945.46	-	42109738	-

#### SAHEBGANJ DIVISION

1979-80	14.16	900.18	600 m3	4885	1000
1980-81	19.22	854.33	330 "	5401	326.298

### 5.5.3.3 Disposal through Departmental Agency:

There exists a Departmental Working Division at Monghyr which harvests the forest produce departmentally for direct supply to various government agencies such as Bihar State Electricity Board, Railways and Defence and also for sale from their depots at Kathikund and Dumka. The Division also possesses a Saw Mill at Dumka from where timber is sold after conversion.

The Departmental working Division with Headquarters at Monghyr works in 14 coupes in Dumka-Damin Range lying in Dumka Division. The amount of forest produce extracted departmentally from these coupes for the last three years are given below:



Year	Forest produce extracted			
	Timber in m3	Poles in m3	Firewood in m3	T.L.Cogging & fencing post in m3
1978-79	890.684	1176.256	1052.527	265.91
1979-80	486.340	508.424	1337.958	266.288
1980-81	369.651	992.425	2069.375	390.909

These produces are generally disposed off through sale from depot at Dumka and Kathikund. The following is the quantity sold from year to year under this category:

Year	Timber in m3	Poles in m3	Firewood in m3
1978-79	823.547	653.688	441.568
1979-80	327.178	909.386	934.956
1980-81	221.958	65.538	1016.338

Departmental supplies of mainly poles & T.L.Coggins to various Government agencies such as collieries, Bharat Coking Coal Ltd., C.C.L. E.C.L. etc. are made annually. The figures of such supplies for the last 3 years are given below:-

Year	Poles in m3	T.L. Cogging & Fencing posts in m3
1978-79	164.972	140.379
1979-80	233.356	110.420
1980-81	330.160	136.160

Supplies of poles are also made departmentally to private agencies and Railway Contractors for Government House construction and for flood control etc. The figures on this account for the last 3 years are given below:

Year	Poles in m3
1978-79	114.342
1979-80	157.709
1980-81	354.410

The balance amount of timber is usually supplied to the departmental Saw Mill at Dumka for conversion and subsequent sale.

#### 6. Forest Resources Information :

6.1 Dumka Division:

The distribution of occurrence of the sample plots in Dumka Division in Santhal Pargana (including Sahebganj) has been shown below in a cross chart of size classes and canopy densities:-

Size Class	Canopy density			Young crop (canopy not formed)	Total no. of plots.	% of occurrence.
	5-29%	30-69%	70% & above.			
< 10cms.	29	5	-	16	50	34.3
10-20cms.	29	24	4	-	57	39.0
20-30cms.	16	7	-	-	23	15.8
> 30 cms.	7	5	-	-	12	8.2
Mixed class	4	-	-	-	4	2.7
Total no. of plots	85	41	4	16	146	100.00
% of occurrence.	58.2	28.1	2.7	11	100	

The above chart shows that approximately 34% of the crop has predominant diameter of less than 10cms. Almost 50% of the area, containing crop of predominant diameter 10-20 cms., has good density and approximately 34% of crop containing predominant diameter >20 cms. has good density. 69.2% of the whole crop has a poor density, this includes regeneration crop also.

6.2 Deoghar Division within Santhal Parganas District:

Distribution of sample plots in size class shown against canopy density in Deoghar Division within Santhal Parganas district is as follows:-

Size class	Canopy density			Young crop (canopy not formed)	Total no. of plots.	% of occurrence.
	5-29%	30-69%	70% & above.			
< 10cms.	15	3	-	6	24	68.6
10-20cms.	3	4	-	-	7	20.0
20-39cms.	1	-	-	-	1	2.0
> 30 cms.	2	-	-	-	2	5.9
Mixed class	-	1	-	-	1	2.8
Total no. of plots.	21	8	-	6	35	100.00
% of occurrence.	60	22.8	-	17.2	100	

The above chart shows that almost 69% of the crop has predominant diameter of less than 10cms. Only 22.8% of the forest area contains crop with satisfactory density.

### 6.3 Deoghar Division in Bhagalpur District:

Distribution of plots according to size classes and canopy density in Deoghar Division within Bhagalpur District is as follows:

Size Class	Canopy density			Young crop (canopy not formed)	Total no. of plots.	% of occurrence.
	5-29%	30-69%	70% & above.			
<10cms.	2	-	-	13	15	38.5
10-20cms.	11	3	-	-	14	35.5
20-30cms.	6	-	-	-	6	15.3
>30 cms.	3	1	-	-	4	10.3
Mixed class	-	-	-	-	-	-
Total no. of plots	22	4	-	13	39	100.00
% of occurrence	56.4	10.3	-	33.3	100	

38.5% of the crop has diameter less than 10 cms. 33% of the area contain crop of regeneration stage where the canopy has not yet been formed and 56% of the area has poor density of 5-29%. Only about 10% of the crop has fairly good density. In Deoghar Division, the crop falling in Bhagalpur District contained more area under pole and timber sizes but it contained less area under good density.

Approximately 52% of the forest area in Deoghar Division was found to be blank. The percentage of area under pole crop and above were much more (65.7%) in Dumka Division (including Sahebganj Division) than in Deoghar Division (in Santhal Parganas) (31.4%). 30.8% of area in Dumka Division and 16.2% area in Deoghar Division contained crop with fairly good density. Majority of these areas contained crop with predominant diameter 10-20 cms. both in Dumka and Deoghar Divisions. About 30% of good density crop in Dumka Division contained crop diameter of more than 20cms. whereas in Deoghar Division only 18% of the good density crop contains crop diameter more than 20cms.

C H A P T E R - II

INVESTIGATION AND METHODOLOGY

2.1 Objectives including precision:

The main object of the inventory work in the area was to collect adequate data from the field as well as other sources with a view to fulfil the following objectives of the Forest Survey of India:-

- i) to monitor periodically (on 10 year cycle) the changing situation of land and forest resources.
- ii) to serve the data needs of development planning including conservation and management of environmental reserves, utilization of forest resources in various industries, and in formulation and implementation of Social Forestry Projects.
- iii) through data analysis and presentation of data act as monitor for evaluation of the effect of development planning and also be of assistance to the forestry planning cell of Central and State Governments.

The organisation being in its infancy and suffering from other limitations, mainly shortage of field staff, the collection of data was limited only to forest areas. Adequate data based on sound statistical basis could not be collected for demands and consumption of wood, logging and accessibility study, photointerpretation and remote sensing, volume and cull study etc. for similar reasons.

The precision aimed at has been  $\pm 10\%$  at 95% probability level.

2.2 Aerial reconnaissance:

No aerial reconnaissance was carried out.

2.3 Photo-interpretation and mapping:

No photo-interpretation maps were available for the area. Ground inventory was based on the Survey of India topographical sheets and the forest maps supplied by the Forest Department.

The following topographical sheets were referred to :-

<u>Sl.No.</u>	<u>Toposheet Number</u>	<u>Scale</u>
1	72 L/7	1"=1 mile
2	72 L/8	-do-
3	72 L/9	-do-
4	72 L/10	-do-
5	72 L/11	-do-
6	72 L/12	-do-
7	72 L/13	1:50,000
8	72 L/14	1"= 1 mile
9	72 L/15	-do-
10	72 L/16	-do-
11	72 O/4	1:50,000
12	72 O/7	-do-
13	72 O/8	-do-
14	72 O/11	-do-
15	72 O/12	-do-
16	72 O/16	-do-
17	72 P/1	-do-
18	72 P/2	-do-
19	72 P/3	-do-
20	72 P/4	-do-
21	72 P/5	-do-
22	72 P/6	-do-
23	72 P/7	-do-
24	72 P/8	-do-
25	72 P/9	-do-
26	72 P/10	-do-
27	72 P/11	-do-
28	72 P/12	1"=1mile.
29	72 P/13	1:50,000
30	72 P/14	-do-
31	72 P/15	-do-
32	73 M/1	-do-
33	73 M/5	-do-
34	73 I/5	-do-
35	73 I/9	-do-
36	73 I/13	1"=1mile.

## 2.4 Inventory Design:

The inventory design adopted has been a systematic sampling with a cluster of two points. Each topographical sheet of 1:50,000 scale was divided into  $2\frac{1}{2}' \times 2\frac{1}{2}'$  grids where cluster of two points were selected randomly and according to a fixed method.

### 2.4.1 Pilot Survey:

No pilot survey was conducted. The standard inventory design of Forest Survey of India has no provision for pilot survey.

#### 2.4.2 Sampling design:

The sampling design consisted of locating two sample points in each grid of  $2\frac{1}{2}' \times 2\frac{1}{2}'$ . Two random numbers are selected from the random number tables which will be X and Y coordinates of the centre of the first sample plot with the south-west corner of each grid as the centre. The centre of the second sample plot will be located by joining the centre of the first sample plot with the grid centre and extending it on the opposite direction upto the same length as the length between the first point and the grid centre.

#### 2.5 Field work :

Various information were collected by the field party in the following codified forms:-

- i) Plot Approach Form.
- ii) Plot Description Form.
- iii) Plot Enumeration Form.
- iv) Sample Tree Form.
- v) Herbs and Shrubs data Form.

Besides, the above mentioned forms, there are Bamboo Enumeration Form(for clump and non-clump forming bamboos) and bamboo weight form. These forms were not used as no bamboos worth considering were found during survey work in these two districts.

##### 2.5.1 Instructions for field work:

A detailed field manual was prepared giving procedures for collecting information and filling up of the above mentioned forms. This was handed over to the field staff for their guidance before proceeding to field.



## C H A P T E R - III

### DATA ANALYSIS

#### 3.1 G e n e r a l :

There are three broad components of the data processing system namely manual processing, processing on unit record machines and processing of computer.

#### 3.2 Manual processing:

It involves the following steps:

- i) Proper documentation of the field forms.  
✓ Checking of existence of all forms with reference to the master list of samples.
- ii) Coding the information in the field forms which has not already been incorporated.
- iii) Manual checking for validity of codes used in various columns of information.
- iv) Reconciliation of discrepancies, if any, in consultation with the Crew Leaders.

#### 3.3 Processing on unit record machines:

Following steps are carried out on the unit record machines:-

- i) Punching the information on cards.
- ii) Verification of punched cards.
- iii) Sorting and collating the cards for proper input to computer.
- iv) Listing the punched data for detecting any omission or duplication etc.

#### 3.4 Processing on the Electronic Computer:

On completion of the preparation of input, the following operations are carried out on Electronic Computer:-

- i) Loading of the data on to magnetic Dis packs/ magnetic tapes.
- ii) Consistency checking on computer.
- iii) Corrections of the data.
- iv) Calculation of tree and plot volume.
- v) Preparation of stand and stock of tables.
- vi) Preparation of growing stock tables for different types of strata as included in the design.

Suitable computer programmes are developed for processing the aforesaid items of work on the Electronic Computer.

### 3.5 Calculation of area:

In the absence of any photo-interpretation map, forest area collected from the State Forest Department was taken as the basis for calculation of area. The following has been the distribution of the forested plots in the different strata falling in the different areas. The area has been calculated proportionately on the basis of number of plots falling in each stratum:

Division	No. of sample plots falling in		
	Sal Stratum	Miscellaneous stratum.	Total.
Dumka(including Sahebganj Division)	33	113	146
Deoghar Division (in Santhal Parganas District)	28	7	35
Deoghar Division (in Bhagalpur District)	26	13	39
Total:	87	133	220

According to the area of the stratum falling within different divisions and districts is as follows:

District Division	Total forest area(sq.km.)	Forested area in	
		Sal Stratum (km <sup>2</sup> )	Miscellaneous Stratum (km <sup>2</sup> )
Santhal Pgs. Dumka(including Sahebganj)	1609.89	363.88	1246.01
Santhal Pgs. Deoghar	314.00	251.20	62.80
Bhagalpur Deoghar	453.88	302.59	151.29
Total:	2377.77	917.67	1460.10

### 3.6 Tree Volume study:

No trees were felled for construction of volume equations. The best and most ideal method for construction of volume equation is to select and fell a large number of trees of each species. The cost in this process would be prohibitive and the time required would be appreciable. In view of this and also because of the fact that the vegetation of Ranchi and Santhal Parganas exhibit little variation, the volume equations developed for Ranchi District have been applied to estimate the growing stock of the area.

### 3.7 Volume studies:

#### 3.7.1 General volume equation:

The general volume equations for the following species which were adopted during Ranchi survey have been utilised in this survey also.

1. Shorea robusta.
2. Anogeissus latifolia.
3. Syzygium cumini.
4. Adina cordifolia.
5. Terminalia tomentosa.
6. Boswellia serrata.
7. Rest of the species.

The equations were adopted in Ranchi survey after taking into consideration the standard error of the estimate, the multiple determination co-efficient and the applicability of the equation in the entire range of the data. The equations for the species are given below:

<u>Species</u>	<u>Equations</u>
✓ <u>Anogeissus latifolia</u>	$V/D^2H = 0.45110 + 0.00161/D^2H$
✓ <u>Syzygium cumini</u>	$V/D^2H = 0.3750 - 0.001154/D^2H + 0.0077689/D^2H$
✓ <u>Adina cordifolia</u>	$V/D^2H = 0.55615 - 0.0052355/D^2H$ ✓
✓ <u>Shorea robusta</u>	$V/D^2H = 0.37802 + 0.0041834/D^2H$
✓ <u>Boswellia serrata</u>	$V/D^2H = 0.43527 - 0.0018469/D^2H + 0.0057489/D^2H$
✓ <u>Terminalia tomentosa</u>	$V/D^2H = 0.42823 - 0.002149/D^2H$
✓ <u>Rest of the species</u>	$V/D^2H = 0.50894 - 0.0019764/D^2H + 0.0078117/D^2H$

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V=Total under bark volume in( $m^3$ ) including branches.  
D=Over bark diameter (m) at breast height.  
H=Height of the tree(m).

### 3.7.2. Local volume equation:

The local volume equations for the following species and rest of the species of Ranchi District were used which were selected on the criteria as mentioned in the Para No.4.2:

Species	Equations
✓ Anogeissus latifolia	$V = 9.628653 - 0.97687 D + 11.024 D^2$
✓ Syzygium cumini	$V/D^2 = 6.2214 - 0.49647/D + 0.016042/D^2$
✓ Adina cordifolia	$V/D^2 = 13.437 + 0.04472/D - 1.3527/D^2$
✓ Shorea robusta	$V/D^2 = 8.714 - 0.70158/D + 0.022585/D^2$
✓ Boswellia serrata	$V/D^2 = 10.316 - 1.124/D + 0.03356/D^2$
✓ Terminalia tomentosa	$V/D^2 = 9.4721 - 0.84158/D + 0.022389/D^2$
✓ Rest of the species	$V/D^2 = 9.5879 - 0.89224/D + 0.025584/D^2$

V = Total under bark volume of tree including branches(m<sup>3</sup>)

D = Over bark diameter(m) at breast height.

H = Height of the tree(m)

### 3.7.3. Volume of tree enumerated:

With the help of local volume equation and the diameter of the enumerated trees, under bark volume of each tree was computed.

### 3.7.4. Plot volume:

Volume of all trees occurring in a plot were added to obtain the plot volume.

### 3.7.5. Volume per ha. by forest type:

Volume per ha. by Division and forest type was calculated both for the Dumka and Deoghar Division. Distribution of volume per ha. by species and diameter class was calculated on the basis of the local volume equation.

The volume per ha. by strata is furnished below:-

Division	Stratum	Volume(m <sup>3</sup> )/ha.		Percentage volume of Sal.
		All species.	Sal species.	
Dumka	Sal	19.001	3.129	16.46
	Misc.	19.132	0.600	3.13
Deoghar in	Sal	15.259	1.212	7.94
Santhal Pargana District.	Misc.	19.840	-	-
Deoghar in	Sal	8.127	1.725	21.23
Bhagalpur District.	Misc.	9.646	0.110	1.14

### 3.8 Stem Tables:

The trees enumerated in the plots were classified by diameter and species and the estimate of number of trees per hectare were derived for Sal and Miscellaneous Stratum (Table 1.1.1 to 1.3.2)

The number of stem per ha. is given as below:-

Table:2

Division	Stratum	No. of stems/ha.		Percentage of Sal.
		All species.	Sal species.	
Dumka	Sal	76.121	32.793	43.08
	Misc.	63.471	5.746	9.05
Deoghar (In	Sal	26.783	12.856	48.00
Santhal Parganas Distt.)	Misc.	55.712	-	-
Deoghar (In	Sal	33.076	14.615	44.19
Bhagalpur Distt.)	Misc.	31.537	2.308	7.32

A study of the table shows that stem density is very poor in all the divisions. Dumka reflects a better stocking in comparison to Deoghar Division. It is important to mention that no enumeration was carried out below 10 cm. diameter over bark.

The forests of both the Divisions being very heavily degraded, the total number of stems per hectare is much more than what is shown in this report, but most of the forests being under "jhati" stage having crop below 10cm. diameter, the reflection of the number of stems per hectare is so poor.

A general sample assessment made at a later stage indicates that the number of stems below 10cm. diameter in Sal stratum in Dumka and Deoghar Division are approximately 80% and 90% of the total stems respectively. The number of stems below 10cm. diameter in miscellaneous stratum is however, much less.

### 3.8.1 Dumka Division:

In Dumka Division the number of stems/ha. and respective percentages of important species in Sal and Miscellaneous stratum is as under :-

Table:3

#### Stratum:Miscellaneous .

Species	Number of stems/ ha.	Percentage with respect to total stems.
<u>Terminalia tomentosa</u>	6.718	10.58
<u>Shorea robusta</u>	5.746	9.04
<u>Diospyros melanoxylon</u>	3.890	6.13
<u>Madhuca latifolia</u>	3.890	6.13
<u>Bombax ceiba</u>	2.740	4.32
<u>Adina cordifolia</u>	2.652	4.18
<u>Anogeissus latifolia</u>	2.564	4.04
<u>Lannea coromandelica</u>	2.475	3.90

The percentage of other species is rather poor in comparison to the species mentioned above.

The number of stems per ha. for important species in Sal stratum is given below:

Species	Number of stems/ ha.	Percentage with respect to total stems.
<u>Shorea robusta</u>	32.793	43.08
<u>Terminalia tomentosa</u>	11.817	15.52
<u>Buchanania latifolia</u>	3.333	4.38
<u>Diospyros melanoxylon</u>	3.030	3.98
<u>Madhuca latifolia</u>	2.727	3.58
<u>Butea frondosa</u>	1.818	2.39
<u>Anogeissus latifolia</u>	1.212	1.59

The species depict an uneven distribution between the stratum due to strong tendencies of clustering and concentration in the two different region. These differences in the distribution pattern are brought out in Table 3 and Table 4.

A study of stem tables in the Division reflects the following facts:-

In Miscellaneous stratum more than 76.74% of the trees are below 20cm. diameter. 86.45% of the stems in Sal stratum are below 20cm. diameter. Further 2.23% and 1.20% of the trees are above 60cm. dia. respectively.

Regarding the density of stems in miscellaneous stratum, Terminalia tomentosa is maximum followed by Shorea robusta, Diospyros melanoxylon, Madhuca latifolia etc. while in Sal stratum Shorea robusta itself contributes 43.08% of the total stems followed by Terminalia tomentosa, Buchanania latifolia, Diospyros melanoxylon etc.

It is interesting to mention that Terminalia tomentosa, Diospyros melanoxylon, Madhuca latifolia, Anogeissus latifolia occupy a significant position in both the stratum of the division. The miscellaneous stratum in the division present a different picture, the number of Sal stems being very low with a poor concentration.

### 3.8.2 Deoghar Division in Santhal Parganas District:

From the study of the distribution of stems/ha. in both Sal and Miscellaneous stratum the following inference may be drawn:-

- i) In Sal type, overall stocking is only 26.783/ stems per ha. which is very poorly represented. Shorea robusta itself contributes 48.00% of the total stems in this stratum. The stems are maximum in the diameter class 10 to 19cm., accounting for 65.33% of the total stems. A very few number of mature and over mature trees exist and is practically absent beyond the diameter class 60cm. and above. The overall stocking in this type is very poor. Shorea robusta and Madhuca latifolia are the two major species in this area.
- ii) In Miscellaneous stratum, the number of stems is 55.712 per ha. The distribution of stems per ha. in different diameter classes is not satisfactory and the average stocking is also poor. Stems over 60cm. diameter class is completely absent. However, among the species present Butea frondosa itself contributes 79.48% of the total stems. Among the other species Erythrina suberosa and Madhuca latifolia may be mentioned from density point of view.



The stems/ha. for important species in Sal and Miscellaneous stratum is as shown below:-

#### I Stratum Sal:

Species	Stems/ha.	Percentage
Butea frondosa	0.714	2.66
Ficus species	0.357	1.33
Madhuca latifolia	10.713	39.99
Shorea robusta	12.856	48.00
Syzygium cumini	0.357	1.33
Semicarpus anacardium	0.357	1.33
Terminalia tomentosa	1.071	3.99
Others	0.357	1.33

#### II Stratum Miscellaneous:

Bombax ceiba	1.428	2.56
Butea frondosa	44.284	79.48
Erythrina suberosa	4.286	7.69
Lannea coromandelica	1.428	2.56
Madhuca latifolia	2.857	5.12
Syzygium cumini	1.428	2.56

### 3.8.3 Deoghar Division in Bhagalpur District:

The following inference may be drawn for the area from a study of the stem tables:

i) In Sal Stratum the number of stems is 33.076/ha. Shorea robusta itself contributes 44.19% of the total stems. The distribution of stems in different diameter classes is not satisfactory. There is practically no tree, over 50cm. diameter except in the diameter class 80 to 90cm. Tree density is concentrated in 10-19cm. diameter class and accounts for 79.06% of the total stems. The number of stems gradually falls towards higher diameter classes after 10-19cm. diameter. 12.79%, 4.47% & 2.32% of the stems is however present in the diameter class 20-29, 30-39 and 40-49cm. respectively. Only Ficus species is found in the diameter class 80-89cm. Average stocking in this type is not satisfactory.

ii) In Miscellaneous stratum the number of stems is only 31.537/ha. which indicate a very poor and degraded condition of forest. Even the medium diameter classes are rather poorly represented. The number of stems is concentrated in the diameter class 10-19cm. and account for 63.41% of the total stems. No tree is found above 60cm. diameter. 19.51% and 14.63% of the trees are present in the diameter class 20-29 and 30-39 cm. respectively. Madhuca latifolia, Acacia catechu, Terminalia tomentosa are however the predominant species in this area. Average stocking is poor due to poor regeneration of the crops and absence of higher diameter class trees.

An abstract for important species is given below:

I Stratum Sal:

=====		
<u>Species</u>	<u>Stems/ha.</u>	<u>Percentage</u>
<u>Shorea robusta</u>	14.615	44.19
<u>Madhuca latifolia</u>	5.769	17.44
<u>Terminalia tomentosa</u>	5.000	15.12
<u>Acacia catechu</u>	1.923	5.61
<u>Diospyros</u>	1.538	4.65

II Stratum Miscellaneous:

<u>Madhuca latifolia</u>	15.384	48.78
<u>Acacia catechu</u>	4.615	14.63
<u>Terminalia tomentosa</u>	3.077	9.75
<u>Nyctanthes arborescens</u>	2.308	7.32

=====

Stand and stock tables:

The trees enumerated in all the plots were classified by species and diameter classes and the estimates of the number of trees per hectare derived for each stratum. These are given in table 1.1.1 to 1.3.2.

The tree volume estimated from local volume equation was classified by species and diameter and the estimated volume per ha. were derived for each stratum. These are provided in Table 3.1.1 to 3.3.2.

From the stand and stock table and the estimated area of each stratum, total stems and total volume of various species under different diameter classes were obtained as shown in Table 4.1.2 to 4.3.2.

3.9.1 Dumka Division:

A study of the stand and stock tables points out the following facts:-

In Sal stratum the volume of Sal is maximum in 10-19cm. diameter class which accounts 74.65% of the total Sal species volume and falls gradually towards higher diameter class. Sal constitutes about 16.46% of the total volume. Very few Sal trees occur above 30cm. diameter class.

Among the other species Diospyros melanoxylon, Madhuca latifolia, Alstonia scholaris and Terminalia tomentosa are the main occurring species and account for 44.27%, 12.16%, 5.21% and 5.05% of volume respectively. Contribution of volume of Diospyros melanoxylon is high due to its presence in 100cm. and above diameter class. Tree density is high in case of Sal species but its volume contribution is low because of its occurrence in lower diameter and a great number of species falling in regeneration crop. Total volume/ha. in this type is extremely low.

In Miscellaneous stratum the volume/ha. is 19.132 m<sup>3</sup> only. The volume contribution of Sal species is very low and account only 3.13% of the total volume. Among the miscellaneous species, Madhuca latifolia, Terminalia tomentosa, Mangifera indica, Mangifera sylvatica are the major important species and contributes only 21.13%, 8.65%, 6.47% and 6.24% of the total volume respectively.

The volume/ha. is very low as in the Sal stratum.

The abstract of volume/ha. from occurrence point of view is appended below:-

<u>I Sal stratum</u>		
<u>Species</u>	<u>Volume/ha. (m<sup>3</sup>)</u>	<u>Percentage.</u>
<u>Diospyros melanoxylon</u>	8.412	44.27
<u>Shorea robusta</u>	3.129	16.47
<u>Madhuca latifolia</u>	2.310	12.16
<u>Terminalia tomentosa</u>	0.956	5.03
<u>Alstonia scholaris</u>	0.990	5.21
<u>II Stratum Miscellaneous.</u>		
<u>Madhuca latifolia</u>	4.043	21.13
<u>Terminalia tomentosa</u>	1.654	8.65
<u>Mangifera indica</u>	1.237	6.47
<u>Mangifera sylvatica</u>	1.194	6.24

=====

3.9.2 Deoghar in Santhal Parganas Distt.Sal stratum:

It is evident from the tables that in Sal stratum the volume/ha. is only 15.259 m<sup>3</sup> only. The contribution of Sal species is 1.212 m<sup>3</sup>/ha. which is only 7.94% of the total volume while *Madhuca latifolia* contributes the maximum volume and account for 41.17% of the volume. This is due to the concentration of Sal species in the lower diameter class whereas *Madhuca latifolia* is also present in the higher diameter class. The maximum volume contribution of *Shorea robusta* is in the diameter class 10-19cm. and falls gradually towards higher diameter class. Amongst other species *Ficus* spp. contribute a significant amount of volume followed by *Sizygium cumini* and *Butea monosperma*. It is interesting to note that *Sizygium cumini* is present mostly in the diameter class 90-99cm. and is practically absent in any other diameter class. Similar is the case for *Ficus* spp. which is present in 100 cm. diameter class. The volume/ha. in this stratum is very poor due to degradation. The volume/ha. is summarised below in order to rank:-

Species	Volume/ha. (m <sup>3</sup> )	Percentage
<i>Madhuca latifolia</i>	6.282	41.17
<i>Ficus</i> species	5.554	36.40
<i>Sizygium cumini</i>	1.802	11.81
<i>Shorea robusta</i>	1.212	7.94
<i>Butea monosperma</i>	0.245	1.61

Miscellaneous stratum:

In Miscellaneous stratum the volume/ha. is 19.840 m<sup>3</sup> only. It is clearly evident that the main species are *Butea frondosa*, *Madhuca latifolia*, *Sizygium cumini*, *Drythrina suberosa*, *Lannea coromandelica* and *Bombax ceiba*. Among these species *Butea frondosa* contributes maximum volume which is 57.30% of the total volume and is present upto diameter class 40-49cm. The higher diameter class trees are practically absent after 60cm. diameter class. The volume contribution of *Bombax ceiba* and *Lannea coromandelica* is, however very insignificant. The overall picture of the stratum is not satisfactory.

An abstract of volume/ha. is appended as below:

Species	Volume/ha.(m3)	Percentage
Butea frondosa	11.408	57.30
Madhuca latifolia	5.469	27.57
Sizygium cumini	2.057	10.37
Erythrina suberosa	0.723	3.64
Lanea coromandelica	0.102	0.51
Bombax ceiba	0.081	0.41

### 3.9.3 Deoghar in Bhagalpur District:

Volume/ha. has been calculated by species and diameter class. This exercise is carried out both for Sal and Miscellaneous stratum. The following observation can be made after analysis of the data.

#### Sal stratum:

In Sal stratum the volume/ha. is only 8.127 m<sup>3</sup>. This reflects a very poor picture of this area. The contribution of Sal is 1.725 m<sup>3</sup>/ha, which is 21.23% of the total volume. Madhuca latifolia and Ficus spp. are the maximum volume donor because of its presence in higher diameter class. The maximum volume is concentrated in the diameter class 10-19 cm. both for Shorea robusta and for the other species. Thereafter the volume falls gradually towards higher diameter class except in the diameter class 80-89cm. where Ficus spp. contributes more. The volume/ha. is summarised below in order of rank:-

Species	Volume/ha.(m3)	Percentage
Madhuca latifolia	2.558	31.48
Ficus species	2.265	27.87
Shorea robusta	1.725	21.23
Terminalia tomentosa	0.473	5.82
Acacia catechu	0.158	1.94

#### Miscellaneous stratum:

Volume distribution in miscellaneous stratum is shown in Table No.3.3.2.

A study of the table reflects a poor status of the crop in the stratum. The volume/ha. is 9.646 m<sup>3</sup>. Volume in higher diameter classes is practically absent except for *Machuca latifolia* which exhibits its dominance in the stratum and is observed to be present upto 60cm. diameter. It contributes about 84.3% of the total volume in the stratum.

The percentage contribution of other important species in the stratum is as below:-

=====	
Species	% contribution to total volume in the stratum
-----	
<u>Acacia catechu</u>	4.6
<u>Terminalia tomentosa</u>	2.7
<u>Butea monosperma</u>	2.9
=====	

### 3.10 Local Volume Tables:

The local volume table of the commercially important species is given in Table 1. The volume equations as mentioned in para 3.7.2 are applicable to 10cm. and above diameter (D.B.H.O.B.) trees. The volume of trees is calculated on the basis of average volume of trees in these diameter classes and is given in the table against mid diameter.

VOLUME TABLES

<u>Diameter</u>	<u>Anogeis</u> <u>latifolia</u>	<u>Syzygium</u> <u>cuminii</u>	<u>Adina</u> <u>cordi-</u> <u>folia</u>	<u>Shorea</u> <u>robusta</u>	<u>Boswellia</u> <u>serrata</u>	<u>Terminalia</u> <u>tomentosa</u>	Rest of the species.
10-19	0.118	0.074	0.131	0.104	0.087	0.099	0.097
20-29	0.451	0.267	0.519	0.373	0.376	0.384	0.382
30-39	1.003	0.585	1.177	0.817	0.872	0.859	0.859
40-49	1.776	1.027	2.103	1.435	1.574	1.523	1.527
50-59	2.770	1.593	3.298	2.228	2.481	2.377	2.387
60-69	3.984	2.284	4.762	3.195	3.595	3.420	3.438
70-79	5.419	3.099	6.494	4.336	4.916	4.652	4.682
80-89	7.074	4.038	8.496	5.651	6.442	6.074	6.117
90	8.950	5.102	10.765	7.141	8.174	7.685	7.744



### 3.11 Estimation of total growing stock:

The total number of stems in the two divisions by species and diameter class in different stratum (10cm. diameter and above) is given in Table No.2.1.1 to 2.3.2. Total number of stems in Dumka and Deoghar Division combined is 13177.108('000 unit).

Total number of stems by stratum is as follows:

Division	Stratum	Total stems ( '000 unit)
Dumka	Sal	2769.923
	Miscellaneous	7908.580
	Total:	10678.503
Deoghar in Santhal Pargansa District.	Sal	672.776
	Miscellaneous	349.868
	Total:	1022.644
Deoghar in Bhagalpur District.	Sal	1000.824
	Miscellaneous	477.137
		<u>1477.961.</u>

### 3.12 Total Volume:

Total growing stock of timber in Dumka & Deoghar Division is 3075.408 m<sup>3</sup>, 899.737('000 m<sup>3</sup>) respectively. Distribution of volume in the two divisions by species and diameter class in different stratum is given in Table No.4.1.2 to 4.3.2.

An abstract of total growing stock by division and stratum is appended below:

Division	Stratum	Total volume ( '000 m <sup>3</sup> )
Dumka	Sal	691.507
	Miscellaneous	2383.901
	Total:	3075.408
Deoghar in Santhal Parganas District.	Sal	383.302
	Miscellaneous	124.601
	Total:	507.903
Deoghar in Bhagalpur District.	Sal	245.904
	Miscellaneous	145.930
	Total:	391.834 ✓
	Grand Total:	3975.145

### 3.13 Estimation of error:

As per objective laid down, error was separately estimated on the volume per hectare for each Division.

The error percentage for each Division is given as below:

=====			
Name of the Division	Vol(m <sup>3</sup> ) per hectare.	Estimated volume (m <sup>3</sup> )	% of error.
-----			
Dunka	19.103	3075.408	13.2
Deoghar in Santhal Parganas District.	20.219	507.903	28.4
Deoghar in Bhagalpur District.	8.633	391.834	18.6
=====			

## C H A P T E R - IV

### GROWING STOCK AND YIELD

#### 4. Annual yield:

##### 4.1 Area under present management:

The project area comprises of Dumka and Deoghar Divisions in the District of Santhal Parganas and Bhagalpur. For this purpose Dumka Division includes Sahebganj Division formed recently.

##### 4.2 Area considered exploitable under present survey:

Ground survey of the project area clearly indicates that Rehabilitation Working Circle will embrace most of the areas under present survey.

It has been ascertained by Shri Prasad, Working Plan Officer, Dumka Division that the behaviour of miscellaneous species in the area is almost similar to Sal species except for higher girth class trees. An evaluation of the stand tables (Table No.1.1) of the present inventory reflects that about 76.74% of the trees are below 20cm. diameter class and stems over 60cm. dia.class are virtually absent.

The existing system in Dumka Forest Division is to fix a rotation period of 30 years for valley Sal, 40 years for Hill Sal and 60 years for Old Reserve Sal. From the current Working Plan, it appears that the forests are distributed into 117 felling series wherein 88 felling series belong to 30 years rotation. 27 felling series falls in 40 years rotation and for 2 felling series only a period of 60 years rotation is adopted. During the course of ground survey, it became evident that most of the Sal crop in the project area belonged to valley Sal group.

A general observation of the forests of Dumka Forest Division and the analysis of past record indicate that 4% of the total forest area of Dumka Forest Division represent stoney and unproductive land which cannot be brought under any annual prescription of yield. Further, in a sizeable portion of the area, it has been very difficult to protect forests upto 30 years rotation and people have got natural tendency to cut any poles reaching 7 to 10cm. dia. class which is locally utilisable. Our analysis show that such area in Dumka Forest Division will be about 60% of the potentially productive area of the Forest Division. This 60% of the workable area should be worked at a shorter rotation of 15 years so that before the poles are cut by local people, they are exploited by the Department and sold in the market to meet the local demand.

Rest of the workable area with better control and management should be worked in 30 years rotation(excluding 5% of the workable area which should be reserved for working in 60 years rotation to attain constructional and structural timber for commercial use.

In Deoghar Forest Division as per the new Working Plan the whole area of the Division is divided into 107 felling series of which 19 felling series cover Coppice Working Circle and 88 felling series are under Rehabilitation Working Circle. Out of Coppice Working Circle, 9 Working Circles have been placed for working in 15 years rotation and 10 Working Circles in 10 years rotation. Under Rehabilitation Working 3 types of areas have been recognised and the allotment of areas of this Working Circle to various felling series are: 1) Restricted exploitable felling series- 16 - Nos.

ii) Rooted waste - 66 Nos.

iii) Blank - 6 Nos.

In Deoghar Division also protection has posed a serious problem and it is felt that unless the demand of the local people are met to some extent, it will be impossible to protect the forests from wanton destruction. Our analysis of crop indicate that 80% of the total area of Deoghar Forest Division falls under degraded forests or forests under regeneration stage. In 5% area of Deoghar Forest Division, the soil has been so depleted that development of productive forestry will not be possible here in next 10 years without prolonged protection and soil conservation measures being taken. Therefore, this 5% area of Deoghar Forest Division should be omitted from all yield calculations. Out of the balance 95% area, 60% area should be worked in 10 years rotation and 40% in 15 years rotation.

It is, however, stressed here that to attain the objectives as stated above, a large portion of Sal area in both Dumka and Deoghar Forest Divisions allotted to Rehabilitation Working Circle is required to be coppiced back flushed to the ground to attain fresh and healthy pole crop, and replanted for miscellaneous areas, and this should be carefully protected upto the rotation of 10 or 15 years as the case may be to yield the desired result. Otherwise, hardly any yield can be expected from the areas now placed under Rehabilitation Working Circle in these divisions.

Bamboos exist to some extent in Dumka Forest Division but has been so badly hacked that they require now a period of rest and other silvicultural measures to improve the stock. Therefore, no regular yield of bamboo is prescribed at this stage. If the stock improves then the areas may be worked in 4 years cycle with exploitable diameter as 8 cm. and above. No yield calculation for bamboo is therefore made.

The annual yield for the areas under the report is therefore calculated as below:-

#### 4.2.1 Deoghar Forest Division:

As explained earlier since 5% of the total area is devoid of top soil and is not expected to support any vegetation in next 10 years. Accordingly,

- i) Area excluded from forest area for the purpose of yield calculation.  
(5% of the forest area) = 3839.40 ha.
- ii) Area left over for yield estimation: = 72948.60 ha.  
(Workable area)
- iii) Area to be worked at 10 years rotation = 43769.16 ha.  
(60% of workable area)
- iv) Area to be worked at 15 years rotation = 29179.44 ha.  
(40% of workable area)

Based on the above said calculations the potential annual cut area is worked out as below:-

<u>Rotation period (years)</u>	<u>Annual cut area(ha.)</u>
10 (ten)	4376.91
15(fifteen)	1945.29
Total area =	<u>6322.20</u>

#### 4.2.2 Dumka Forest Division(including Sahebganj Forest Division):

- i) Area excluded from forest area for yield calculation. = 6439.56 ha.  
(4% of the area being stoney)
- ii) Area left over for yield estimation = 154549.44 ha.  
(Worakable area)
- iii) Area to be worked at 15 years rotation = 92729.66 ha.  
(60% of the workable area)
- iv) Area to be worked at 60 years rotation = 7723.47 ha.  
(5% of the workable area)
- v) Area to be worked at 30 years rotation = 54092.31 ha.  
(Balance area of 35%)

On the above said premises, the potential annual cut area is worked out as below:-

<u>Rotation period (years)</u>	<u>Annual cut area(ha.)</u>
15	6181.97
60	128.79
30	1803.07
<hr/>	
Total:	8113.83

#### 4.3 Estimation of yield from different divisions:

Estimated yield of total wood which is likely to be available from the project area under the present working model is furnished below :-

<u>Division</u>	<u>Area ( ha.)for yield estimation</u>	<u>Volume(m3)/ha.</u>	<u>Total yield (m3)</u>
Deoghar	6322.20	11.72	74096.18
Dumka	8113.83	19.10	154974.15
<hr/>			
	14436.03	15.87	229070.33

#### 4.4 Yield according to utility classes:

The main utilisation of wood in the project area is in the form of timber, pole, T.L.Giggins and firewood. Examination of outturns, from the annual coupes in Dumka And Deoghar Divisions showed that the average percentage yield of these utility classes out of the total outturn are as follows:

<u>Name of Division</u>	<u>Percentage of total outturn of</u>			
	<u>Timber</u>	<u>Pole</u>	<u>Sleeper/T.L. Ciggins.</u>	<u>Firewood.</u>
Deoghar	2.1	0.62	2.0	95.3
Dumka	12.6	17.4	27.2	42.8

Accordingly the estimated yield divided into the utility classes of timber, pole, T.L.Coggins and Firewood will be as follows:-

Name of Division	Timber	Pole	Sleeper/T.L. Coggins.	Firewood	Total
Deoghar	1556.00	444.57	1481.92	70613.66	74096.18
Dumka	19526.74	26965.50	42152.97	66328.94	154974.15
Total:	21082.74	27410.07	43634.89	136942.60	229070.33

The present inventory does not include the outturn of poles and saplings below 10cm. d.b.h. as well as small - branch wood below 5 cm. d.b.h. It is estimated that: an additional yield of 10% over the calculated yield of 229070.33 will be available as poles and approximately 30% as fuelwood. Thus, there will be additional yields of 22907 m<sup>3</sup> of pole and 64721 m<sup>3</sup> of firewood.

The total yield according to utility class will then be as follows:

I t e m	Timber	Pole	Sleeper/T.L. Coggins.	Firewood
Total yield(m <sup>3</sup> )	21082.74	27410.07	43657.12	136942.60
Additional yield (m <sup>3</sup> )	-	22907.00	-	68721.00
Total:	21082.74	50317.07	43634.89	205663.60

## C H A P T E R - V

### LOGGING AND ACCESSIBILITY STUDIES

#### 5.1 Objectives:

Logging and accessibility studies in detail was not carried out with respect to the areas under this report in view of the fact that in the present state protection, preservation and development of forests is more important than exploitation.

#### 5.2 Extraction routes:

The District of Santhal Parganas has got the following length of roads covering various parts of the district and having a total length of 4515 km:-

1) National Highway	: Nil.
2) State Highway	: 361 kms.
3) Other metalled and tarred road	: 896 "
4) Kutchha village road	: 2707 "
5) Project roads	: 551 "

ways No extraction by river is possible in this district as the internal rivers are too small and do not carry sufficient water in major portion of the year for floating of timber or firewood for its movement. The state High- and other tarred and metalled roads can be used for extraction of forest produce throughout the year but village roads can be used for extraction of timber only between the month of December to May.

The District of Bhagalpur has got the following length of roads covering various parts of the district and having a total length of 1895 kms:

1) National Highway	: Nil.
2) State Highway	: 175 kms.
3) Other tarred & metalled: roads.	551 "
4) Kutchha village road	: 1169 "



Two important Railway lines passes through this terrain. The break-up is as follows:-

1. Calcutta to Kiul entering the eastern part of the project area near Pakur and leaving the area via Sahebganj and Bhagalpur in the north.
2. The western part of the district is connected by Railway lines running between Chittaranjan to Giridih via Madhupur.

In addition there is a small length of Railway line from Madhupur to Jasidih via Deoghar. Another small Railway line connect the north central portion of the project area falling in Bhagalpur district running between Bhagalpur to Bausi.

The main stations from which forest produce is despatched into various places of the district are given below:-

Sl. No.	Name of the district.	Name of Rly. Stations.	Total no. of wagons despatched.	Total qty. of bamboo, stone, Kendu leaves etc. despatched in tonnes.
1	Santhal Pgs.	1. Sahebganj	37	804
		2. Maharajpur	1627	33786
		3. Tinpahar	751	16527
		4. Bakudih	3096	68114
		5. Barharwa	1403	30854
		6. Tilbhitha	118	2594
		7. Pakur	878	19305
		8. Kotalpakur	1762	38754
		9. Sakarigali	37	815
		10. Karanpurato	1172	25778
		11. Talihari	172	3790
2	Bhagalpur	1. Pirpaiti	45	175
		2. Madarhill	13	585
		3. Bhagalpur	155	2117

The total quantity of bamboo, stones, Kendu leaf, timber, firewood and Sal leaves etc. despatched in tonnes from these districts thus works out to approximately 240000 tonnes and 3000 tonnes respectively with respect to Santhal Parganas and Bhagalpur district. Very small quantity of forest produce from outside is received at different Railway stations of this area.

Practically all the important Railway stations are linked by all weather road and movement of forest produce is not a difficulty throughout the year. As indicated above, though there is a regular movement of forest produce through Railway but this is much less compared to the quantity of forest produce moved by road.

### 5.3 Existing Logging Practices:

The timber in log form is available mainly from a portion of Dumka-Damin range and Godda-Damin Range of Dumka forest division and this is exploited solely by Department and brought to the Depots. Felling and logging are mostly done by orthodox method of using Axe and hand saws and after the logging done in the field the produce is extracted to Depot by Trucks. The Departmental Working Division has also introduced power cross cut saws recently for felling and logging. Some Departmental Saw Mills are also run by the Forest Department for conversion of the logs to T.L. Coggins and other specified utilisable product as per demand. Trees of 3' girth and over are cut and converted into logs of 12' to 18' in length as are required for use. Grading or sorting is done in the Depot at Kathikund and Dumka by Departmental Working Division. Hard fuelwood and Sal poles are also extracted to such depots from nearby areas. A treatment plant has also been established at Dumka for preservation treatment of Electric poles and T.L. Coggins. When the coupes are sold to Contractors, the method of logging and transport is similar as mentioned above. Only difference is that in this case the produce is removed to private Depots in the district as well as in the neighbouring districts. Small Contractors however sometimes use Bullock carts for extraction. Some produce also find its way to Calcutta market or to the industrial areas in Bengal in nearby districts.

5.4 Terrain classification:

Detailed study on terrain classification was not undertaken.

5.5 Proposed logging practices including road planning:

There is nothing to report at this stage as protection of forest and conservation of trees is of utmost importance in the areas. However, as a general suggestion, it may be mentioned that some improvement of roads in Dumka-Damin range and Godda-Damin Range of Dumka Forest Division and Katoria range of Deoghar Forest Division will help in better extraction of forest produce and its economic utilisation. This may be taken up subject to the availability of fund.

## C H A P T E R - VI

### CONSUMPTION STUDIES

#### 6.1 Objectives:

Consumption study based on a definite methodology and design, was not conducted at Santhal Parganas. The field staff, during inventory, collected various data, wherever possible, regarding consumption of firewood and timber, from the local people as well as the local Saw Mills. These data were compiled in order to assess the present requirements of timber and firewood, of the local population and the industries, in the project area.

#### 6.2 Consumption by large industries:

There is no large industry situated in the project area. Departmental supply of mainly poles and T.L.Coggins are made annually to various Government agencies such as the neighbouring Collieries, Bharat Coking Coal Ltd., C.C.L., E.C.L. etc. The average annual requirement of these produces are 243 m<sup>3</sup> of poles and 129 m<sup>3</sup> of T.L. Coggins and fencing posts.

#### 6.3 Consumption of small industries:

Demand from Saw Mills: Saw Mills were found to be the major forest industry in the area. As per records available, there are 34 Saw Mills existing in Santhal Parganas District and 24 Saw Mills in Bhagalpur District. A sample survey of 18 Saw Mills were done over various localities out of which 13 Saw Mills were situated in Santhal Parganas and 5 Saw Mills in Bhagalpur District. It was found that 70% of the Saw Mills possessed capacities less than 800 m<sup>3</sup> per annum and 44% had capacities less than 500 m<sup>3</sup> per annum. The capacity distribution was as follows:-

<u>Capacity of Saw Mills</u>			
	<u>500 m<sup>3</sup></u>	<u>500-800 m<sup>3</sup></u>	<u>&gt;800 m<sup>3</sup></u>
	<u>annually</u>	<u>annually</u>	<u>annually</u>
<u>% of total</u>	44	26	30
<u>Saw Mills</u>			
<u>sampled.</u>			100

The average percentage of capacity utilization was 46.79%. The total demand of wood for the Saw Mills in Santhal Parganas is estimated to be 20037 m<sup>3</sup> and in Bhagalpur it was estimated to be 9267m<sup>3</sup>. The timber used for the purpose are Asan, Mango, Semul, Neem, Jam, Gamar, Kendu, Kara, Kathar etc. The end products are sized wood for packing boxes and planks. The supply is made mostly to the local market and part of it is sent to Calcutta.

Most of the logs are purchased by these Mills locally either from the timber merchants or from the forest coupes. Approximately 5% of the Saw Mills, specially the larger Saw Mills having capacity of more than 1100 m<sup>3</sup> per annum, purchase logs from outside the project area viz., Orissa, Madhya Pradesh and Singhbhum and other parts of Bihar. Soft wood planks converted in these Saw Mills are also exported to the neighbouring Collieries.

#### 6.4 Household consumption:

There is a great demand for fuelwood, timber, pole and other forest produce by the local population. Their requirements, beside firewood, are chiefly Sal poles of 30-70cm.girth and bamboos and thatch grasses for building their houses. Species such as Pial (*Buchanania latifolia*), Gamar (*Gmelina arborea*), Asan (*Terminalia tomentosa*), Jamun (*Sizygium cumini*) alongwith other miscellaneous species are used for the purpose of constructing their houses, agricultural implements, furniture and utensils etc.

The present survey indicates that there are 609071 houses in the rural and 67574 houses in the urban sector of the project area. A low intensity survey was conducted to find out the quantity of wood required in construction of new houses and repair of old houses. It is ascertained that the quantity of wood required for house construction is about 1.9 m<sup>3</sup> in rural and 0.8 m<sup>3</sup> in urban areas respectively.

Based on the growth of new houses in the project areas as available from past records, the number of new houses constructed in the rural and urban areas works out to be 10476 and 2392 (per year) respectively.

#### No. of houses and wood requirement

Category	Total No. of house.	No. of houses annually constructed.	Wood requirement for new construction (1.9 = R & 0.8 O U )
Rural	609071	10476	19904.40
Urban	67574	2392	1913.60
Total:	676645	12868	21818.00

It has been found out in the survey that repairs of rural houses are carried out at an interval of 10 years and the quantity of timber required is about 10% of the new house construction. Thus the annual requirement of timber for repair of rural houses works out to be  $0.02 \text{ m}^3$  per house. Accordingly the total annual wood requirement for repair of rural houses is  $12180 \text{ m}^3$ .

The requirement of wood for repairs of Pucca houses is almost negligible and, therefore, has not been considered.

The number of cultivators in the project area is estimated to be 871354. Each cultivator requires  $0.02756 \text{ m}^3$  of wood for construction of agricultural implements which has a longevity of 2 years. Accordingly, the total wood required annually for agricultural implements work out to be  $24397.91 \text{ m}^3$ .

The timber required for making of furniture and household utensils is estimated to be  $0.025 \text{ m}^3$  per family in the rural areas. The quantity required in the rural household will be  $15226.78 \text{ m}^3$ .

#### 6.5 Fuelwood consumption:

Revelle(1976) while working out the pattern of energy use in rural India has found that out of the 80% of rural energy which comes from the traditional sources, 64% is met from firewood which is used mainly for cooking and heating.

A low intensity sampling in the villages of the project area revealed that the per capita consumption of fuelwood in the urban and rural sector is 0.189 tonnes and 0.264 tonnes respectively per annum. On this basis, the total quantity of fuelwood required will be  $1935440.843 \text{ m}^3$  per annum for 4872566 number of rural population and 405445 numbers of urban population as per details below:-

Item	Population	Per capita consumption (in tonnes)	Total consumption in tonnes	Total consumption in $\text{m}^3$
Rural	4872566	0.264	1286357.42	1826627.52
Urban	405445	0.189	76629.55	108813.32
Total:	5278011		1362986.97	1935440.84

It will be seen from the aforesaid paragraph that the fuelwood requirement of the project area annually is only 1935440 84 m<sup>3</sup>. It is ascertained that out of this total requirement of fuelwood, 35/ comes from Dungcake, Bagasse Vegetable waste, Paddystraw, Saw Mill waste etc. Another about 30/ requirement comes from the unrecorded sources outside the forest area. About 10/ of fuel demand is met up from hard coal obtained from nearby mines and received locally through dealers. About 2 / of fuelwood requirement also comes from the dry fallen leaves and twigs collected by local people through sweeping of forest floor. Thus, the net demand of firewood on forest sources is worked out as under:-

Sl No	Category of alternative fuel	Percentage	Availability(m <sup>3</sup> )
1	Dungcake, Bagasse, Vegetable waste etc	35	677404 28
2.	Unrecorded sources (including produce coming from adjacent Districts)	30	580632 24
3	Hard coke	10	193544 08
4	Dry fallen leaves	2	38708 81
	Total from all sources as above	77	1490289 41
	Net demand on forest sources	23	445151.43

On the face of the above, the total demand in the area for all categories of wood utilisation is worked out as under:-

Sl No	Category of wood demand	Requirement(m <sup>3</sup> )
1	Departmental supply of Cogging & Poles	372
2	Saw Mills	29304
3	House-hold consumption	21818
4	Repair of old houses	12180
5	Agricultural implements	24397.91
6	Furniture and household purpose	15226 78
7	Fuel	1935440 84
	Total:	2038739 53

6.6 Demand according to utility classes:

During inventory it was seen that out of the above demand for wood in the consumption in Saw Mills, house construction and repair, and in making of furniture and household implements, wood is used mainly in the form of timber. Some poles are required during house construction and repair but the quantity has been found to be negligible. Poles are used locally for making of agricultural implements. The demand, if divided among utility classes, would then be as follows:

Sl. No.	Category of demand.	Total demand (m <sup>3</sup> )	Demand according to utility class-			
			Timber (in m3)	Pole (m3)	Sleeper/ T.L. Coggins (m3)	Fuelwood (m3)
1.	2.	3.	4.	5.	6.	7.
1.	Departmental supply of Coggins & poles.	372.00	-	243.00	129.00	-
2.	Saw Mills	29304.00	29304.00	-	-	-
3.	Household consumption	21818.00	21818.00	-	-	-
4.	Repair of old houses.	12180.00	12180.00	-	-	-
5.	Agricultural implements.	24397.91	-	24397.91	-	-
6.	Furniture & Household purpose.	15226.78	15226.78	-	-	-
7.	Fuelwood (On Forest Resources)	445151.43	-	-	-	445151.43
Total:		548450.12	78528.78	24640.91	129.00	445151.43



### 6.7 Wood Balance:

The wood-balance between the demand and yield from forest sources, according to utility classes, will be as follows:-

Item	Timber (m3)	Pole (m3)	Sleeper/ T.L. Coggins (m3)	Fuelwood (m3)
Estimated yield	21082.74	50317.07	43634.89	205663.60
Total demand	78528.78	24640.91	129.00	445151.43
Net Balance (-)	57446.04	+25676.16	+43505.89	(-)239487.83

It is thus seen that considerable deficit exists while meeting the demand of timber and fuelwood from the forest sources. A part of this deficit is met from wood available from trees standing in private land. No data is available for such resources. Also some percentage of Saw Mills import timber from neighbouring areas for which no reliable data exist. This imported timber also goes a long way towards meeting the deficit in timber.

It is also seen that there are sizeable surplus available in poles and Sleeper/T.L.Coggins. Their use is mostly in the neighbouring Coalfields and as such the demand is largely from outside the project area. These surpluses are mostly exported to the demand zone. But it can be utilised in meeting partly the local demand if the export of these forest produces are controlled.

### 6.8 Consumption of Bamboo:

Bamboos are used in the rural areas mostly for construction and repair of Kuchha houses. During survey of forest resources of South West Bihar, it was found that the annual requirement of bamboos for construction of a new house was 1.9 tonnes. It was also found that the repair to the houses was carried out at an interval of 10 years and the bamboos required for repair was estimated to be 10% of the new house construction. On these premises, the demand of bamboos are estimated as follows:

.....			
Sl. No.	Item	No. of houses.	Requirement of Bamboo per house in tonnes.      Total in tonnes.
.....			
1.	Annual construction of Kutchha houses.	10476	1,900      19904.40
2.	Repairing	609071	0.19      115723.49
Total:			135627.89
.....			

The above requirement of bamboo is met partly from the forest and partly from private land where bamboos are grown.

#### 6.9 Conclusion:

It will thus be seen that there is a tremendous pressure on the forest resources of the area owing to the local demand which mostly comes in the form of requirement of fuelwood by local people. So, if the forests of the project area is required to be protected then either the volume outturn/ha. of the forest will have to be increased or alternative arrangement of bringing hard coal from the nearby mines and its regular distribution to interior village areas has to be made. Equally important is that the people must be taught about the use of coal by switching over from their orthodox habit of utilising firewood as a major source of their fuelwood. Otherwise the forest capital is bound to be over exploited leading to further destruction of forests.

## C H A P T E R - V I I

### ECOLOGICAL CHANGES AND STATUS OF FLORA AND FAUNA

#### (a) Dumka Division:

The Working Plan of Dumka Division states that almost pure Sal occurs on the plains and all along the boundary of lower slopes over a strips of 20-24 chains with occasional breaks. The limited quantity of fairly good quality Sal was also found to occur in valleys and in sheltered pockets of the 'Old Reserve'. 90% of the crop was found to be Sal with associates as Pterocarpus marsupium, Terminalia tomentosa, Diospyros melanoxylon, Anogeissus latifolia, Gmelina arborea, Adina cordifolia, Emblica officinalis. The mixed forest was found to be restricted to continuous narrow strips on ridges and tops of the hills.

During the inventory, it was found that the occurrence of pure Sal was restricted and even in the predominantly Sal forests the percentage of occurrence of Sal was only 43% with <sup>10-15%</sup> associates as Terminalia tomentosa, Buchanania latifolia, Diospyros melanoxylon, Madhuca latifolia, Butea frondosa and Anogeissus latifolia. Approximately 60% of the area was under cover of predominantly Sal forest. Occurrence of miscellaneous species was found to be more frequent and distributed even on lower slopes though restricted mainly in ridges and tops of hills. The common miscellaneous associates found are Terminalia tomentosa, Diospyros melanoxylon, Madhuca latifolia, Bombax ceiba, Adina cordifolia, Anogeissus latifolia, Lannea coromandelica. Incidence of Sal of sizes of 20-30 cm. diameter was found to be more in the area south of Bansloi river and north of Gumani, Brahmani river. Large sized trees, which were to be retained as standards to be worked on a rotation of 120 years, were found to be conspicuously absent except for a few large sized trees of Dumka-Damin & Goda-Damin Ranges.

In most of the Sal areas it was observed that though the coppice regeneration was good the shoots were not allowed to grow well due to merciless cutting of forests for firewood by the local population. Most of the regeneration shoots are not allowed to grow to exploitable diameter and the majority of the crop are felled much before they can reach maturity.

The wide and frequent occurrence of *Bantulsi*, *Kalmegh*, *Zizyphus* spp. *Carissa spinarum*, *Aegle marmelus*, *Bankapash* of *Zerophytic* type indicate that the region is becoming progressively drier. The valuable miscellenous species are also disappearing slowly giving way to species like *Diospyros melanoxylon* and *Madhuca latifolia* which were frequently found as large sized trees. Degraded forest land with scrubby vegetation, rooted waste and malformed trees were noticed at many places during the inventory work. Existence of totally blank areas with exposed rocks are also not uncommon.

In order to meet the demands of the local population excessive fellings are often resorted to which has greatly damaged whatever good forests were available. The extent of tropical dry deciduous scrub forest has increased sizeably at the cost of dry mixed deciduous forest. The evil practice of 'Kuraon' the shifting cultivation has converted many forest areas into scrub and degraded forests. During the revision of the Working Plan of Dumka sizeable forest areas were found to be rooted waste and undergoing rapid soil erosion. As a result the exploitable area under coppice with standard working circle was reduced and almost half of the area was shifted to "Rehabilitation-Cum-Soil Conservation Working Circle" in order to rehabilitate these degraded forests.

(b) Deoghar Division:

The state of forests of Deoghar Division is similar. In the first Working Plan of the Division, it has been stated that Sal is found almost pure in plains and the crops are in general of 10cm. to 15cm. diameter. Large sized poles are found in interior valley bottoms. The main associates were found to be *Terminalia tomentosa*, *Diospyros melanoxylon*, *Buchanania latifolia*, *Adina cordifolia*, *Anogeissus latifolia* etc. Small blanks were found scattered all over the area. Pure Sal were also found in low hillocks and lower reaches of hills with low density and size of 10-15 cm. diameter.

During inventory, it was found that Sal was the predominant species of the Division with 44% occurrence (of Sal) and pure patches of Sal still exist in many pockets but the size is restricted mainly in less than 10cm. diameter class. The common associates of Sal have been found to *Terminalia tomentosa*, *Madhuca latifolia*, *Butea monosperma*, *Ficus* spp., *Sizygium cumini*, *Senecarpus anacardium* etc. The area under miscellaneous species has been found to be less than that under Sal.

Blank areas within the forests were frequently found. The density of the forests was found to be open to very open and depletion of Sal and other valuable miscellaneous species is in progress. Scrub forests were noticed at many places with predominance of thorny and Xerophytic species like Carissa spinarum, Bantulsi, Zizyphus spp., Aegle marmelos etc. There appeared to be a gradual degradation of the soil and consequently of the standing tree crop. Natural regeneration appeared to be absent or insufficient.

In the First Working Plan for Deoghar Forest Division, Coppice Working Circle was prescribed almost in all the forests except those which have been completely or partly robbed of their vegetative cover and for that reason the latter area was put under "Afforestation Working Circle". The area placed under Afforestation Working Circle was only about 500 ha. at that time. There was also a "Bamboo Overlapping Working Circle" for the exploitation of the bamboo bearing areas. During the period of last twenty years, there was so much degradation of forests in this area that in the present Working Plan about 60% of the area of the division had to be allotted to "Rehabilitation-Cum-Soil Conservation Working Circle" and the areas allotted to Coppice with standard Working Circle covered only about 40% of the area of the Division. Bamboo which covered substantial areas of the division in past was virtually exterminated and the requirement of "Bamboo Overlapping Working Circle" was not at all felt. 25% of the area of the division is now virtually blank and devoid of tree growth. A sizeable portion of top soil has been completely washed away leading to exposure of mother rocks.

Thus, there has been a gradual depletion of the original dominant species 'Sal' alongwith its valuable miscellaneous associates under relentless pressure of biotic factors leading to drier condition of the locality including invasion by some grasses and shrubby thorny species.

As regards the fauna, there has been an overall dwindling of wild animal heritage in the area. This area in historical past harboured even wild Elephant and Rhinoceros. About two to three decades back this area was quite rich in wild animals like Tiger, Bear, Leopard, Deer, Sambar, Wild Boar etc. Due to depletion of forests through over felling, illicit cutting, fire shifting cultivation as well as due to indiscriminate killing of animals in the name of sports, trade and customary tribal shikar, the wild life population has become so poor that there is hardly any wild animal worth mentioning in the area. Only a counted number of Panther, Bear, Hyena, Wolf and wild boar are found in very restricted and sheltered areas. Few Peacocks and wild fowl are found in the higher reaches of the interior hills. Even these remnant species of wild animals are threatened with extinction and it is difficult to say if it will at all be possible to protect these species of wild animal from total extinction.

## C H A P T E R : VIII

### PHOTOINTERPRETATION AND REMOTE SENSING STUDIES

No aerial photographs or Satellite Imageries were available for the project area under report. Therefore, the result of investigation on photo-interpretation and remote sensing studies could not be incorporated in this report. However, this is being taken up separately and when the maps and imageries are available, a separate report will follow.

## C H A P T E R - I X

### PLANTATION ACTIVITIES IN FORESTS WITH SPECIAL REFERENCE TO SOCIAL FORESTRY

It will be seen from earlier chapters that there is gradual depletion of forest resources in the area and fairly good amount of waste and fallow lands are available outside the control of Forest Department. It appears that preservation or development of forests may not be possible through administrative machinery alone and people's participation in forestry activities including large scale afforestation is a must in protecting and developing the forest resources of the area. Though in recent years as much as 2750 ha. of plantation is being taken up in the project area annually through funds coming from forestry and other sectors, but that is considered extremely inadequate compared to the demand and necessity of large scale afforestation in the area. Apart from this, there are some areas where the local people need fuelwood, but there is no forest department land nearabout. In view of this, mass scale launching of social forestry programme of raising plantations in all available land along road side, Railway lines, Canal banks, fringe land of agricultural field, waste land, community lands are felt as a dire necessity.

A rough estimate of the availability of land in the project area indicates that in Dumka Forest Division out of about 40,000 ha. of approved shifting cultivation area, 50% can easily be taken under social forestry programme. This works out to be 20,000 ha. of land being available for social forestry works. In addition to this, the quantum of various Government land likely to be available for social forestry works will not be less than 5,000 ha. Similarly another 5,000 hectare of land is likely to be available from various old fallows under private ownership. Thus, nearly 30,000 ha. of land outside the control of Forest Department can easily be available for taking up social forestry works in the area if proper organisation is set up and proper liaison and working condition created.



It is encouraging to note that a special feasibility study for social forestry work of the area has been carried out by SIDA through agencies like X.L.R.I., I.S.S., R.C.C.F. and Tribal Research Institute. The report in the matter has already been submitted. The terms and conditions are now being finalised and actual action programme is likely to be taken up soon.

At present small scale social forestry programme is being undertaken in experimental basis in isolated pockets through the existing Organisation of the divisions. Initial results are fairly encouraging. There is a programme of opening up an independant social forestry organisation in the area headed by a Conservator of Forests with 2/3 Deputy Conservators under him. The sooner this comes up the better.

## C H A P T E R - X

### CONCLUSIONS AND RECOMMENDATIONS

#### 10.1 Main results and conclusions:

Approximately 92% of the population of the project area reside in the rural areas. Majority of them earn their livelihood through agriculture. Due to orthodox agricultural practice and lack of enough input the yield from agricultural land is very poor. Employment opportunities in the area is limited as such the bulk of the population of the area live below poverty line.

Rural population is greatly dependent on forest for fuelwood and timber. The previous system in which the rural population collected their bonafide requirement of forest produce from the forest, as of right, no longer exists now. The present collection of forest produce from the forest by the villagers are controlled and restricted. This has caused resentment among the rural people and a tendency to remove forest produce, as of right, remains.

With the increase in population, the demand of forest produce specially fuelwood has soared up and has now become a heavy burden on the available forest resources.

Indiscriminate removal of forest produce by the local people and wide spread practice of 'Kuraon', a traditional form of shifting cultivation in forest land have been the major causes of recession of forest cover and depletion of its resources.

Approximately 58% of the project area contain poor density crop and approximately 16% of the forest area contains young crop of regeneration stage. Thus, only 26% of the area contain forest crop with satisfactory density and fit for exploitation.

Only 26% of the area in Dumka Division and approximately 18% of the area in Deoghar Division contain crop of size more than 20cms. d.b.h. Out of this, about 18% in Dumka and about 16% in Deoghar Division, contain poor density crop. Thus the availability of area under timber sized crop with good density is only .8% in Dumka and 2% in Deoghar Division respectively.

The potential yield of produce from forest area is unable to meet the local demand and the total supply is short of total demand by about 227751 m. Demand for fuelwood is approximately 95% of the total demand of wood.

Only 5.5% of the forest area in Bhagalpur is Reserved Forest and the balance is Protected Forest.

Only 5.3% of the total forest area of Santhal Pargana is Reserved Forest. The balance 94.7% area is Protected Forest out of which approximately 50% is undemarcated Protected Forest for which it has become very difficult to provide protection and also to exercise proper control.

## 10.2 Variation from past study:

The study of the Preinvestment Survey Of Forest Resources in the year 1977 in the adjacent areas of South West Bihar indicates the following number of stems and volume/ha. over 10cm. diameter class:-

Species	Stems/ha.	Volume in m3/ha.
Sal	196.19	29.60
Miscellaneous	247.67	31.98

In the present inventory the number of stems and growing stock of the project area above 10cm.dia.class has been found out to be as under:-

Name of the Division	Species	Stems/ha.	Vol.in m3/ha.
Dumka	Sal	76.12	19.001
	Misc.	63.47	19.13
Deoghar	Sal	26.78	15.86
	Misc.	53.71	19.84
Bhagalpur	Sal	33.08	8.13
	Misc.	31.54	9.65

It is seen from the comparative studies that there is gradual dwindling of density of trees from earlier study and a lot of productive areas of past have now been so badly affected that these areas had to be transferred to "Rehabilitation Working Circle" needing large scale afforestation, soil conservation treatment, protection and adoption of special improvement measures. The number of stems in the higher diameter class is also found to be much less than earlier report.

There has been a general change from comparatively moist to drier condition and wild life of the areas is virtually on way of extinction. The main reasons for this change is the continuous pressure on forest land and difficulty in protecting forests from various biotic interference. The staff position is probably inadequate and the machinery for protection and development is also not sufficient.

#### 10.3 Final recommendations and proposals:

1. The forest of project area requires adequate protection. The forest is required to be demarcated immediately and steps are required to be taken to change the legal status from P.F. to R.F. for better control and protection.
2. Forestry developmental activities are required to be intensified in order to provide employment opportunities to the local people.
3. The local population are required to be made self sufficient in their needs of fodder and fuelwood. Social Forestry Programmes are required to be augmented for raising firewood trees in private and community land.
4. Alternative fuel in the shape of coal is to be made available easily and cheaply to the villagers in order to relieve the pressure on forest for fuelwood.
5. Adequate rest is required to be provided to the areas where the forest crop has been degraded due to maltreatment. Crop is to be improved through silvicultural operations and protection.
6. Blank areas are required to be located and planted with quick growing species which have fuelwood and fodder value.
7. More and rational utilization of minor forest produce and development of cottage industry based on such produce in the area are required through Departmental initiative to improve the economic standing of the local people.

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4. Bihar Statistical Hand Book (1978)
5. Statistical Glimpes of Bihar Forest(1976-77)
6. Resources survey report of Monghyr, Bhagalpur & Santhal Parganas by P.D.Sahay - 1981.
7. Inventory report on South West Bihar(conducted by Preinvestment Survey Of Forest Resources, Northern Zone, 1976-77).

:68:

TABLE NO.1.1.1

STEMS PER HECTARE BY SPECIES AND DIAMETER CLASSES( IN CM.) DIVISION: DUMKA

STRATUM: SAL

SP. NAME	code	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100	TOTAL
ANOGEISSUS LATIFOLIA	1		1.212										1.212
ADINA COROFOLIA	2		0.303										0.303
ARTOCARPUS CHAPLASHA	17		-	0.303									0.303
ALSTONIA SCHOLARIS	19		-	-				0.303					0.303
ANACARDIUM OCCIDENTALE	31		0.608	-				-					0.608
ACER SPECIES	35		0.606	-				-					0.606
ALBIZZIA SPECIES	54		0.303	-				-					0.303
BAUHINIA SPECIES	69		0.303	-				-					0.303
BOMBAX CEIBA	73		0.606	-				-					0.606
BOSWELLIA SERRATA	74		0.303	-				-					0.303
BRIDELIA RETUSA	75		0.303	-				-					0.303
BUCHANANIA LATIFOLIA	76		2.727	0.606				-					3.333
BUTEA FRONDOSA	78		1.212	0.606				-					1.818
CASSIA FISTULA	97		-	0.303				-					0.303
DIOSPYROS MELANOXYLON	161		1.212	0.909	-	0.606		-			0.303		3.030
DALBERGIA SISOO	181		0.303	-		-		-					0.303
DIOSPYROS SPECIES	188		0.606	-		-		-					0.606
FLAEGAGNUS UMBELLATA	215		1.212	-		-		-					1.212
GARUGA PINNATA	239		0.303	-		-		-					0.303
LANNEA COROMANDELICA	301		0.909	-		-		-					0.909
MADHUCA LATIFOLIA	326		0.909	1.212	-	0.303		-	0.303	-	-		2.727
MAC-RANGA DENTICULATA	339		0.606	-		-		-	-				0.606

: 69 :

SP. NAME	Code	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100	TOTAL
MORINDA TINCTORIA	348		0.303	-									0.303
ODINI WODIER	383		0.303										0.303
DUGEINIA OOJEINENSIS	384		0.303										0.303
PTEROCARPUS MARSUPIUM	403		1.212										1.212
SPONDIAS PINNATA	460		0.303										0.303
SCHLEICHERA TRIJUGA	461		0.303	-	-	0.303							0.606
SHOREA ROBUSTA	462		30.300	2.424	0.050	0.019							32.793
SIZYGIUM CUMINII	469		1.515	0.303	-								1.818
SEMECARPUS ANACARDIUM	472		0.909										0.909
TERMINALIA BELERICA	506		-	-	-	0.303							0.303
TERMINALIA ARJUNA	508		0.606										0.606
TERMINALIA TOMENTOSA	516		10.908	0.909	-	-							11.817
ZIZYPHUS XILOPYRA	550		0.303										0.303
ZIZYPHUS SPECIES	552		0.303										0.303
O T H E R S	600		3.636	0.303									3.939
TOTAL :			65.750	7.877	0.050	1.533	-	0.303	0.303	-	-	0.303	76.121

: 70 :

TABLE NO. 1.1.2

STEMS PER HECTARE BY SPECIES AND DIAMETER CLASS (IN CM.) DIVISION:DUMKA

STRATUM : MISCELLANEOUS

SP.NAME	Code	5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
ANOGEISSUS LATIFOLIA	1		1.680	0.619	0.265							2.564
ADINA CORDIFOLIA	2		2.033	0.442	0.177							2.652
IEGLE IIRMELOS	4		0.265									0.265
ALBIZZIA LEBBEK	5		0.088									0.088
ALBIZZIA PROCERA	6		0.707									0.707
ACACIA CATECHU	9		0.442									0.442
AZADIRI CHTA INDICA	11		0.088									0.088
ALSTONIA SCHOLARIS	19		-	-	0.088							0.088
ACER SPECIES	35		0.177							0.088		0.177
ARTOCARPUS INTEGRIFOLIA	38		-	-	-					0.088	-	0.088
ALBIZZIA SPECIES	54		-	0.088		0.088						0.177
BAUHINIA SPECIES	69		0.619	0.177								0.796
BOMBAX CEIBA	73		1.503	0.707	0.265	0.177	-	0.088				2.740
BRIDELLIA RETUSA	75		0.972	0.354								1.326
BUCHANANIA LATIFOLIA	76		1.680									1.680
BUTEA FRONDOSA	78		1.061	0.177								1.238
BAUHINIA PURPUREA	82		0.442	0.088								0.530
BAUHINIA RETUSA	84		0.088									0.088
CASSIA FISTULA	97		0.177									0.177
CALLOPHILLUM POLYANTHUM	104		0.177									0.177
CALLICARPA ARBOREA	112		0.530									0.530
CAREYA ARBOREA	116		0.354	0.088								0.442





: 72 :

SP. NAME	Code	5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
SPONDIAS PINNATA	460	0.354	0.265	0.088								0.707
SCHLEICHERA TRIJIGI	461	0.442	0.177	0.088								0.707
SHOREA ROBUSTA	462	5.127	0.530	0.088								5.746
STERCULIA VILLOSA	463	-	-	-	0.088							0.088
SYZYGIVM CUMINII	469	0.972	0.088	0.088	0.177							1.414
SEMECARPUS ANACARDIUM	472	0.972	0.265									1.238
TERMINALIA BELERICA	506	0.442	0.088	0.088	0.088	0.088						0.796
TERMINALIA CHEBULA	507	0.088										0.088
TERMINALIA ARUJUNI	508	0.088	-	0.088								0.177
TECTONA GRANDIS	510	0.707	0.177	-	-							0.884
TAMARINDUS INDICA	515	-	-	-	-	0.177	0.088					0.265
TERMINALIA TOMENTOSA	516	5.127	0.884	0.354	0.265	-						6.718
ZIZYPHUS SPECIES	552	0.265	0.088									0.354
O T H E R S	600	3.890	0.619	-	0.088	0.088	0.088	-	0.088	-	-	4.774
TOTAL:		48.708	8.221	2.917	1.238	0.972	0.796	0.354	0.265	-	-	63.471

: 73 :

TABLE NO.1.2.1

STEMS PER HECTARE BY SPECIES AND DIAMETER CLASS (IN CM.) DIVISION: DEOGHAR.

STRATUM: SAL

SPECIES NAME	Code	5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100	TOTAL
BUTEA MONOSPERMA	88		0.357	0.357									0.714
FICUS SPP.	233		-	-						-	-	0.357	0.357
MADHUCA LATIFOLIA	326		3.571	4.285	1.428	0.714	0.714	-	-	-	-	-	10.713
SHOREA ROBUSTA	462		11.784	0.714	0.357	-	-						12.856
SYZYGIUM CUMINII	469		-							0.357	-	-	0.357
SEMECARPUS ANACARDIUM	472		0.357										0.357
TERMINALIA TOMENTOSA	516		1.071										1.071
OTHERS	600		0.357										0.357
TOTAL:		17.498	5.357	1.786	0.714	0.714	-	-	-	0.357	0.357	26.783	

: 74 :

TABLE NO.1.2.2

STEMS PER HECTARE BY SPECIES AND DIAMETER CLASS (INCM.)

DIVISION: DEOGHAR STRATUM: MISCELLANEOUS

SPECIES NAME	Code	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	TOTAL
BOMBAX CEIBA	73		1.428										1.428
BUTEA FRONDOSA	78		25.713	15.713	1.428	1.428							44.284
ERYTHRINA SUBERDOSA	202		2.857	1.428	-	-							4.286
LANNEA COROMANDELICA	301		1.428										1.428
MADHUCA LATIFOLIA	326		-			1.428	1.428	-	-	-	-	-	2.857
SYZYGIUM CUMINII	469		-			-	1.428	-	-	-	-	-	1.428
TOTAL:			31.427	17.142	1.428	2.857	2.857	-	-	-	-	-	55.712

: 75 :

TABLE NO:1.3.1

STEMS PER HECTARE BY SPECIES AND DIAMETER CLASS (IN CM)

DIVISION: DEOGHAR STRATUM: SAL

SPECIES NAME	Code	DIAMETER CLASSES (IN CM.)										TOTAL
		5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	
ACACIA CATECHU	9		1.923									1.923
BUCHANANIA LATIFOLIA	76		0.385									0.385
DIOSPYROS MELANOXYLON	161		1.154	0.385								1.538
FICUS SPP.	233							0.385				0.385
GMELINA ARBOREA	246		0.385									0.385
LANNEA COROMANDELICA	301		0.385									0.385
MADHUCA LATIFOLIA	326		2.692	1.154	1.154	0.769						5.769
SHOREA ROBUSTA	462		13.461	0.769	0.385							14.615
STERCULIA VILLOSA	463		0.385									0.385
TERMINALIA BELERICA	506		0.385									0.385
TERMINALIA TOMENTOSA	516		4.231	0.769								5.000
OTHERS	600		0.769	1.154								1.923
TOTAL			26.153	4.231	1.538	0.769			0.385			33.076

TABLE NO: 1.3.2

## STEMS PER HECTARE BY SPECIES AND DIAMETER CLASS (IN CM.)

DIVISION: DEOGHAR STRATUM: MISCELLANEOUS.

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)										TOTAL
		5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	
ACACIA CATECHU	9		4.615								4.615	
BUCHANANIA LATIFOLIA	76		1.538								1.538	
BUTEA MONOSPERMA	86		-	0.769							0.769	
MADHUCA LATIFOLIA	326		4.615	5.384	4.615	-	0.769				15.384	
NYCOANCHES ARBORISTIS	376		0.769								0.769	
SHOREA ROBUSTA	462		2.308								2.308	
TERMINALIA TOMENTOSA	516		3.077								3.077	
OTHERS	600		3.077								3.077	
TOTAL:		19.999	6.154	4.615	-	0.769	-	-	-	-	31.537	

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TABLE NO:2.1.1

## TOTAL STEMS (IN 000 UNIT) BY SPECIES AND DIAMETER CLASS (IN CM.)

DIVISION: DUMKA DISTRICT: SANTHAL PARAGANA STRATUM: SAL

[illegible]

: 78 :

SPECIES NAME	CODE	5-09	10-19	20-29	30-39	40-49	50-59	60-69	70-80	90-100+	TOTAL
DIAMETER CLASSES (IN CM.)											
LANNEA COROMANDELICA	301		33.077						79.89		33.077
MADHUCA LATIFOLIA	326		33.077	44.102		11.026			11.026		99.230
MAGARANGA DENTICULATA	339		22.051								22.051
MORINDA TINCTORIA	348		11.026								11.026
ODINI WOODIER	383		11.026								11.026
OUGENIA OOJEINENSIS	384		11.026								11.026
PTEROCARPUS MARSUPIUM	403		44.102								44.102
SPONDIAS PINNATA	460		11.026								11.026
SCHLEICHERA TRIJUGA	461		11.026			11.026					22.052
SHOREA ROBUSTA	462		1102.554	88.204	1.819	0.691					193.268
SYZYGium CUMINII	469		55.128	11.026	-	-					66.154
SEMECARPUS ANACARDIUM	472		33.077	-							33.077
TERMINALIA BELERICA	506					11.026					11.026
TERMINALIA ARJUNA	508		22.051								22.051
TERMINALIA TOMENTOSA	516		396.919	33.077	-						429.996
ZIZYPHUS ZYLORPYRA	550		11.026								11.026
ZIZYPHUS SPECIES	552		11.026								11.026
OTHERS	600		132.306	11.026							143.332
TOTAL:			2392.545	286.665	1.819	55.819	-	11.026	11.026	-	2769.826



## STRATUM: MISCELLANEOUS

[illegible]



SPECIES NAME	CODE	5-10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100	TOTAL
OSTODES PANICULATUS	377	22.029									22.029
ODINI WOODIER	383	88.118	22.029	11.015		11.015					132.177
BUGENIA OOUJEINEISLS	384	22.029									22.029
PTEROCARPUS MARSIHUM	403	11.015									11.015
PRUNUS CORNUTA	407	11.015									11.015
SPONOTUS PINNATA	460	44.059	33.044	11.015							88.118
SCHILETCHERA IRIJIGA	461	55.074	22.029	11.015							88.118
SHOREA ROBUSTA	462	638.855	66.088	11.015							715.958
STERCULIA VILLOSA	463	-		11.015							11.015
SYZYGIUM CUMINII	469	121.162	11.015	11.015	22.029						176.236
SEMECARPUS ANACARDIUM	472	121.162	33.044								154.206
TERMINALIA BELERICA	506	55.015	11.015	11.015	-	11.015					99.133
TERMINALIA C. EBULIA	507	11.015									11.015
TERMINALIA ARJUNA	508	11.015	-	11.015							22.029
TECTONA GRANDIS	510	88.118	22.029								110.147
TAMARINUS INDICA	515				22.029	11.015					33.044
TERMINALIA TOMENTOSA	516	638.865	110.147	44.059	33.044	11.015					837.120
ZYZYPHUS SPECIES	552	33.044	11.015								44.059
OTHERS	600	484.648	77.103	-	11.015	11.015	11.015	-	11.015	-	594.796
TOTAL:		6069.1191024.370	363.486154.206	121.162	99.133	44.059	33.044	-	7908.580		

TABLE NO: 2.2.1  
TOTAL SYSTEMS (IN 1000 UNIT) BY SPECIES AND DIAMETER CLASSES (IN CM.)

DIVISION: DEOCHUR IN SINTHAL PARGANA DISTRICT

STRATUM: SAL

SPECIES NAME	CODE	5-10-19	20-29	30-39	40-49	50-59	60-70	80-90	100+	TOTAL
BUTEA MONOSPERMA	86	8.970	8.970							17.941
FICUS SPP.	233									8.970
MADRACA LATIFOLIA	326	89.704	107.644	35.881	17.941	17.941				269.111
SHOREA ROBUSTA	462	296.022	17.941	8.970						322.933
SYZYGIUM CUMINII	469									8.970
SEMECARPUS ANACARDIUM	472	8.970								8.970
TERMINALIA TOMENTOSA	516	26.911								26.911
OTHERS	600	8.970								8.970

TOTAL:

439.547 134.555 44.852 17.941 17.941 8.970 8.970 672.776

TABLE NO: 222.2

TOTAL STEMS (IN '000 UNIT) BY SPECIES AND DIAMETER CLASS (IN CM.)  
 DIVISION: DEOGHAR IN SANTHAL PARGANA DISTRICT. STRATUM: MISCELLANEOUS.

SPECIES NAME	CODE	DIAMETER CLASSES ( IN CM.)									
		5-	10-19	20-29	30-39	40-49	50-59	60-	70-	80-	90- 100+ TOTAL
		09						69	79	89	99
BOMBAX CEIBA	73										8.971
BUTEA FRONDOSA	78										8.971
ERYTHRINA SUBEROSA	202										8.971
LANNEA COROMANDELICA	301										8.971
MADHUCA LATIFOLIA	326										8.971
SYZYGIUM CUMINII	469										8.971

TOTAL: 197.362 107.652 8.971 17.942 17.942 17.942 17.942 17.942 17.942 17.942 17.942 17.942

TABLE NO: 2.3.1

TOTAL STEMS (IN '000 UNIT) BY SPECIES AND DIAMETER CLASSES (IN CM.)												
DIVISION: DEOGHAR IN BHAGALPUR DISTRICT.												
STRATUM : SAL.												
SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)										
		09	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+ TOTAL
ACACIA CATECHU	9		58.187									58.187
BUCHANANIA LATIFOLIA	76		11.637									11.637
DIOSPYROS MELANOXYLON	161		34.912	11.637								48.550
FICUS SPP.	233								11.637			11.637
GMELINA ARBOREA	246		11.637									11.637
CANNEA COROMANDELICA	301		11.637									11.637
MADHUCA LATIFOLIA	326		81.462	34.912	34.912	23.275	-	-	-	-	-	174.562
SHOREA ROBUSTA	462		407.312	23.275	11.637	-						442.224
STERCULIA VILLOSA	463		11.637									11.637
TERMINALLA BELERICA	506		11.637									11.637
TERMINALLA TOMENTOSA	516		128.012	23.275								151.287
OTHERS	600		23.275	34.912								58.187
TOTAL			791.349	128.012	46.550	23.275	-	-	11.637	-	-	1000.824

: 85 :

TABLE NO: 2.3.2

TOTAL STEMS(IN '000 UNIT)BY SPECIES AND DIAMETER CLASSES(IN CM.)

DIVISION: DEOGHAR IN BHAGALPUR DISTRICT.

STRATUM : MISCELLANEOUS.

SP. NAME	CODE	5= 10-19	6= 20-29	7= 30-39	8= 40-49	9= 50-59	10= 60-69	11= 70-79	12= 80-89	13= 90-99	TOTAL
ACACIA CATECHU	9	69.825									69.825
BUCHANANIA LATIFOLIA	76	23.275									23.275
BUTEA MONOSPERMA	86		11.637								11.637
MADHUCA LATIFOLIA	326	69.825	81.462	69.825	-	11.637					232.750
NYCTANIHES ARBORITRISTIX	376	11.637									11.637
SHORUA ROBUSTA	462	34.912									34.912
TERMINALIA TOMENTOSA	516	46.550									46.550
OTHERS	600	46.550									46.550
TOTAL:		302.574	93.100	69.825	-	11.637	-	-	-	-	477.137

TABLE NO: 3.1.1

VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES (IN CM.)

DIVISION: DUMK. IN SANTHAL PARGANA DISTRICT.

STRATUM : SAL

SPECIES NAME	CODE	DIAMETER CLASSES ( IN CM.											TOTAL
		5-10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	
							59			89	99		
ANOGNISSUS LATIFOLIA	1	0.135											0.135
ADINA CORDIFOLIA	2	0.036											0.036
ARTOCARPUS CHAPSASHA	17			0.089									0.089
ALSTONIA SCHOLARIS	19							0.990					0.990
ANACARDIUM OCCIDENTALE	31	0.023											0.023
ACER SPECIES	35	0.039											0.039
ALBIZZIA SPECIES	54	0.013											0.013
BAUHINIA SPECIES	69	0.017											0.017
BOMBAX CEIBA	73	0.043											0.043
BOSWELLIA SERRATA	74	0.014											0.014
BRIDELIA RETUSA	75	0.010											0.010
BUCHANANIA LATIFOLIA	76	0.281		0.180									0.461
BUTEA FRONDOSA	78	0.187		0.158									0.345
CASSIA FISTULA	97	-		0.079									0.079
DIOSPYROS MELANOXYLON	161	0.057		0.340	-	0.912						7.1038	7.1038
DAIBERGIA SISOO	181	0.053											0.053
DIOSPYROS SPECIES	188	0.049											0.049
ELAEGNUS UMBELLATA	215	0.177											0.177
GARUGA PINNATA	239	0.017											0.017
LANNEA COROMANDELICA	301	0.029											0.029
MADHUCA LATIFOLIA	326	0.058		0.384	-	0.429	-	-	1.438	-	-	-	2.310



: 87 :

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)										TOTAL
		5-	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-	90-	
										89	99	
MACARANGA DENTICULATA	339	0.026										0.026
MORINDA TINCTORIA	348	0.017										0.017
ODINI WODIER	383	0.022										0.022
OUGENINIA OOJEINENSIS	384	0.010										0.010
PTEROCARPUS MARSUPIUM	403	0.050										0.050
SPONDIAS PINNATA	460	0.010										0.010
SCHELEICHERA TRIJUGA	461	0.017				0.575						0.575
SHOREA ROBUSTA	462	2.336	0.725	0.041	0.027							3.128
SYZYGIUM CUMINII	469	0.085	0.050	-								0.138
SEMECARPUS ANACARDIUM	472	0.036										0.036
TERMINALIA BELERICA	506					0.364						0.364
TERMINALIA ARJUNA	516	0.023										0.023
TERMINALIA TOMENTOSA	550	0.022										0.022
ZIZYPHUS XILOPYRA	552	0.015										0.015
ZIZYPHUS SPECIES	516	-	0.622	0.334	-							0.956
OTHERS	600	0.188	0.070									0.258
TOTAL:		4.714	2.408	0.041	2.304	-	0.990	1.439	-	7.103		19.001

TABLE NO:3.1.2

VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES (IN CM.) DIVISION: DUMKA  
 STRATUM: MISCELLANEOUS.

SPECIES NAME	CODE	DIAMETER CLASSES: (IN CM.)							TOTAL
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	
ANOGEISSUS LATIFOLIA	*1	0.164	0.346	0.258	-	-	-	-	0.769
ADINA CORDIFOLIA	2	0.261	0.228	0.246	-	-	-	-	0.734
AEGLE MARMELOS	4	0.013	-	-	-	-	-	-	0.013
ALBIZZIA LEBBEK	5	0.003	-	-	-	-	-	-	0.003
ALBIZZIA PROCERA	6	0.046	-	-	-	-	-	-	0.046
ACACIA CATECHU	9	0.024	-	-	-	-	-	-	0.024
AZADIRACHTA INDICA	11	0.003	-	-	-	-	-	-	0.003
ALSTONIA SCHOLARIS	19	-	-	0.069	-	-	-	-	0.069
ACER SPECIES	35	0.008	-	-	-	-	-	-	0.008
ARTOCARPUS INEGRITOLIA	38	-	-	-	-	-	-	0.482	0.482
ALBIZZIA SPECIES	54	-	0.020	-	0.145	-	-	-	0.166
BAUHINIA SPECIES	69	0.059	0.059	-	-	-	-	-	0.118
BOMBAX CEIBA	73	0.129	0.207	0.221	0.266	-	0.260	-	1.083
BRIDELIA RETUSA	75	0.077	0.158	-	-	-	-	-	0.234
BUCHANANIA LATIFOLIA	76	0.148	-	-	-	-	-	-	0.148
BUTEA FRONDOSA	78	0.127	0.083	-	-	-	-	-	0.210
BAUHINIA PURPUREA	82	0.030	0.029	-	-	-	-	-	0.059
BAUHINIA RETUSA	84	0.003	-	-	-	-	-	-	0.003
CASSIA FISTULA	97	0.018	-	-	-	-	-	-	0.018
CALLOPHYLLUM POLYANTHUM	104	0.008	-	-	-	-	-	-	0.008
CALLICARPA ARBOREA	112	0.040	-	-	-	-	-	-	0.040
CAREYA ARBOREA	116	0.014	0.023	-	-	-	-	-	0.037

[illegible]

: 90 :

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)									
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+ TOTAL
ODINI WODIER	383	0.055	0.059	0.089	-	0.175					0.378
OUGENIA OOJEINENSIS	384	0.006									0.006
PTEROCARPUS MARSUPIUM	403	0.006									0.006
PRUNUS CORNUTA	407	0.004									0.004
SPONDIAS PINNATA	460	0.022	0.100	0.073							0.195
SCHLEICHERA TRIJUGA	461	0.020	0.069	0.095							0.183
SHOREA ROBUSTA	462	0.364	0.147	0.090							0.600
STERCULIA VILLIOSA	463	-	-	-	0.167						0.167
SYZYGIUM CUMINII	469	0.068									0.068
SEMECARPUS ANACARDIUM	472	0.045	0.107				0.279				0.152
TERMINALIA BELERICA	506	0.025	0.029	0.078	0.112	-	0.279				0.524
TERMINALIA CHEBULA	507	0.004		0.064							0.004
TERMINALIA ARJUNA	508	0.003									0.003
TECTONA GRANDIS	610	0.090	0.055								0.067
TAMARINDUS INDICA	515	-				0.458	0.279				0.145
TERMINALIA TOMENTOSA	516	0.515	0.367	0.249	0.382	0.241					0.757
ZIZYPHUS SPECIES	552	0.021	0.029								1.654
OTHERS	600	0.274	0.225	-	0.152	0.160	-	0.385	-	-	0.090
TOTAL:		3.817	3.152	2.433	1.818	2.094	2.576	1.623	1.618	-	19.132

: 91 :

TABLE NO: 3.2.1

VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES(IN CM.) ( DIVISION:DEOGLAR STRATUM: S.L.) IN SANTHAL PARGANA DISTRICT.											
SPECIES NAME	CODE	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
BUTEA MONOSPERMA	86	0.032	0.175								0.245
FICUS SPP.	233	-								5.554	5.554
MADHUCA LATIFOLIA	326	0.336	1.515	1.514	1.204	1.713					6.282
SHOREA ROBUSTA	462	0.699	0.230	0.283							1.212
SEZYGIVUM CUMINII	469								1.802		1.802
SEMECARPUS ANACARDIUM	472	0.038									0.038
TERMINALIA TOMENTOSA	516	0.063									0.063
OTHERS	600	0.063									0.063
TOTAL:		1.271	1.918	1.796	1.204	1.713				1.802	15.259

TABLE NO: 3.2.2

## VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES (IN CM.)

DIVISION: DOGHRU IN SANTHAL PARGANA DISTRICT

STRATUM : MISCELLANEOUS...

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)							TOTAL
		10-19	20-29	30-39	40-49	50-59	60-69	70-80	80-99
BOMBAX CEIBA	75	0.081							0.081
BUTEA FRONDOSA	78	2.529	5.975	1.186	1.718				11.408
ERYTHRINA SUBEROSA	202	0.092	0.631						0.723
LANNEA COROMANDELICA	301	0.102							0.102
MADHUCA LATIFOLIA	326					2.127	3.342		5.469
SYZYGIUM CUMINII	469					2.057			2.057
TOTAL:-		2.804	6.606	1.186	3.845	5.399			19.840

: 93 :

TABLE NO: 3.3.1

VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES (IN CM.) DIVISION: DEOGHAR  
IN BHAGALPUR DISTRICT.

STRATUM : SAL.

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)						TOTAL
		10-19	20-29	30-39	40-49	50-59	60-69	
ACACIA CATECHU	9	0.158						0.158
BUCHANANIA LATIFOLIA	76	0.022						0.022
DIOSPYROS MELANOXYLON	161	0.168	0.155					0.323
FICUS SPP.	233	-	-					2.265
GMELINA ARBOREA	246	0.034						0.034
LANNEA COROMANDELICA	301	0.034						0.034
MADHUCA LATIFOLIA	326	0.271	0.359	0.923	1.005			2.558
SHOREA ROBUSTA	462	1.117	0.262	0.346				1.725
STERCULIA VILLIOSA	463	0.049						0.049
TERMINALIA BELERICA	506	0.022						0.022
TERMINALIA TOMENTOSA	516	0.294	0.179					0.473
OTHERS	600	0.080	0.383					0.463
TOTAL:		2.249	1.338	1.269	1.005	-	- 2.265	8.127

: 94 :

TABLE NO: 3.3.2

VOLUME PER HECTARE BY SPECIES AND DIAMETER CLASSES (IN CM.) DIVISION: DEOGHAR IN  
BHAGALPUR DISTRICT. STRATUM : MISCELLANEOUS.

SPECIES NAME	CODE	DIAMETER CLASSES ( IN CM.)									
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
ACACIA CATECHU	9	0.448									0.448
BUCHANANIA LATIFOLIA	76	0.050									0.050
BUTEA MONOSPERMA	86	-	0.280								0.280
M DHUCA LATIFOLIA	326	0.355	1.859	4.118	-	1.800					8.132
NYCTANTAES ARBORISTIS	376	0.044									0.044
SHOREA ROBUSTA	462	0.110									0.110
TERMINALIA TOMENTOSA	516	0.269									0.269
OTHERS	600	0.313									0.313
TOTAL:		1.589	2.139	4.118	-	1.800	-	-	-	-	9.646





: 96 :

SPECIES NAME	CODE	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
MORINDA TINGTORIA	348	0.624									0.624
ODINI WODIER	383	0.790									0.790
OUGEINIA OOJEINENSIS	384	0.355									0.355
PTEROCARPUS MIRSUPIUM	403	1.814									1.814
SPONDIAS PINNATA	460	0.355									0.355
SCHLEICHERA TRIJUGA	461	0.624			20.843						21.467
SHOREA ROBUSTA	462	85.008	26.376	1.492	0.982						113.858
SYZYGIUM CUMINII	469	3.102	1.826								4.928
SEMECARPUS ANACARDIUM	472	1.314									1.314
TERMINALIA BELERICA	506				13.261						13.261
TERMINALIA ARJUNA	508	0.835									0.835
TERMINALIA TOMENTOSA	516	22.633	12.169								34.802
ZIZYPHUS ZYLIOPIYA	550	0.790									0.790
ZIZYPHUS SPECIES	552	0.479									0.479
OTHERS	600	6.829	2.543								9.372
TOTAL:		171.615	87.670	1.492	83.860	36.042	52.367		258.459		691.507

**TABLE NO:4.1.2**

TOTAL VOLUME('COOUNT)BY SPECIES AND DIAMETER CLASSES(IN CM.) STRATUM:MISCELLANEOUS							
DIVISION:DUMKA IN SATHAL PARGANA DISTRICT.							
SPECIES NAME	CODE	10-19	20-29	30-39	40-49	50-59	60-69 70- 79 80- 89 90- 99 TOTAL
ANOGEISSUS LATIFOLIA	1	20.496	43.105	32.200			95.801
ADINA CORDIFOLIA	2	32.528	28.347	30.602			91.477
AEGLE MARMELOS	4	1.580					1.580
ALBIZZIA PROCERA	6	5.779					5.779
ACACIA CATACHU	9	2.954					2.954
AZADIRACHTA INDICA	11	0.355					0.355
ALSTONIA SCHOLARIS	19	-		8,539			8.539
ACER SPECIES	35	0.978					0.978
ARTOCARPUS INTEGRIFOLIA	38					60-009	60.009
ALBIZZIA SPECIES	54	-	2,541	-	18.108		20.648
BAUHINIA SPECIES	69	7.295	7.406				14.702
BOMBAX CEIBA	73	16.105	25.792	27.530	33.145	-	134.975
BRIDELIA RETUSA	75	9.559	19.653				29.212
BUCHANANIA LATIFOLIA	76	18.401					18.401
BUTEA FRONDOSA	78	15.819	10.320				26.139
BAUHINIA PURPUREA	82	3.764	3.608				7.375
BAUHINIA RETUSA	84	0.355					0.355
CASSIA FISTULA	97	2.290					2.290
CALLOPHYLLUM POLYANTHUM	104	0.978					0.978
CALLICRPA ARBOREA	112	4.994					4.994

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)							TOTAL
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	
CAREYA ARBOREA	116	1.689	2.875						4.564
CROTON OBLONGIFOLIUS	141	0.623							0.623
DIOSPYROS MELANOKYLON	161	30.952	20.521	20.946					72.419
DILLENIA PENTAGYNA	164	0.789							0.789
DIOSPYROS EMBRYOPTERIS	165	0.976							0.976
DALBERGIA SPECIES	181	-	2.541						2.541
DALBERGIA	187	0.976							0.976
DIOSPYROS SPECIES	188	3.286							3.286
ELAEODENORON GLAUCUM	194	13.808							13.808
EUGENIA GRANDIS	220	2.639	2.875						5.514
EMBLICA OFFICINALIS	222	1.184	4.006						5.190
FICUS RELIGIOSA	228	2.227							2.227
FICUS SPP.	233	13.498	6.313	13.676					33.487
GARUGA PINNATA	239	3.640							3.640
GARDENIA TURGIDA	240	0.789							0.789
GMELINA ARBOREA	246	6.286							6.286
HOLARRHENA ANTIDYSENTERIC	266	2.227	6.106						8.333
HYMENODICTYON EXCELSUM	269	7.421							7.421
KYDIA CALYCINA	291	2.680							2.680
LAGERSTROEMIA PARVIFLORA	299	15.158	6.313						21.466
LANNEA COROMANDELICA	301	24.702	6.547						31.249
LAGERSTROEMIA SPACIOSA	313	0.623	-						0.623
MADHUCA LATIFOLIA	326	13.370	40.250	71.501	64.479	47.477	151.863	46.541	503.710
MITRAGYNA PARVIFLORA	331	2.142							2.142

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)									
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	TOTAL
MANGIFERA INDICA	333	1.268	2.875			25.770		50.840	73.416	-	154.170
MANGIFERA SYLVATICA	337					24.738	67.188	56.868	-	-	148.795
MANGIFERA ANDAMANICA	370	0.355									0.355
OSTODES PANICULATUS	377	0.710									0.710
ODINI WODIER	383	6.822	7.406	11.103	-	21.770					47.101
OUGENIA OOJEINENSIS	384	0.710									0.710
PTEROCARPUS MARSUPIUM	403	0.789									0.789
PRUNUS CORNUTA	407	0.479									0.479
SPONDIAS PINNATA	460	2.725	12.420	9.149							24.294
SCHLEICHERA TRIJUGA	461	2.456	8.558	11.797							22.812
SHOREA ROBUSTA	462	45.313	18.293	11.172							74.779
STERCULIA VILLIOSA	463				20.823						20.823
SYZYGIUM CUMINII	469	8.509	2.811	6.239	9.454	30.437					57.451
SEMECARPUS ANACARDIUM	472	5.551	13.361								18.918
TERMINALIA BELERICA	506	3.119	3.608	9.779	14.005	-	34.784				65.296
TERMINALIA CHEBULA	507	0.479									0.479
TERMINALIA ARJUNA	508	0.355	-	7.951							8.306
TECTONA GRANDIS	510	11.190	6.881								18.071
TANARINDUS INDICA	515	-				57.016	34.784				91.800
TERMINALIA TOMENTOSA	516	51.731	45.775	30.998	47.574	29.968	-				206.046
ZIZYPHUS SPECIES	552	2.596	3.608								6.204
OTHERS	600	34.142	28.067	-	-	18.992	23.728	-	47.953	-	152.882
TOTAL:		475.570	392.785	303.182	226.579	260.903	321.024	202.203	201.655	-	2383.901

: 100 :

TABLE NO: 4.2.1

TOTAL VOLUME (IN '000 M<sup>3</sup>) BY SPECIES AND DIAMETER CLASSES (IN CM.) DIVISION: DEOGHAR IN SANTHAL PARGANA DISTRICT.

SPECIES NAME	CODE	DIAMETER CLASSES (IN CM.)						Total
		10-19	20-29	30-39	40-49	50-59	60-69 70-79 80-89 90-99	
BUTEA MONOSPERMA	86	1.814	4.358					6.152
FICUS SPECIES	233							139.523
MADHUCA LATIFOLIA	326	8.434	38.063	38.020	30.248	43.038		157.803
SHOREA ROBUSTA	462	17.563	5.780	7.099				30.443
SYZYGIVM CUMINII							45.270	45.270
SEMECARPUS ANACARDIUM	472	0.964						0.964
TERMINALIA TOMENTOSA	516	1.571						1.571
O T H E R S	600	1.575						1.575
T O T A L :		31.922	48.182	45.119	30.248	43.038	45.270	139.523 383.302

TABLE NO. 4.2.2

BOMBAX CEIBA	73	0.508						0.508
BUTEA FRONDOSA	78	15.881	37.520	7.451	10.790			71.642
ERYTHRINA SUBEROSA	202	0.578	3.963					4.541
LANNEA COROMANDELICA	301	0.643						0.643
MADHUCA LATIFOLIA	326			13.360	20.989			34.348
SYZYGIVM CUMINII	469				12.920			12.920
T O T A L :		17.609	41.483	7.451	24.150	33.908		124.601

TABLE NO. 4.3.1

TOTAL VOLUME (IN '000 M<sup>3</sup>) BY SPECIES AND DIAMETER CLASSES (IN CM.) DIVISION : DEOGHAR IN  
BHAGALPUR DISTRICT : STRATUM : SAL

SPECIES NAME	CODE	10-19	20-29	30-39	40-49	50-60	60-70	70-80	80-90	90-100	100+	Total
ACACIA CATECHU	9	4.786										4.786
BUCHANANIA LATIFOLIA	76	0.658										0.658
DIOSPYROS MELANOXYLON	161	5.096	4.676									9.772
FICUS SPECIES	233								68.546			68.546
GMELINIA ARBorea	246	1.031										1.031
LANNEACOROMANDELICA	301	1.031										1.031
MADHUCA LATIFOLIA	326	8.189	10.863	27.933	30.416							77.401
SHOREA ROBUSTA	462	33.789	7.935	10.466								52.190
STERCULIA VILLOSA	463	1.493										1.493
TERMINALLIA BELERICA	506	0.658										0.658
TERMINALLIA TOMENTOSA	516	8.903	5.422									14.325
O T H E R S	600	2.419	11.592									14.011
T O T A L :		68.054	40.487	38.400	30.416				68.546			245.904

TABLE NO. 4.3.2

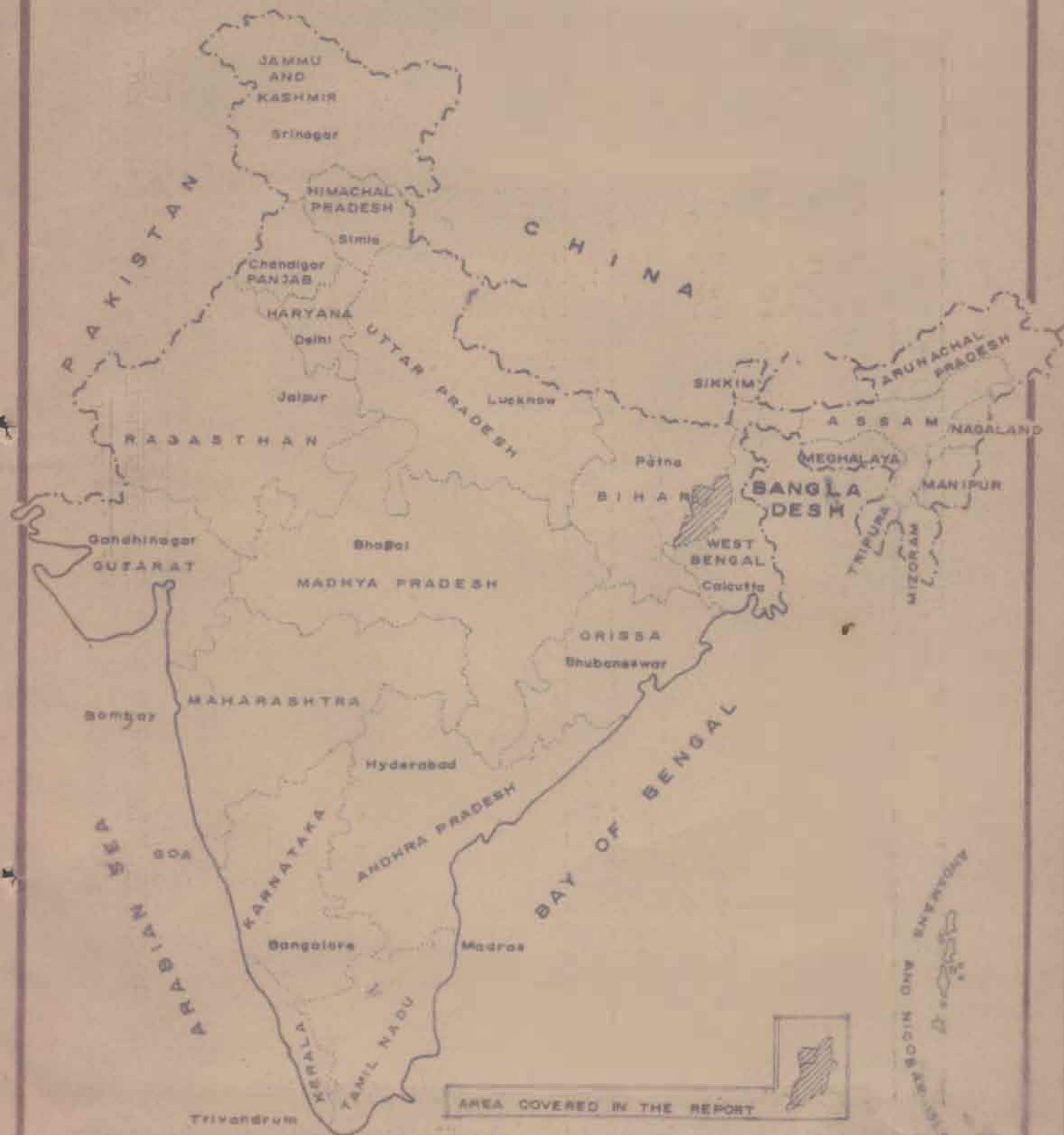
ACACIA CATECHU	9	6.785										6.785
BUCHANANIA LATIFOLIA	76	0.750										0.750
BUTEA MONOSPERMA	86		4.233									4.233
MADHUCA LATIFOLIA	326	5.377	28.125	62.304	27.227							123.034
NYCTANTAES ARBORICRISTIS	376	0.658										0.658
SHOREA ROBUSTA	462	1.664										1.664
TERMINALLIA TOMENTOSA	516	4.064										4.064
O T H E R S	600	4.742										4.742
T O T A L :		24.041	32.357	62.304	27.227							145.930

FOREST SURVEY OF INDIA  
EASTERN ZONE

MAP OF INDIA

SHOWING PROJECT AREA IN SANTHAL PARGANA [BIHAR]

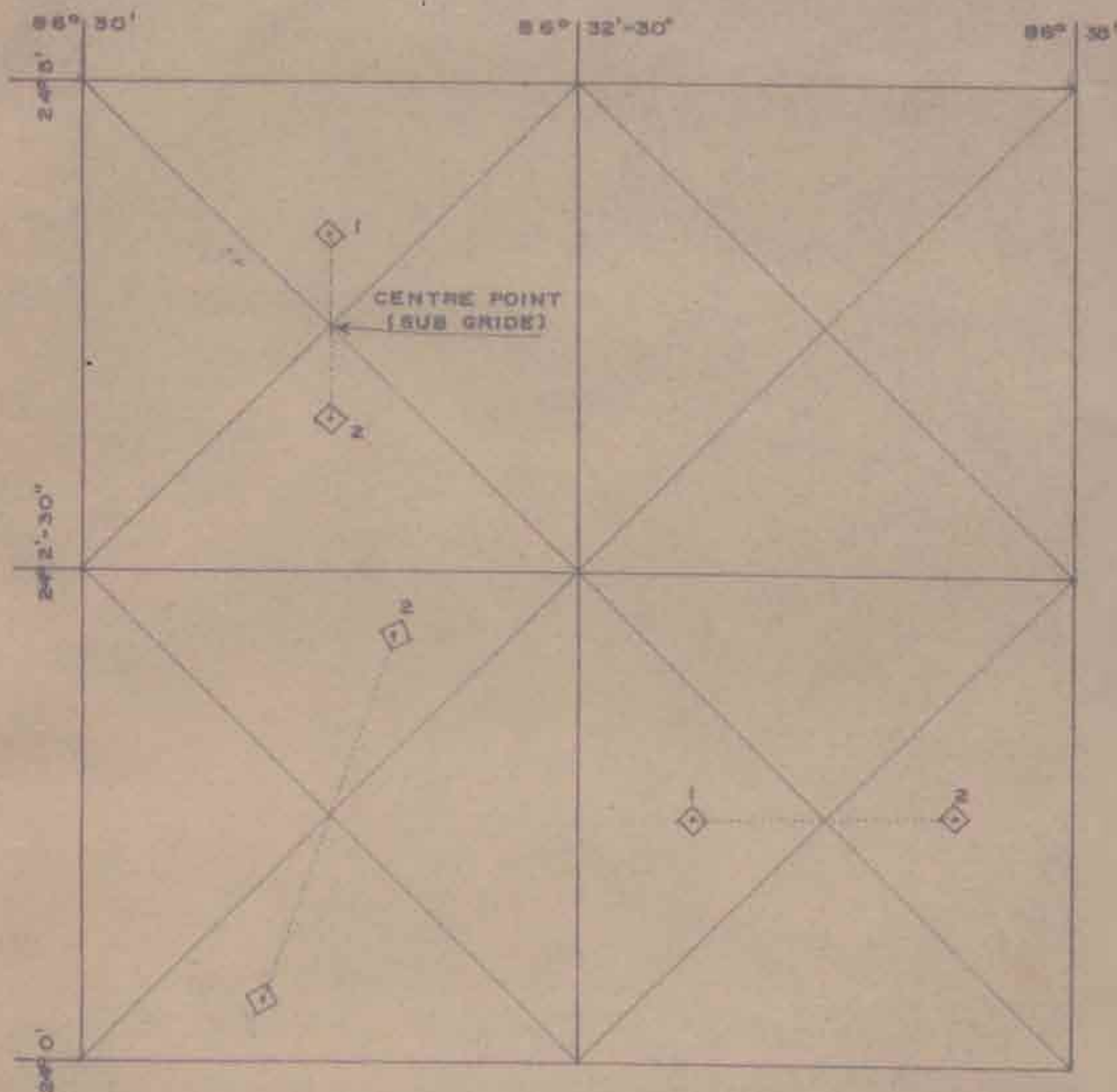
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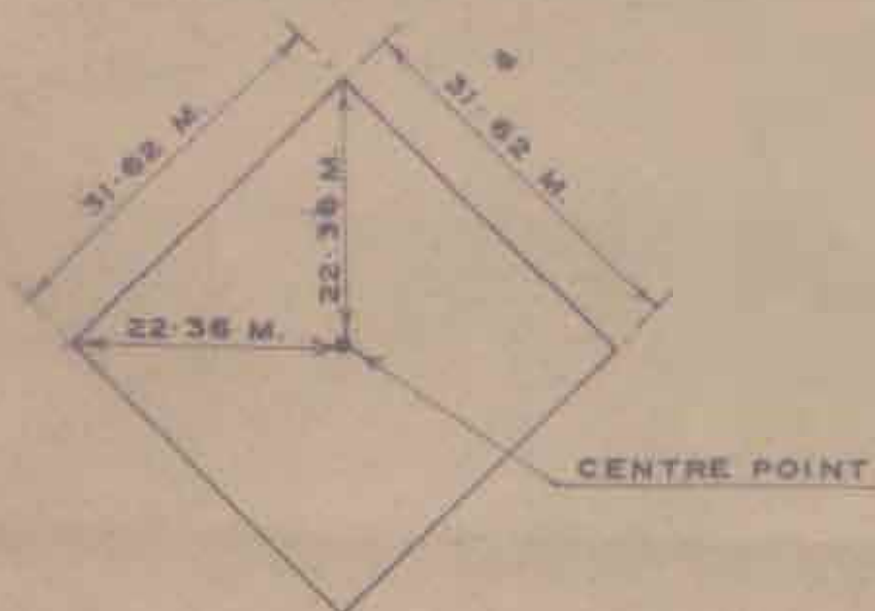


# FOREST SURVEY OF INDIA

## INVENTORY DESIGN



FIRST PLOT IS SELECTED RANDOMLY AND THE SECOND PLOT IS SITUATED AT AN EQUAL DISTANCE FROM THE CENTRE OF THE FIRST PLOT TO THE CENTRE OF 2'-30" x 2'-30" SUB GRID AND IS JUST IN THE OPPOSITE DIRECTION.



### DETAILS OF PLOT

DRAWN BY: SUMAN BHATTACHARJEE, B. D.

**MAP SHOWING FOREST AREAS OF  
SANTHAL PARAGANA AND PART OF  
BHAGALPUR DISTRICT.**

1 INCH = 4 MILE  
OF  
SCALE  
1:253440

PART OF BHAGALPUR

BHAGALPUR DIVISION

BHAGALPUR DIVISION

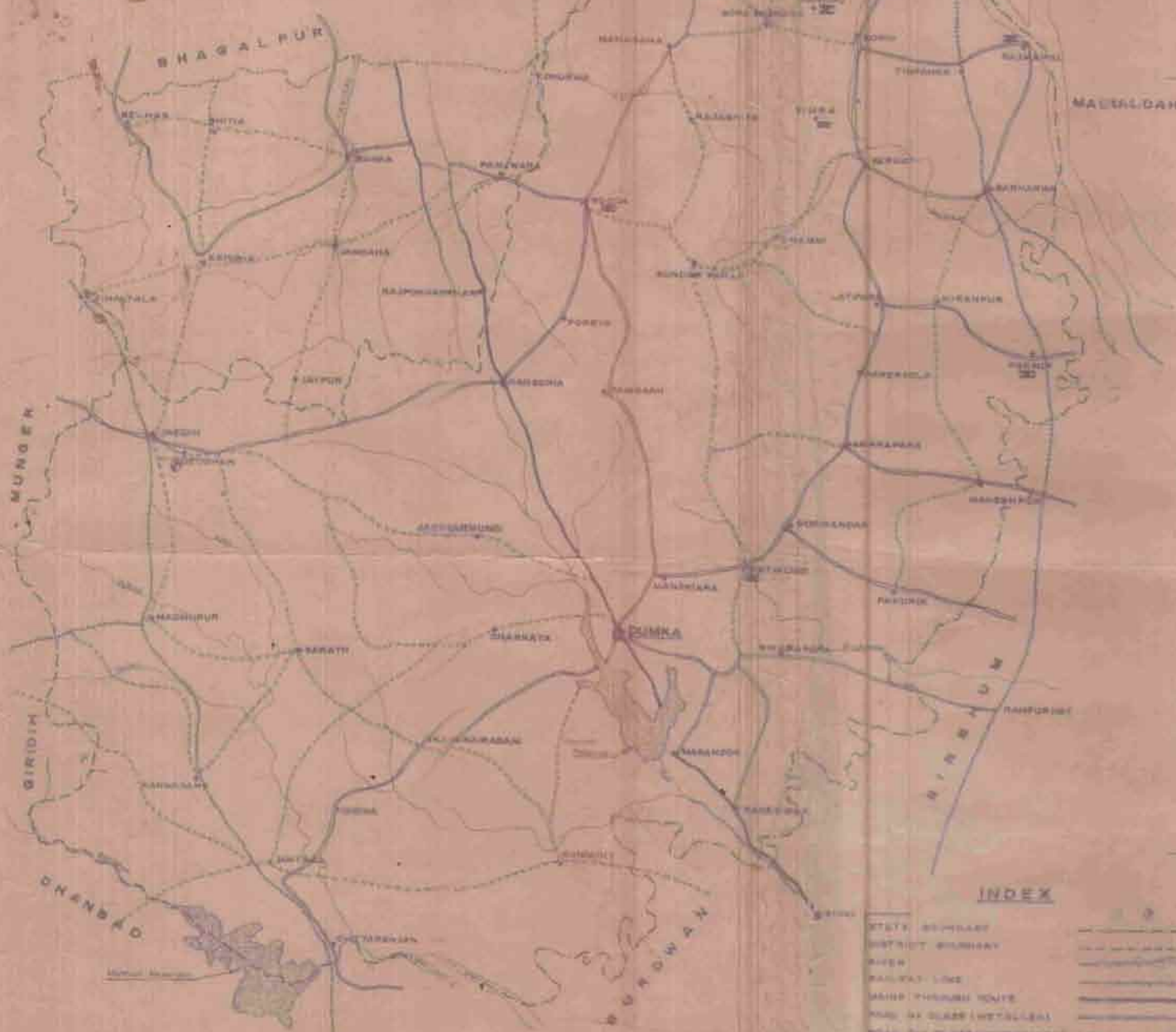
BHAGALPUR DIVISION

Legend
Forest Area
Unclassified Area
Water
Settlements
Roads
Railways
Boundaries
Contours
Spot Heights
Index

MAP OF SANTHAL PARGANA DISTRICT  
SHOWING ROAD AND RIVER

SCALE - 1 IN. = 25 M.  
OR  
1 CM. = 2.5 KM.

N



INDEX

- STATE BOUNDARY
- DISTRICT BOUNDARY
- RIVER
- RAILWAY LINE
- MAJOR THROUGH ROUTE
- ROAD 1st CLASS (METALLED)
- ROAD 2nd CLASS (UNMETALLED)
- RAIL AND ROAD
- RAIL AND ROAD

PRINTED BY - P. N. SINGH, DUMKA