

36-89

By Director (Dy)
 Forest Survey of India
 25-Subhash Road, Dehra Dun

~~26~~

~~30~~

Box

4

WITHOUT PREFACE

FOR OFFICIAL USE ONLY



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(Department of Agriculture & Cooperation)

REPORT ✓
ON
FOREST RESOURCES OF
SIKKIM
(PART)



FOREST SURVEY OF INDIA
DEHRA DUN
1981

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(DEPARTMENT OF AGRICULTURE & COOPERATION)

REPORT ON FOREST RESOURCES
OF
S I K K I M
(Part)

FOREST SURVEY OF INDIA
DEHRADUN
1981

C O N T E N T S

	<u>Para</u>	<u>Page</u>
<u>CHAPTER-I</u> - <u>INTRODUCTION</u>		
General	1.1	1
Area	1.2	1
Physical	1.2.1	1
Geology, Rock & Soil	1.2.2	3
Climate	1.2.3	3
Land use	1.2.4	4
Socio-economics	1.2.5	5
Infrastructure	1.2.6	5
Forests	1.3	6
Vegetation	1.3.1	6
Demarcation	1.3.2	9
Legal status	1.3.3	9
Forest settlement	1.3.4	9
Existing utilisation	1.3.5	9
Available Forest Resources Information	1.4	11
Maps and Photography	1.5.	12
Maps	1.5.1	12
Aerial Photography	1.5.2	12
<u>CHAPTER-II</u> - <u>INVESTIGATION & METHODOLOGY</u>		
Objectives	2.1	13
Aerial Photointerpretation	2.2	14
Evaluation of aerial photographs regarding the interpretation qualities.	2.2.1	14
Interpretation work on aerial photographs	2.2.2	14
Inventory Design	2.3	15
Field work	2.4	18
<u>CHAPTER-III</u> - <u>DATA ANALYSIS</u>		
General	3	19
Tree volume study	3.1	19
Cull volume	3.1.1	20
Bark volume	3.1.2	20
Utility volume	3.1.3	20
Volume studies	3.2	20
General volume equations	3.2.1	20
Local volume equations	3.2.2	21
Tree volume	3.2.3	22
Plot volume	3.2.4	22
Estimation of error	3.3.1	22

<u>CHAPTER-IV</u> - <u>GROWING STOCK & YIELD</u>	<u>Para</u>	<u>Page</u>
Area estimate	4.1.1	23
Volume estimate	4.1.2	23
Local volume table	4.1.3	24
Distribution of stems per hectare	4.1.4	25
Distribution of volume per hectare	4.1.5	25
Present management	4.2.1	25
Rotation and conversion period	4.2.2	26
Potential annual cut	4.2.3	27
Annual yield	4.2.4	28
Certain aspect of future management proposals	4.3	28

CHAPTER-V - COST & ACCESSIBILITY STUDY - This Chapter is attached in separate volume.

CHAPTER-VI - INDUSTRIAL POTENTIALITY

Supply and demand analysis	6.1	30
Status of existing wood based industries in and around the project area	6.2	31
Net balance calculation	6.2.1	32

CHAPTER-VII - CONCLUSIONS AND RECOMMENDATIONS - 33

LIST OF ANNEXURE

Annexure-I - List of species	-	35
Annexure-II - List of Revenue districts, Forest Divisions, Ranges, Block & Stratum along with the corresponding code.	-	36
Annexure-III - Coding instruction for inventory work.		37
Annexure-IV - Coding instruction for plot description form (Form No.2)		38
Annexure-V - Coding instruction for plot enumeration form (Form No. III/B)		47
Annexure-VI - Coding instruction for Sample Tree form (Form No. III/A)		49
Annexure-VII - Coding instruction for tree volume and cull study (Form No. VI)		51
Annexure-VIII - List of Jeepable roads and Bridal paths		56
Annexure-IX - List of species showing various utility classes and specifications.		57
Bibliography - -		58

LIST OF TABLES

<u>Table Number</u>	<u>Page No.</u>
1. <u>Number of stems/ha. species wise and diameter class-wise.</u>	
1.1.1 "Sector A; Stratum-I	59
1.1.2 "Sector A; Stratum-II	61
1.1.3 "Sector A; Stratum-III	63
1.2.1 "Sector B; Stratum-I	64
1.2.2 "Sector B; Stratum-II /	66
1.2.3 " Sector B; Stratum-III	67
2. <u>Total Stems('000 units) by species and diameter classes</u>	
2.1.1 "Sector A; Stratum-I	68
2.1.2 "Sector A; Stratum-II	69
2.1.3 "Sector A; Stratum-III	71
2.2.1 "Sector B; Stratum-I	72
2.2.2 "Sector B; Stratum-II	73
2.2.3. "Sector B; Stratum-III	75
3. <u>Utility class-wise volume distribution/ha.</u>	76
4. <u>Per hectare stem distribution of Plywood species</u>	
4.1.1 "Sector A; Stratum-I, II & III	77
4.2.1 "Sector B; Stratum-I	78
4.2.2 "Sector B; Stratum-II	78
4.2.3. "Sector B; stratum-III	78
5. <u>Per hectare stem distribution of constructional timber</u>	
5.1.1. "Sector A; Stratum-I	79
5.1.2. "Sector A; Stratum-II	79
5.1.3. "Sector A; Stratum-III	80
5.2.1. "Sector B; Stratum-I	80
5.2.2. "Sector B; Stratum-II	81
5.2.3. "Sector B; Stratum-III	81
6. <u>Per hectare stem distribution of Box planking timber</u>	
6.1.1. "Sector A; Stratum I & II	81 & 82
6.1.2. "Sector A; Stratum-III	82
6.2.1. "Sector B; Stratum I & II	82
6.2.2. "Sector B; Stratum III	83
7. <u>Per hectare stem distribution of Match wood</u>	
7.1. "Sector A; Stratum I, II & III	83
7.2. "Sector B; Stratum I, II & III	84

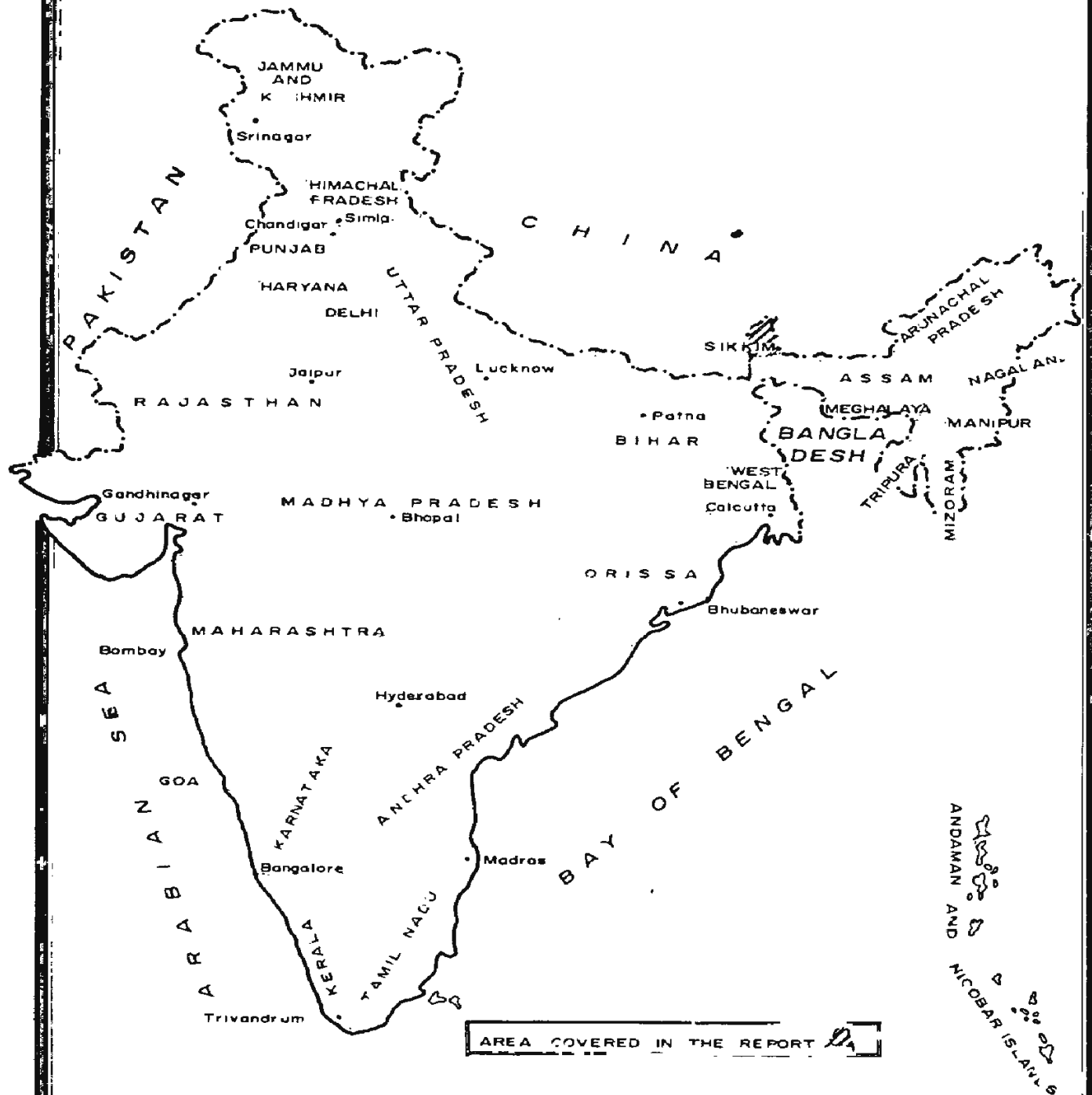
<u>Table Number</u>		<u>Page No.</u>
8.	<u>Utility class-wise volume distribution per ha in m³ Sector A & Sector B</u>	85
9.	<u>Utility class-wise volume distribution diameter class-wise according to the percentage of total volume(U.B.)</u>	86
10.	<u>Distribution of stems utility class-wise Sector A & Sector B</u>	87
11.	<u>Stem per ha. by stratum and diameter classes(in cm.)</u>	88
12.	<u>Total stems(in '000 units) diameter classwise and stratumwise.</u>	89
13.	<u>Per hectare volume(m³) distribution stratumwise</u>	90
14.	<u>Total volume(in '000 m³) diameter classwise</u>	91
15.	<u>Total no. of Symplocos theifolia</u>	
15.1.	Study on <u>Symplocos theifolia</u> per ha. stem distribution and total no. of stems Sector A & B.	92 & 93
15.2.	Study on <u>Symplocos theifolia</u> per ha. volume distribution and total volume, Sector A & B.	94 & 95
16.	<u>Volume/ha. species-wise and diameter class-wise('000m³)</u>	
16.1.1.	"Sector A; Stratum - I	96
16.1.2.	"Sector A; Stratum-II	98
16.1.3.	"Sector A; Stratum-III	100
16.2.1.	"Sector B; Stratum-I	101
16.2.2.	"Sector B; Stratum-II	103
16.2.3.	"Sector B; Stratum-III	104
17.	<u>Total volume specieswise and dia. classwise('000 m³)</u>	
17.1.1.	"Sector A; Stratum-I	105
17.1.2.	"Sector A; Stratum-II	106
17.1.3.	"Sector A; Stratum-III	108
17.2.1.	"Sector B; Stratum-I	109
17.2.2.	"Sector B; Stratum-II	111
17.2.3.	"Sector B; Stratum-III	112
18.	<u>Volume Tables</u>	113
19.	<u>Cull percentage by diameter class</u>	114
20.	<u>Bark percentage according to form class and some individual species.</u>	115

LIST OF MAPS

1. Map of India in 1 cm. = .158 km.(approx.) scale showing location of survey area.
2. Map of State of Sikkim in 1: 50,000 scale showing location of project area.
3. Map showing selected grid points for survey in scale 1:2,50,000.
4. Map showing Sector A of project area(scale 1: 1,00,000).
5. Map showing Sector B of project area(Scale 1:1,00,000).
6. Road Map of Sikkim(scale 1: 1,50,000)

MAP OF INDIA

SHOWING PROJECT AREA SIKKIM. SCALE — 1 Cm. = 158Kms.

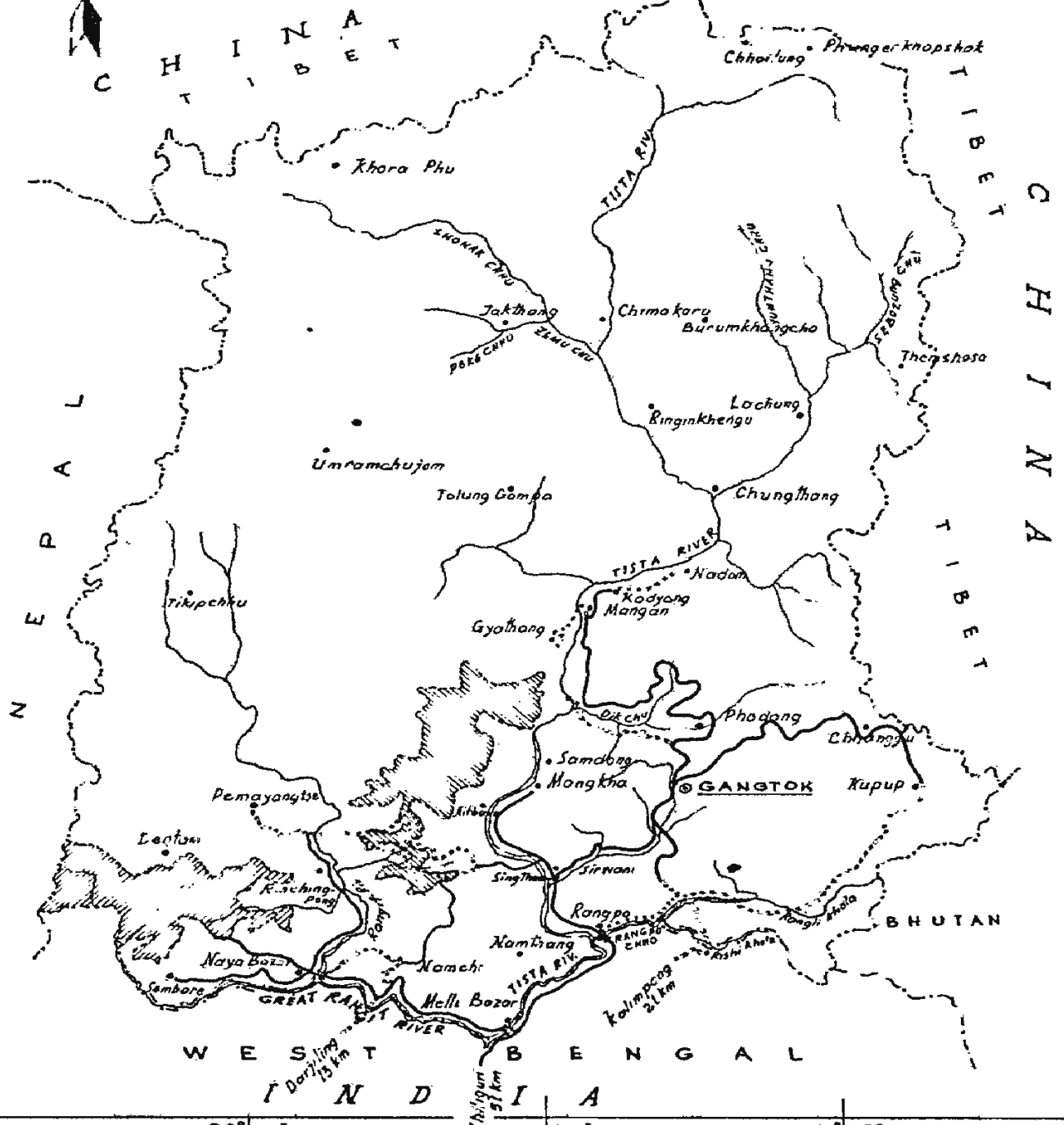


DRAWN BY - SUMAN BHATTACHARJEE

SIKKIM

SCALE 1:500,000

2ms. 5 3 1
 4 2 0 5 10 15
 6.000m to 1cm



REFERENCES

PROJECT AREAS 1976-77
 SECTOR "A" - - - - -
 SECTOR "B" - - - - -

BOUNDARY :- INTERNATIONAL - - - - -
 " " STATE - - - - -
 ROAD :- METALLED - - - - -
 " " UNMETALLED - - - - -
 CAPITAL - - - - -

Rinchingpong

Tinkitam

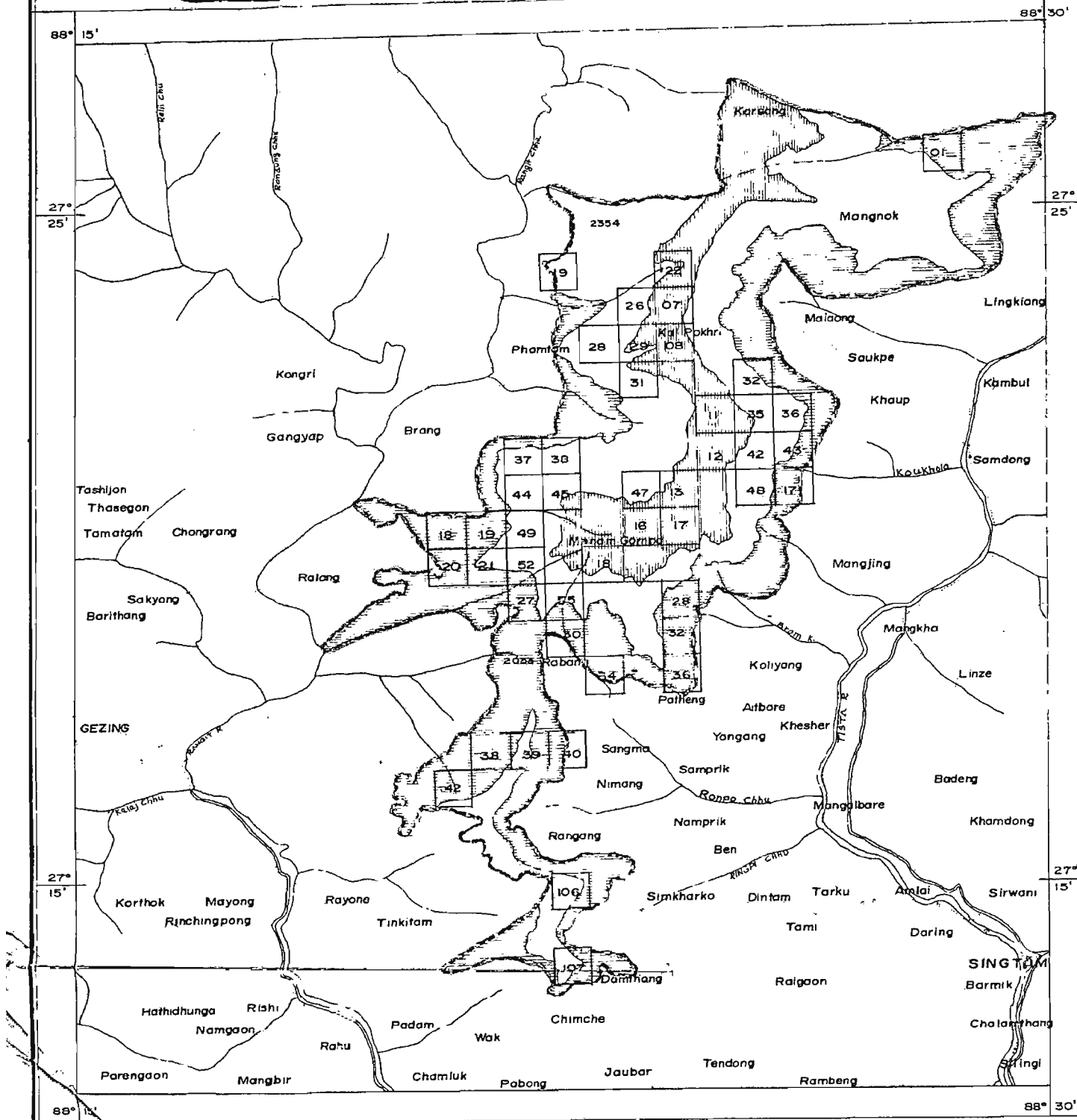


102

PART OF SIKKIM

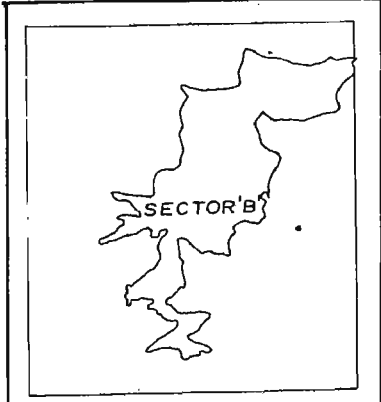
MAP SHOWING THE PROJECT AREA, SECTOR 'B'

SCALE - 1 : 1,00,000



REFERENCES

- ROADS, METALLED, UNMETALLED ———
- BOUNDARY, PROJECT - - - - -
- RIVERS, GENERALLY CONTAIN WATER ———
- TOWN, OR VILLAGE ———
- ALTITUDES OF HILLS ———
- STRATA 1 ———
- STRATA 2 ———
- STRATA 3 ———
- GRID NO ———



DRAWN BY - SUMAN BHATTACHARJEE

C H A P T E R - I.

I N T R O D U C T I O N

1.1 General :

This inventory of Forest Resources of two separate areas in South Western part & South Central part of Sikkim has been undertaken as per express desire of the Government of Sikkim. In pursuance of a meeting held on 12.6.1976 between representative of P.I.S.F.R., Eastern Zone and the Chief Conservator of Forests, Sikkim, this work had been taken up with a view to furnish a comprehensive assessment of the forest potentialities in the form of a reliable estimate of growing stock of standing wood of various utility classes as well as suggesting possibilities of setting up of wood based industrial complexes in Sikkim.

It was decided that during the present survey, part of South Western Sikkim and South Central Sikkim consisting of twelve reserved forests extending over an area of about 350 km² in total, should be taken up. Accordingly, Preinvestment Survey of Forest Resources, Eastern Zone undertook the survey work in the middle of October, 1976 and it continued upto January, 1977. The project area consists of two parts, hereinafter referred to as sector, located wide apart and forests are reserved forests demarcated by clear boundaries on the ground.

1.2 Area.

1.2.1 Physical.

The project area consists of two sectors comprising of a group of Reserved Forests located in the South Western part and South Central part of Sikkim. The two sectors are about 100 km. apart. The geographical location of two sectors is as below :- (See sketch map : 2)

Sector - A - The area bounded by latitude 27°9'15" to 27°16' North Longitude - 88°4" to 88°16' East

Sector - B - Latitude - 27°13'23" to 27°26'45" North Longitude - 88°18'35" to 88°30' East.

Further details of boundary of the two Sectors are given in the sketch map enclosed (Map - 2).

Area Statement:

The forest Reserves which form the project area are furnished below with the area of each.

<u>Name of Sector</u>	<u>Name of the Reserve</u>	<u>Area of the Reserve</u> (hecters)
Sector - A	i) Hill top R.F.	*4583.17
	ii) Sungri R.F.	1570.18
	iii) Samdong R.F.	1942.49
	iv) Phunsebong R.F.	1570.18
	v) Tal R.F.	2848.98
		<u>12515.00</u>
Sector - B	i) Taryang R.F.	6491.16
	ii) Lingi R.F.	3124.17
	iii) Rayong R.F.	922.68
	iv) Deorali R.F.	139.61
	v) Ralang R.F.	2076.40
	vi) Brang R.F.	1035.99
	vii) Menam R.F.	1294.99
		<u>15085.00</u>

* Due to nonavailability of Topo Sheet No.78 A/3, the area has not been included in Hill top R.F.

Sector - A falls under the jurisdiction of West Sikkim district and it is under the territorial control of Western Sikkim Forest Division with Head quarters at "Gyolging". Part A part viz., Taryang Reserved Forest of this sector falls under the territorial control of Northern Sikkim Forest Division with Head quarters at Mangan and the rest is under the control of the South Sikkim Forest Division with Head quarters at Namchi.

Configuration :

The entire project area is highly mountaineous ('barring a few small scattered pockets of gently sloping lands like Dharmdin, Higaon and Siribadam in Sector - A and areas adjacent to Rabangla, Brang and Ralang in Sector - B. Lofty hills of major ridges, in innumerable minor ridges and spurs, inter-spersed with valleys and steeply sloping hills present the characteristic Himalayan configuration here. The Sector-A is mainly composed of hard rocks capable of resisting denudations to an appreciable extent, while the Sector-B consists of comparatively soft, thin, slaty rocks and thereby can easily be denuded. The project area is more mountaineous in Sector-A than that in Sector-B.

Altitude :

/ation

There is altitudinal variation. Altitude in Sector-A varies from 1885 m. to 3685 m., while that in Sector-B it varies from 1200 m. to 3726 m. Karsang peak which is the highest point of the project area is located in Sector - B.

1.2.2 Geology, Rock & Soil :

The most impressive geological feature in this area is the occurrence of predominantly two important groups of rocks viz. gneissic group and Daling group. Daling occurs in South and South Western Sikkim. As a result of everfolding or over-thrust the various stratigraphical units have been superimposed. The Dumuda sandstone is seen in places inter border with Daling slate. Further up in the hills, the Daling slates are gradually changed into Mica schists and finally into Darjeeling gneiss along the side south of Ramam and great Rangit River. The boundary between ~~the~~ Daling and Gneiss is said to be a fault; elsewhere the boundary between these two ~~s~~ types is ill defined and often cannot be properly traced.

The gneissic group of South Sikkim is described as highly micaceous rock, muscovite, biotic both being present. This rock here is well foliated. This crystalline Complex consists of both igneous and sedimentary rocks. Band of quartzites are common. The Daling group in general give rise to sub-metamorphic slates and phyllites. In the transitional zone micaceous schists are common. Dark clay, slates with thick quartzite band are common in Chakung and Soreng areas in Sector-A. Copper is found near Bermek and graphite occurs near Dentak. Considerable deposits have been reported to exist and geological investigations are already in progress for actual quantification of the deposits. Coal is also said to occur in Rangit valley - Namchi zone. There are a number of hot springs particularly in the Western part of Sector-B near Brang and others occur in the Tista and Rangit valleys adjacent to the project area.

The part of the project area where the soil is predominantly of ~~gmx~~ gneissic group it is clayey, brownish, shallow and poor. Such tracts are characterised by profuse growth of Alnus, Macaranga, Syzygium and Engelhardtia. On the other hand luxuriant forest growth of various species come up on the rich, porous dark grey soil with underlying rocks of phyllite sand and slates.

1.2.3 Climate :

The climate of the entire project area in general is moist temperate although due to local factors a difference in the amount of annual rainfall in the area of same latitude is common. The rainfall decreases as one proceeds from South

to North. Pre-monsoon shower takes place in March and April. Monsoon operates normally from the month of May and continues upto early October. Average rainfall over the entire tract dealt with varies between 2000 mm. to 2500 mm.

Mean annual temperature in the lower altitudinal zone of the project area (between 1300 m. and 1800 m.) ranges from 5°C. and 18°C., whereas in higher areas beyond 3000 m. it varies between 2°C and 10°C. Winter is severe and such areas experience snow-fall in winter (January to March). At higher elevations i.e. beyond 3750 m. and up snow fall sometimes continues even upto June. Fog occurs every where from May to September. The period between October to December is some what clear throughout the area.

As there is no meteorological station within the Project area, the data of Gangtok station has been stated below which may be taken as an indicative climatological data of the project area and its neighbourhood.

STATION : GANGTOK, SIKKIM - CLIMATIC DATA.

Year	Mean annual temperature at °C.		Annual rainfall in mm.	Av. relative humidity in %.	Highest rainfall month.	Lowest rainfall month.
	Maximum	Minimum				
72	20.2	11.2	3936	86	June	December
73	20.6	10.0	3494	84	June	December
74	19.6	11.3	4295	86	July	November
75	20.0	11.6	3450	84	July	November
76	19.5	11.3	3461	87	Aug.	January.

.4 Land use :

As the project area is extremely mountaineous with innumerable ridges and spurs, cultivation pattern is mostly by terracing and is of permanent nature. Flat lands are quite rare except some scattered pockets. Agriculture is the major land use and it forms the main occupation of the local population. Agriculture extends even upto 2000 m. As such all forest areas lie mostly beyond that zone. Due to the remoteness of the forest from the habitation biotic interference in these reserves are less pronounced. Paddy, Maize, Wheat, Mustard etc. are the common agricultural crops raised by the local cultivators. Cultivation of Cardamam and Orange is very widely practiced here. Except some minor installations and local diversifications of water courses, irrigation is almost non-existent in the high hills. As the project area comprises of reserved forests only barring some forest villages there is hardly any cultivation. As the local people are accustomed to permanent cultivation and that by proper benching and terracing, the incidence of shifting cultivation is practically un-common in these areas.

1.2.5 Socio-economics :

The project area is very sparsely populated and biotic interference or habitation inside or outside the reserve are very little. The Sector-B has twenty five houses of forest villagers over an area of 25 hectare. Sector-A in Hilley, Burikhop, Bhareng, Siribadam and Kamdul has a total of 107 houses, forest villagers covering an area of approximately 61 hectare. Literacy is quite low and persons with higher education are few. Owing to water scarcity lot of families from adjoining villages in Sector-A had migrated to areas adjoining the project in Sector-B. Tibetan refugees are also being settled in those areas.

The local population in the villages are mainly agriculturist, working mostly on the agricultural land. Agriculture is the main profession and forestry forms a subsidiary one. As the forests are located in comparatively high hills, forestry activity is not very brisk in these areas. Occasional fellings and conversions are done by local population for their nominal house hold consumption. Weaving of woollen clothes from local wool is another industry worth mentioning.

Local population consists mainly of Nepalese, Lepchas and Bhutias. As we go North and East local population consists ~~mainly~~ mainly of Lepchas and Bhutias whereas the western part of Sikkim is mainly inhabited by the people originally from ~~for~~ Nepal. These areas are quite thinly populated. Available labour is chiefly engaged in local agriculture, road building constructional activities and subsidiary forestry operations. Improved method of agriculture is quite in practice and people are accustomed to permanent cultivation. Shifting cultivation and consequent damage to soil, forest etc. is quite unknown here.

1.2.6 Infrastructure :

Considering the mountaineous terrain of this small Himalayan state, the project area and its neighbouring tracts in Sikkim have a fairly good system of main roads. Though the roads are mostly metalled and all weather, the total kilometre of roads for use of heavy vehicles in the project area is quite low.

National High way No. 31-A It enters the State near Rangphoo and proceeds upto Gangtok and beyond. The southern and western districts of the state is connected to Darjeeling District town through Mazhitar, ~~and~~ a Nayabazar and a new suspension bridge directly connects Darjeeling district head quarters to Melli through Nayabazar. There are 5 major all weather metalled roads in and around Sector-A areas which are furnished below :-

- 1) Nayabazar - Chakung - Soreng - Siribadam - Bormek-Higaon - Dentam - Uttare (85 kms.)
- 2) Nayabazar - Dharamdin - Somebare - Okhre - Nagi - Hilley (55 kms.)
- 3) Nayabazar - Chakung (15 kms.) (metalled road with steep gradient)
- 4) Nayabazar to Melli (30 kms.)
- 5) Forest road (10 kms.) is under construction to open up forests of Phunsebung and Samdong Reserved Forests.

There are also quite a good number of bridal paths and the list is furnished in the Annexure VIII. The Sector-B areas are well connected to Gangtok and also to Nayabazar through the following all weather metalled roads.

- 1) Gangtok-Singtam-Temi-Rabangakla(75kms. approximately)
- 2) Rabangla-Sosing-Legahip-Jorethang-Melli(85 kms,)

The construction of P.W.D. road from Rabangla to Phantam through Brand is under rapid progress, thereby opening up forests of Ralang, Menam, Brand and Lingi Reserved Forests. The eastern part of the project area in Sector-B is also connected upto Yangang and the proposed road will cross Tista River near Mangkha; besides, there are also quite a good number of bridal paths in this sector.

As per 1976 figure the density of road in Sector-A is quite low which is 1.9 m./ha. and in Sector-B of the project area it is 1.7 m./ha. per km². The road length is very meagre and construction of more road to facilitate extraction of forest produce and further development of infrastructure is necessary. The streams in the area are mostly perennial but none is suitable for floating of timber. There is immense possibilities of Hydro Electric Power though at present electricity is available in remote villages.

At present there is no important industry within and in the neighbourhood of the project area. The major industries like Fruit Preservation Factory, a State Government Undertaking, Furniture Factory, A state Government Undertaking and Sikkim Distillery, a Private Undertaking are located near Rongpo in East Sikkim.

3 Forests.

3.1 Vegetation :

The vegetation is purely wet temperate and evergreen in nature. Forests consist mainly of broadleaved trees with small patches of fir and Hemlock occurring in mixture. Tree forests mainly predominate and there are occasional grassy patches with open scrub. Amongst the broad leaved species Oak, Castanopsis, Laurels, Michelias, Birches etc. form major part of forests vegetation.

Type composition :

The major tract of forests dealt with can be grouped under Upper Hill Forests which correspond to Champion & Seth's revised type 11b/C1-East Himalayan Wet temperate Forest. Altitude, aspect, rainfall and geological formations have got a spectacular influence on the growth of these forests, but the effect of altitude is considered to be most pronounced and accordingly the following four groups of forests are likely to be met within different altitudinal zonations.

1) Zone - I - 1550 mts. - 1850 mts. :-

Michelia doltsopa (Ranichamp) & M. lanuginosa (Phunsrc champ) occur in abundance. Other common species is Engelhardtia (Mowa).

2) Zone - II - 1850 mts. - 2200 mts. :-

Alchimandra cathcartii (Tita champ), Castanopsis tribuloides (Muare-catus), Machilus edulis (Lapcha kawla), M. gammiana (Chiple kawla), Beilschmiedia roxburghiana (Tursing), Macaranga species, Betula alnoides (Sour), Quercus species etc. are quite common. Alnus nepalensis (Utis) occurs in plenty in shallow soil.

3) Zone III - 2200 mts. - 2500 mts. :-

Predominantly Quercus lamellosa (Buk), Quercus pachyphylla (Sungre katus), Acer campbelli (Kapasi), Machilus odoratissima (Dali kawla), M. gammiana (Chiple kawla). Here Sungre katus and Buk also forms occasionally pure patches.

Undergrowth mainly consists of small trees such as Eurya japonica (Jhingni), and Symplocos thieffolia (kharane). Herbaceous under growth consists of mainly Gerardiana, Rubus (Aselu), Viburnum (Asare), Ephiphytes (Valaya), Strobilanthes (kibu) various temperate ferns and maling bamboos etc.

4) Zone - IV - 2500 mts. - 2800 mts. :-

Quercus lineata (Phalant), Q. pachyphylla (S. katus), Q. lamellosa (Buk), Castanopsis tribuloides (Musre katus), Acer campbelli (Kapasi), Magnolia campbelli (Choga champ), Prunus nepalensis (Arupate), Michelia doltsopa (Rani champ) are the chief species in the upper storey. Middle storey consists mainly of Machilus and Litsea. Under growth consist mainly of Eurya species, Symplocos, Ilex, Edgeworthia, Garden-eri (Argayle) and Daphne cannabina (Kagate), Daphne and Edgeworthia and they occur profusely through-out the project area as under growth bushy shrubs.

5) Zone - V - 2800 mts. - 3100 mts. :-

The forests are mostly mixture of Oaks and Conifers. and are mainly Oak - Tsuga forest. This type corresponds with Champion & Seth's Forest Type No. 11/C. Here on the hill ridges profuse growth of Rhododendrons have been noted. Betula utilis commonly occurs as associate. Various species of Rhododendrons are commonly met with in these forests of which 2 major groups locally called Guras and chimal are ~~imp~~ important. Gorus attains the height and diameter of a good middle size tree and timber is also utilisable.

In the Tal reserve near Hilly and Bhoreng, Abies densa is quite common. Conifers in this belt are middle aged to mature and extend to the North, West and about 8 kms. to the East. Chiabhunjang in the borders of Nepal and Sikkim has Taxus baccata in abundance. In the Sector-B conifers occur occasionally in the higher ridges of Taryang Reserve only whereas in other areas the forests are mainly of the above types. A special indication about the occurrence of Conifers in these areas are furnished below :-

- i) Tsuga dumosa - Tal Reserved Forest at an elevation of 2400 mts. to 2800.mts.
- ii) Picea morindoides - Tal Reserved Forests at an elevation of 3200 mts. to 3600 mts.
- iii) Larix griffithii - Occurs in Tal forest at an elevation of 3300mts. to 3700 mts.
- iv) Abies densa - Occurs in Tal forest at an elevation of 2500 mts. to 2800 mts.

Though the forests of these two sectors within the project area are not very much distantly located, certain differences in the composition can be noticed. Compared to forest of Sector-A, ~~the~~ Sector-B has smaller percentage of Conifers. Quercus p chyphylla and Quercus lineata appreciably less in Sector-B areas. Quercus lamellosa is quite pre-dominant here. Castanopsis occasionally forms almost pure patches in these forests and the same species goes very high in the forest of Western part of the project area.

Condition of the crop :

Most of these forests of the project areas are virgin and have excellent growth. Trees of commercial importance are mature to over mature where biotic interference is not much pronounced. Growth is better in the eastern part than in the western part probably due to difference in rainfall.

Natural regeneration of commercially important species is not quite satisfactory. In the middle and upper hills Utis and Sour come up profusely. Regeneration of Laurels in the upper hills is moderately good but hemlock and Fir regeneration is unsatisfactory.

1.3.2 Demarcation :

The Reserved Forests are separated from adjoining Garucharan forests, Khas forests (or villages) by boundary pillars and clear strip of land. This boundary of the reserve is also properly demarcated in the Survey of India latest maps.

1.3.3 Legal Status :

The entire project area consists of twelve Reserved forests where no rights of any nature exist. As these forests are located in quite difficult areas, shifting cultivation and encroachment etc. are not common, while grazing is a common practice.

1.3.4 Forest settlement :

In order to facilitate forestry operations settlement of forest villages in various reserves of the project area had been carried out in the past. These forest villages covering an area of 106 hectare of Reserved Forests are inside the project area. The villagers mainly raise plantation by Taungya and also perform other forestry operations. Near Rabangla 120 hectare of land have been properly surveyed demarcated and transferred to Tea garden authorities, 41 hectare of land have been dereserved and after proper demarcation has been recently handed over to Army Authorities, (except above dereservation the Reserved Forest area remains unchanged.). At present there is no proposal for creation of further new reserves. The department is leasing out Reserved Forest land suitable for Cardamom cultivation to land-less people @ 1 hectare per family. The lease of forest land to landless people for Cardamom cultivation is fixed for 10 years. On the whole the department is exploring the possibilities of leasing out large tracts of Reserved Forest lands particularly in areas where timber operation is not possible at present.

1.3.5 Existing utilisation :

These forests are not covered by any Working Plan at present and the last working plan for these forests dates back to 1950. With development of infrastructure in the vicinity and opening up of the area with new roads, possibilities of concentrated forest activities have become promising. As already mentioned forests here are mainly of mixed temperate miscellaneous type with less number of trees of high utilisation value. Due to paucity of feeder roads and prohibitive haulage costs to the centre of consumption, concentrated timber extraction operations are not much in practice here. Such forests are mainly centred at the foot hills near Nayabazar, Jorethang etc. Certain timber extraction works had been carried out in Hilly area in the Tal. Reserved Forests for developmental works. At present the forests are worked under selection felling system. Occasional marking and felling of constructional, Box planking and

Furniture timber are carried out in the reserves near ~~villages~~ villages sites. Timber is generally disposed by coup system. Suitable areas for plantations are worked under clear felling with artificial regeneration system. As most of the Oaks do not have any commercial utilisation up-till now these are marked for manufacture of Charcoal as Charcoal is in great demand here. Hilly, Siribadam, Dentam, in Sector-A and Rabangla, Rayong in Sector-B are the important sites for the forest activities in the project area.

The main timber market in these areas are Gangtok, Singtam, Melli and Jorhang. As the distance is not much, same rate is prevalent in the first three markets. Rates at Jorhang slightly differ from other markets. Data collected in 1977 April (year of survey) is furnished below:-

Sal scants etc.	- Rs.706 per m ³ (sawn)
Champ	- Rs.636 per m ³ (sawn)
Panisaj	- Rs.525 per m ³ (sawn)
Mixed hardwood	- Rs.484 per m ³ (sawn)
Utis (for box and ceiling)	- Rs.425 per m ³ (sawn)
Fir timber (North Sikkim)	- Rs.484 per m ³ (sawn)
	- Rs.360 per m ³ (Round)

Whatever limited timber operation takes place within the project area, it is all by local methods of pulling i.e. felling by axe, conversion by ordinary pitsaws at site and carriage by man as no mule or poney is available here. Cost of carriage by manual labour from sawing site to main road is Rs.72/m³ if the lead is upto 2 kms. If the lead is within 4-5 kms. the rate is Rs.106/m³. These are the normal rates in fair weather. The rate is about 1.5 times more in rainy season.

In an experimental way a departmental extraction work had been undertaken in Rabangla areas on slightly undulating terrain. Felling was done by cross cut saws, Cost of felling, delimiting and cross cutting was Rs.36/m³. Dragging of timber was done by a 25 H.P. Massey Ferguson Tractor, logs loaded on trailer and average load was 1 km. The average cost of haulage (1 km. lead) per cubic metre of round log comes to about Rs.18/m³. But such tractor terrains are quite limited. Onroad transportation cost for various grades of timber fixed as truck transport on the major routes of Sikkim is nationalised. Sikkim nationalised Transport has a fixed chart of truck hire charges which is furnished below. Plying of private trucks here are prohibited. Jorethang is the main centre of operation for S.N.T. for the western and southern Sikkim.

Sl. No.	From	To	Distance	Rate
1.	Jorethang	Rabangla	52 Kms.	18 paise/quinta /kms.
2.	Jorethang	Gazing	42 kms.	Rs. 7.90 p./quin
3.	Jorethang	Sosing	45 kms.	18 paise/quinta /kms.
4.	Jorethang	Melli	28 kms.	Rs. 3.90/quintal
5.	Jorethang	Sombare	29 kms.	Rs. 6.20 p./quin -tal
6.	Jorethang	Namchi	20 kms.	Rs. 3.90 p./quin -tal
7.	Jorethang	Uttare	83 kms.	Rs.18.72 p./quin -tal.

Sal is taken as the heaviest timber here and 1 cft. of Sal timber is counted as 35 kgs. for freight purposes. All other timber is termed as local and considered 25 kgs./cft.

Amongst the utilisation of minor forest produce, Cardamom cultivation both by forest department and that on lease to landless people is of great importance. The Government share per hectare is fixed at 1/4th of the processed fruit. The basic objective utilisation of forest lands by planting Cardamom as under storey in forest lands and plantation areas in order to put the forestry to multipurpose use.

In the artificial regeneration of forests species of Michelia (Champ), Cupressus (Laharedhupi), Cryptomeria (Dhupi), Abies (Fir), Buklandia (Pipli), Juglans (Walnut) Acer (Kapasi), Prunus (Arupate), etc. are selected. In Sector-A 2500 hectare and in Sector-B 1000 hectare of plantations of selected species have been raised during the past decades.

The forests are mature to over mature in age and it is essential that intensive forestry operation should be taken up immediately for speedy utilisation of the growing stock provided such areas can either be restocked naturally or artificially.

1.4. Available forest resources information :-

No comprehensive resources survey had been conducted during the past few decades to obtain any reliable estimate of the growing stock of these reserves in the project area. Little amount of work had been done during the preparation of last working plan in 1950. But information on total growing stock and indication on categorical assessment of

timber for these reserves is completely lacking; no information was available on the nature and variation pattern of the forest crop. A pilot survey had to be conducted for collection of basic data for the formulation of design of the actual inventory.

1.5 Maps and photography :

1.5.1 Maps :

Survey of India latest topographical map sheets of 1:50,000 scale which covers the project area had been procured for the purpose of the survey. The coverage of the area is furnished below:-

<u>Index No.</u>	<u>Scale</u>	<u>Year of Survey</u>	<u>Year of publication</u>
78 A/3	1:50,000	1961-62	Not yet published
78 A/4	1:50,000	1961-62	1963
78 A/7	1:50,000	1962-63	1963
78 A/8	1:50,000	1962-63	1963

State map of Sikkim in the scale 1:1,50,000 published in the year 1974 had also been referred.

1.5.2 Aerial photography :

Aerial photographs for Sector-A exist in black and white. The scale of Photographs is 1:25,000. This photographic coverage under ~~task~~ task no. 784 A is quite recent, with camera lens 15.3 cm. and flying height 3810 m. The Sector-B mostly falls under gap and the portion of the Eastern part is covered under aerial photographic coverage of task No.413 A in 1:40,000 scale. But the photography is of 1960 and it now hardly serves any purpose as ground conditions have changed considerably. A part of Sector-B in south is covered by aerial photograph of task No. 784 A.

Therefore, only the aerial photographs of specification No.784 A of November 1974 in 1:25,000 scale were taken up for detailed aerial photointerpretation and vegetation type mapping.

C H A P T E R - II.

INVESTIGATION AND METHODOLOGY.

2.1 Objectives :

The major objectives envisaged for this survey in consultation with the State Forest Department are indicated below :-

1. to obtain a reliable estimate of the growing stock of total wood (volume for trees upto 5 cm. diameter under bark) at $\pm 10\%$ error at 95% probability level.
2. to furnish an estimate of the growing stock separately on the basis of utility patterns to assess the resources potentialities for setting up of wood based industrial complexes. The utility classes decided were as follows:-
 - i) Plywood and Furniture wood, ii) Match wood, iii) Constructional timber, iv) Box planking wood, v) Fire wood.
3. to conduct a study, based on suitable design, for compilation of volume tables of commercially important species occurring in the State.
4. to conduct detailed cull study by actual felling of trees with a view to obtain an estimate of sound timber volume. The forest being mature and to over mature in age a comprehensive assessment of decay of growing stock was considered essential.
5. to perform a special study on the availability of *Symplocos theaeifolia* (Kharane) for proposed match industry.
6. to undertake a detailed study on the accessibility, logging and transport cost analysis of raw materials from various reserves of the project area to proposed industrial sites at Nayabazar in the case of Sector-A and Rabangla or Singtam in the case of Sector-B.

2.2 Area of Survey and Inter-relationships.

2.2-1 Evolution of the Survey Area and regarding the inter-relationships.

Aerial Photo-interpretation :

Evaluation of the aerial photographs regarding the interpretation qualities. :

The aerial photographs with specification 784 A are quite recent, the date of photography being 17.11.1977. The focal length of the camera is 15.3 cm. and flying height is 3810 m. On stereoscopic examination of the photos it reveals that these have superior interpretation qualities. The scale and quality of the photographs enable delineation into volume density and forest type classes. Water areas, agriculture habitation, grassland, barren lands and forest blanks are discernable.

Preparation of the aerial photographs for interpretation :

The format size of the print is 23 cm. x 23 cm, with a forward overlap of 50% to 75% and lateral overlap of 50% to 55%.

Minimum unit of delineation :

As the photos are of the scale 1:25,000 the minimum unit of delineation on aerial photographs had been kept as 5mm. x 5mm. as this can be conveniently depicted on photos, keeping the scale of final map in view. Streams, roads and other linear features which are less than 5 mm. on photos were not delineated.

2.2 Interpretation work on aerial photographs :

On stereoscopic examination of these photos it was found that interpretation possibilities are moderately good and accordingly the following interpretation key had been framed.

The area had been divided into the following classes:-

A. Forested :

- A. 1.E. Himalayan Wet temperate forests.
- A. 2. - do - & mixed coniferous forests
- A. 3. - do - dry temperate forests
- A. 4. Forest blanks (A blank is defined to be an area without wood of 10 hectares and above).
- A. 5. Plantation (Young)

B. Non Forested :-

- B. 1 Regrowth area
- B. 2 Grassland, Barren land
- B. 3 Agriculture & Habitation
- B. 4 Water areas
- B. 5 Orchards

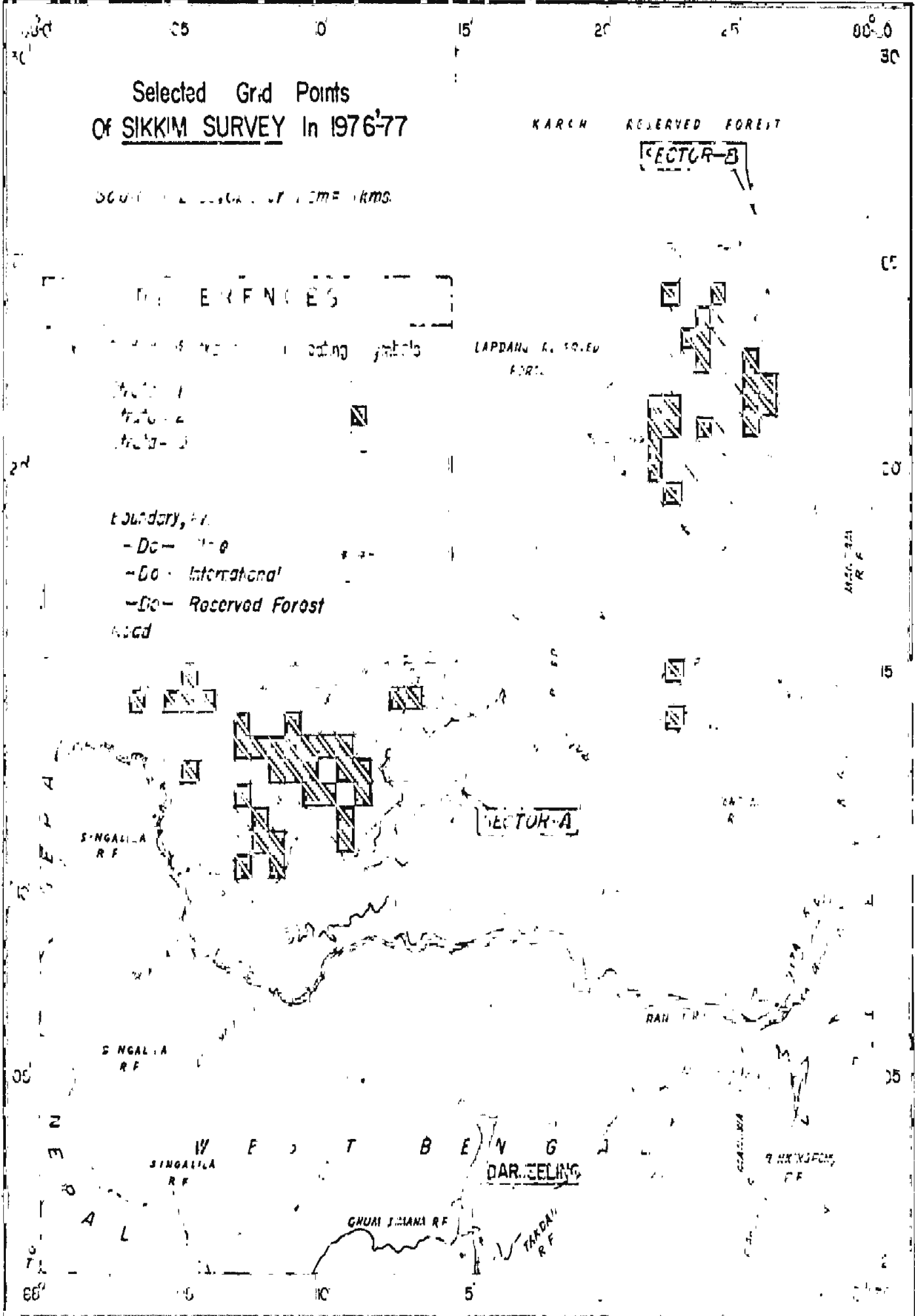
Selected Grid Points
 Of SIKKIM SURVEY In 1976-77

Scale 1:50,000

REFERENCES

- Do - ...
- Do - ...
- Do - ...

- Do - ...
- Do - International
- Do - Reserved Forest



LAY OUT OF SAMPLE PLOTS

4

1



PROGRAM DRAWING 387



PROGRAM DRAWING 388

C. Density classes :- Density code (first digit) has been given in the denomination to the forest type A.1 to A.3 only)

- C. 1 Low density 5% - 20%
- C. 2 Medium density 21% to 60%
- C. 3 High density 61% and more

D. Volume class :- Volume code second digit in the denominator. The volume range is subject to ground inventory result.

- D. 1 Low volume (below 50 cu.m./ha.)
- D. 2 Medium volume (51 to 100 cu.m./ha.)
- D. 3 High volume (above 100 cu.m./ha.)

2.3 Inventory Design :

Sampling design :

A through reconnaissance of the forest reveals a clear demarcation in difference in crop and vegetation in the two sectors namely Sector-A and Sector-B. The distribution and pattern of occurrence of important commercial species follow a definite altitudinal pattern. Accordingly 3 altitudinal strata can be clearly differentiated.

- Stratum I = Area upto the limit of 2170 m.
- Stratum II = Area upto the limit of 2170 - 2800m.
- Stratum III = Area from 2800 m. and above.

The stratified Random Sampling with cluster of 2 plots was adopted.

Laying out of the plots :

Each grid is a cluster of 2 plots at a distance of 100 m. from each other. Each plot has an area of .49 ha. (70 m. x 70 m.). The lay out of plots is clearly depicted in diagram I.

FORM CLASS AND NAME OF THE SPECIES (FOR SIKKIM AREA)
LIST NO. I

<u>Form Class</u>	<u>Scientific Name</u>	<u>Local Name</u>
<u>Form Class-I</u> (i)	<u>Acer campbelli</u>	Kapasi
(ii)	<u>Simingtonia populnea</u>	Pipli
(iii)	<u>Betula alnoides</u>	Sour
(iv)	<u>Cinnamomum impressinervium</u>	Sissi

	(v)	<u>Toona febrifuga</u>	Toona
	(vi)	<u>Evodia roxburghii</u>	Khanakpa
	(vii)	<u>Juglans regia</u>	Walnut
	(viii)	<u>Maceranga spp.</u>	Malata
	(ix)	<u>Syzygium spp.</u>	Jam.
<u>Form Class-II</u>	(i)	<u>Beilschmeidia roxburghiana</u>	Thupo tarsing
	(ii)	<u>Echinocarpus dasycarpus</u>	Gobre
	(iii)	<u>Engelhardtia spicata</u>	Mowa
	(iv)	<u>Elaeocarpus spp.</u>	Bhadraasi
		Others - <u>Rhododendron hodgsonii</u> etc.	
<u>Form Class-III</u>	(i)	<u>Betula utilis</u>	Bhujpat
	(ii)	<u>Litsea spp.</u>	Pahak (Pahale)
	(iii)	<u>Machilus edulis</u>	Lepcha kawla
	(iv)	<u>Machilus gammiana</u>	Chiplo kawla
	(v)	<u>Machilus odoratissima</u>	Lali kawla
	(vi)	<u>Nyssa javanica</u>	Lekp chila- -uni
	(vii)	<u>Prunus nepalensis</u>	Arupate
	(viii)	<u>Phoebe lanceolata</u>	Angare
<u>Form Class-IV</u>	(i)	<u>Castanopsis spp.</u>	Katus
	(ii)	<u>Quercus lamellosa</u>	Buk
	(iii)	<u>Quercus lineata</u>	Phalant
	(iv)	<u>Quercus pachyphylla</u>	S. katus.

As requested by the State Government the volume table of the following species had also to be compiled.

- | | |
|--------------------------------|----------------|
| 1. <u>Abois densa</u> | (Gobra salla) |
| 2. <u>Tsuga dumosa</u> | (Tengra salla) |
| 3. <u>Alnus nepalensis</u> | (Utis) |
| 4. <u>Symplocos thieffolia</u> | (Kharane) |
| 5. <u>Michelia doltsopa</u> | (Rani champ) |

Volume and cull study for these species were done separately for which selection of trees was done at random. The total number of trees felled for each species in different diameter class are given below in List No. 2.

Name of species (Botanical Name)	Sp. Code	D I A M E T E R C L A S S (in Cm.)									
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+ To

Form Class - 1.

Equation for *Alnus nepalensis* (Utis) was found to be suitable for Form Class-I and hence felled tree data for this species was used for Form Class-I*

Form Class - 2.

<u>Beilschmedia</u>	4	1	-	1	2	1	-	1	-	-	1	7
<u>Echinocarpus dasycarpus</u>	12	1	1	2	1	1	1	1	1	2	1	12
<u>Engelhardtia spicata</u>	13	1	1	1	1	-	-	-	-	-	-	4
<u>Elaeocarpus species</u>	17	-	1	-	1	-	2	1	-	-	-	5
T o t a l		3	3	4	5	2	3	3	1	2	2	28

Form Class - 3.

<u>Betula utilis</u>	6	1	1	2	2	1	2	-	-	-	-	9
<u>Litsoca spp.</u>	21	1	-	3	-	2	-	1	-	-	-	7
<u>Machilus gammiena</u>	23	-	1	2	3	1	2	2	3	-	-	14
<u>Machilus odoratissima</u>	24	1	1	-	-	-	1	2	1	-	-	6
<u>Phoebe lanceolata</u>	32	1	-	2	-	-	-	-	-	-	-	3
T o t a l		4	3	9	5	4	5	5	4	-	-	39

Form Class - 4.

<u>Castanopsis spp.</u>	8	2	-	2	-	-	1	1	1	-	5	12
<u>Quercus lamellosa</u>	34	2	-	-	2	-	1	1	-	1	4	11
<u>Quercus pachyphylla</u>	36	3	-	1	2	-	1	2	2	-	6	17
T o t a l		7	-	3	4	-	3	4	3	1	15	40

Name of species (Botanical name)	Sp. Code.	Diameter class (in cm.)										Total
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	
INDIVIDUAL SPECIES												
<u><i>Acacia dumosa</i></u>	42	3	4	1	4	2	3	3	2	2	2	26
<u><i>Albizia</i></u>	39	6	6	3	2	1	1	-	-	-	-	19
<u><i>Albizia</i></u>												
<u><i>Albizia excelsa</i></u>	27	2	4	3	3	3	3	3	1	-	-	22
<u><i>Alnus nepalensis</i></u>	03	3	3	4	2	4	3	3	-	-	1	23
<u><i>Alnus densa</i></u>	01	3	3	2	3	2	3	3	2	1	2	24
OTHERS												
<u><i>Magnolia</i></u>	25	-	2	1	1	1	1	-	1	-	-	7
<u><i>Magnolia</i></u>												
<u><i>Rhododendron</i></u>	37	2	2	1	2	3	2	1	-	-	-	13
<u><i>Rhododendron</i></u>												

2.4 Field Work :

A field manual had been drawn up with detailed procedure of field work and coding instructions for filling various forms.

Six parties were formed under direct supervision of a D.C.F. The mapsheet showing the layout of the grids and randomly selected grid plots were provided to each Crew Leader. The number of grids selected for enumeration were 62 in Sector-A and 49 in Sector-B.

For collection of information in codified form, the various types of forms used are as under :-

- 1) Plot Description Form (PDF)
- 2) " Enumeration Form
- 3) " Sample Tree Form
- 4) Tree Volume & Cull Study Form

(For detail please refer to Annexure IV, V, VI, VII.)

CHAPTER - III

DATA ANALYSIS

General :

Data Processing :-

Computer editing is attached maximum attention as many errors come to light which may escape manual checking.

The edit operation involves the following steps :-

- i) Manual checking of field forms
- ii) Punching, verification and sorting of the data
- iii) Checking of the field data with electronic computer
- iv) Comparison of the error list with field forms
- v) Finalisation of corrections
- vi) Incorporation of the corrections in the source documents and punched cards.

Tree Volume Study :

As over-bark and under-bark measurements at the two ends of a section are available, the over-bark & under-bark volume of each section was calculated by the 'Smalian Formula' :-

$$V = \frac{\pi L}{8} (D_1^2 + D_2^2) \quad \text{where, } V = \text{Volume}$$

(D_1, D_2 = Average diameter at the two ends of a section, L is the length. D_1 & D_2 represent over-bark measurement for over-bark volume & under-bark measurement for under-bark volume.)

In case of measurements of small wood the mid diameter of a log (both o.b. and u.b.) were taken. Huber's formula was applied to get the volume :-

$$V = \frac{\pi D^2 L}{4} \quad (\text{where } D \text{ represents overbark diameter for overbark volume and under bark diameter for under bark volume})$$

3.1.1 Cull Volume :-

It has been found that Cull is distributed in a very complicated pattern within various species. The use of one equation for the entire range of species is not suitable as it does not explain the variations completely.

In view of the limited fellings done in Sikkim the Equational approach was abandoned. Instead the data has been summarised in the form of graphs and tables.

3.1.2 Bark Volume :

Over bark & underbark volume are calculated for each felled tree. The difference forms the bark volume. Estimation of the total bark volume for each diameter class is obtained from the felled trees in the specified class. This volume when expressed as percentage of total underbark volume gives the bark percentage.

3.1.3 Utility Volume :

The percentage of each utility volume was plotted against D.B.H. (OB). A freehand smooth curve was drawn to indicate the trend of utility over the entire range of diameter. The utility % for different diameter class is given in Table No. 9

Applying these percentages on volume per ha., a set of tables have been drawn up to show the volumes per hectare for different utility classes.

Volume Studies :

3.2.1 General Volume Equations :-

Felled tree data furnished the basic information required for formulating the Multiple Regression Equations correlating the measured volume of the trees with their diameter at breast height and the total height (both before felling). These equations are known as general volume equations as they are based upon two variables, diameter and height.

The following General Volume Equations were tried :-

- | | | | |
|----|-------------------------|----|----------------------------------|
| 1) | $V = a + b D^2 H$ | 2) | $V = a + b D^2 H + c D/\sqrt{H}$ |
| 3) | $V = a + b D^2 H + c H$ | 4) | $V = a + b D + c D^2 H$ |
| 5) | $V/D^2 H = a + b/D^2 H$ | 6) | $V/D^2 = a + b/D^2 + c H$ |

a, b, c & d are regression constant and co-efficient.

Where V = Under bark volume (m³) upto 5 cm. limit under bark diameter.

D = Diameter (OB) at breast height in cm.; H = Height (m.).

The selected General Volume Equations are as follows:-

Form Class	E	Q	U	A	T	I	O	N
Form - I	$V/D^2 = 0.000172 - 0.0258/D^2 + 0.0000332 H$							
Form - II	$V/D^2 H = 0.0000389 + 0.02856/D^2 H$							
Form - III	$V/D^2 = 0.00006 + 0.000032H - 0.0177/D^2$							
Form - IV	$V/D^2 H = 0.0000387 + 0.02305/D^2 H$							
Name of species	E	Q	U	A	T	I	O	N
<u>Abies densa</u>	$V/D^2 = 0.01945/D^2 + 0.00002896H + 0.00009565$							
<u>Alnus nepalensis</u>	$V/D^2 = 0.000172 - 0.0258/D^2 + 0.0000332H$							
<u>Michelia doltsopa</u>	$V/D^2 H = 0.00003503 + 0.02692/D^2 H$							
<u>Symplocos theaeifolia</u>	$V/D^2 = 0.0000718 - 0.005398/D^2 + 0.00003255H$							
<u>Tsuga dumosa</u>	$V/D^2 H = 0.00003283 + 0.0008056/D^2 H$							
Others	$V = 0.024659 + 0.00003492D^2 H$							

3.2.2 Local Volume Equations :

In order to obtain local volume equations the following types of regression equations were tried :-

- | | |
|-------------------------|-----------------------------------|
| 1) $V = a + bD^2$ | 4) $V/D^2 = a + b/D^2 + c/D$ |
| 2) $V = a + bD + cD^2$ | 5) $V/D^2 = a + b/D + cD + dD^2$ |
| 3) $V = a + bD^2 + c/D$ | 6) $V/D^2 = a + b/D^2 + c/D + dD$ |

The following equations were selected keeping in view the standard error of the estimate, the multiple determination coefficient and the applicability of the equations in the entire range of data.

Form Class/Species	VOLUME EQUATION
Form Class - 1	$V/D^2 = 0.001559 + 0.06674/D^2 - 0.02039/D$
Form Class - 2 (applicable at 12 cm. and above).	$\frac{V}{D^2} = 0.0012897 + 0.25564/D^2 - 0.030418/D$
Form Class - 3	$V = 0.12652 - 0.018037D + 0.000956D^2$
Form Class - 4	$V/D^2 = 0.001184 + 0.1812/D^2 - 0.02348/D$
<u>Abies densa</u> (Species - 1)	$V = 0.12167 - 0.01140 + 0.000812D^2$
<u>Alnus nepalensis</u> (Species - 3)	$V/D^2 = 0.001559 + 0.06674/D^2 - 0.02039/D$

Form Class/Species VOLUME EQUATION

Michelia excelsa
(Species - 27) $V/D^2 = 0.0002138 + 0.002517/D + 0.00001064D - 0.00000004D^2$

Symplocos theaeifolia
(Species - 39) $V = 0.03754 + 0.000587D^2$

Tsuqa dumosa
(Species - 42) $V/D^2 = -0.00055 + 0.00716/D + 0.000029D - 0.00000012D^2$

Others (applicable at 15 cm. & above) $V = 0.3555 - 0.037D + 0.001259D^2$

Where V = Under bark volume (m³) upto 5 cm. limit over bark diameter.

D = Diameter at breast height (DBH) in cm.

3.2.3 Tree Volume :

With the help of the selected local volume equations, the volume of all enumerated trees were calculated.

3.2.4 Plot Volume :

The volume of all enumerated trees in a plot this arrived at were added up to obtain the plot volume.

3.3.1 Estimation of Error :

The error was estimated based on cluster sampling method. The percentages of error for Sector-A and Sector-B is appended as below :-

Sector - A :

Stratum	Net Forest Area (in ha.)	Volume/Ha. (m ³)	S.E. %
I	2427.27	175.202	15.32
II	4420.54	240.234	3.93
III	2792.50	168.209	14.60
Total	9640.31	202.995	5.29

Sector - B :

I	5132.77	204.354	14.47
II	5406.92	316.822	5.97
III	3110.00	117.856	12.74
Total	13649.69	229.196	5.02

CHAPTER - IV

12515
 15085

 27600

4.1.1. Area Estimate :

The break up of the total geographical area of 12515 ha. in Sector-A and 15085 ha. in Sector-B into various land use classes is shown below :-

AREA STATEMENT : SIKKIM.

SECTOR - A

Stratum	Gross forest area (in ha.)	Forest villages (in ha.)	Plantations (in ha.)	Disreservation (in ha.)	Blank area (in ha.)	Net forest area (in ha.)
I	3047.50	20.23	600.00	-	-	2427.27
II	5675.00	40.46	1214.00	-	-	4420.54
III	3792.50	-	1000.00	-	-	2792.50
T o t a l	12515.00	60.69	2814.00	-	-	9640.31

SECTOR - B

2814

Stratum	Gross forest area (in ha.)	Forest villages (in ha.)	Area handed over to Tea Garden (in ha)	Area handed over to Army (in ha)	Area cleared for Tibetan refugees	Plantation (in ha)	Blank area (in ha)	Net forest area (in ha)
I	5425.00	20.23	-	-	-	272.00	-	5132.77
II	6550.00	-	121.40	41.68	80.00	900.00	-	5406.92
III	3110.00	-	-	-	-	-	-	3110.00
Total	15085.00	20.23	121.40	41.68	80.00	1172.00	-	13649.69

4.1.2 Volume Estimates :

Growing stock volume per hectare has been estimated for each stratum in the two sectors separately (Refer Table No.13.0). It is quite interesting to report that in both the sectors stratum-II has the highest volume per hectare and it is estimated to be 240.233 m. in Sector-A and 316.82 m. in Sector-B. Volume per hectare decreases progressively in stratum 1 and 3 in both the sectors. Total volume estimation diameter classwise is furnished in Table No.14. The volume of growing stock of trees 100 cm. d.b.h. and up comes to 32.76% in Sector-A and 38.9% in Sector-B, indicating the fact that considerable portion of growing stock volume comes under mature to over-mature class.

96
 136

 232960

9640.31
 13649.69

 23290.00

2874.69

125.15

 .6

Distribution of volume of estimated growing stock utility class-wise is furnished in the Table No.8. Average volume per hectare of saw logs (construction and box sawn timber) comes to 116.22 m³ (gross under bark) in Sector-A and 124.64 m³ (Gross under bark) in Sector-B which is appreciably high. The estimated plywood timber per hectare in Sector-B is 16.62 m³ per hectare.

A significant variation in estimated volume per hectare of growing stock, (utility classwise) was noted in all the three different strata of Sector A and B.

4.1.3 Local Volume Table :

Volume tables were prepared for Form Class II, III & IV. The equation developed for Alnus nepalensis was found to be suitable for Form Class I. Thus local volume tables were developed for all the form classes and also for important commercial species like Michalia excelsa Symplocos thieffolia, Tsuga dumosa.

(Please refer to table No.18).

ESTIMATION OF WOOD BY VARIOUS UTILITY CLASSES

SECTOR -- A & SECTOR -- B

Utility Class	Sector - A	Sector - B
	Estimated volume (m ³) (volume expressed in UB)	Estimated volume (m ³) (Volume expressed in UB)
(a) Total volume	1956935	3128461
(b) Ply wood	160218	321550
(c) Constructional Timber	943405	1283469
(d) Box planking	176944	417971
(e) Match wood	46647	51234
** (f) Fire wood	629721	1054237

** Fire wood volume = Total wood volume - (Plywood volume + Constructional Timber + Box planking + Match wood volume)

Volume as mentioned here in this report is all under bark unless mentioned otherwise.

4.1.4 Distribution of stems per hectare :

Diameter classwise distribution of stems per hectare is incorporated in Table No. 11.0. The preponderance of low diameter group trees in each stratum is quite evident in case of both the sectors. A sharp drop in number of stems per hectare is noted as the diameter group changes from 10-19 to 20-29 (percentage changed from 50.12 to 21.84 for Sector-A and 45.41 to 22.89 in Sector-B) in Table No.12.0. Therefore, the decline in number of stems is gradual upto diameter 100 cm. and above. This pattern is remarkably similar in different forest strata.

Out of the three strata in Sector-A number of stems per hectare is highest in stratum 3 which is 230 and it is almost similar in stratum 2 of Sector-B where it is 228. Besides, tables showing per hectare distribution of stem utility classwise under different diameter classes had also been drawn up and furnished in the Appendix (Refer Table number 3).

As desired by the State a special study regarding the distribution of stem per hectare, volume per hectare and total growing stock of Symplocos theifolia (kharane) had been undertaken and separate detailed results are furnished in the Table No. 15.1 & 15.2).

4.1.5 Distribution of volume per hectare :

It is evident from Table No. 14 that the vol./ha. in Sector-A is 202.9 m³ while in Sector-B it is 229.2 m³. Thus Sector-B is better stocked in comparison to Sector-A.

4.2.1 Present management :

At present there is no valid working plan operative in the project area. The general pattern of management is clear felling in selected area with artificial regeneration of coniferous or temperate broad leaf species of higher economic value. Concentrated logging operations under departmental supervision had been carried out at places like Tal Forests near Hilley. Most of the mature to over-mature Oak, Katus forests are being exploited by making Charcoal cokes as these species do not have much market value at present. Selection marketing of trees is also done at places for particular species of trees on local demand.

The State Forest Department mainly aims at conversion of wherever possible, mixed irregular wet miscellaneous forests of diverse species into a regular even aged forest of more economically important species in order to obtain improved future yield as well as highest return per unit area. The State has already taken up intensive plantation programmes of various broad leaf species like Champ, Kapasi, Pipli, Utis, Prunus, Juglans and Conifers

trees like Silverfir, Cupressus and Cryptomeria to produce cellulosic raw material for pulp and paper industry as well as raw materials for other forest based industries likely to come up in the state. The state also is eager to open up hitherto inaccessible forest so that locked up capital can be utilised.

During ground survey it was noticed that natural regeneration of commercial species of trees is quite poor and deficient to be relied upon as a dependable method of re-stocking of these areas. Except Kholme, Kharane and Jhinganim the representation of other commercial species in the low diameter class is almost negligible. So natural regeneration could not be adopted for conversion of these forests to even aged crop. The system of management suitable under such circumstances will be clear felling with artificial regeneration.

The growing stock comprises of about 40 commercially important tree species in irregular mixture and silvicultural characteristics of growth and management. The age gradations and diameter class distributions also strikingly lack in uniformity and not much growth data of these in natural condition are available. Under such circumstances, it is not possible to control yield by volume, yield here is to be calculated only by area.

4.2.2 Rotation & Conversion period :

Sufficient growth data regarding the species to be selected for plantations are not available. On the basis of data collected from Silvicultural Division, West Bengal, it is found that Pipli, Champ, Walnut, Kapasi etc. will attain exploitable diameter within 80 years in adjacent Darjeeling Himalayas. It is found that Champ, Pipli and Kapasi attain average d.b.h. of 58.62 cm. in 100 years. In 80 years Silverfir attain d.b.h. of 25 cm. and Champ and Pipli attain diameter of 69 cm. in 80 years. It is expected that growth of these species will definitely improve if proper silvicultural care is ensured from the very start of the plantation. Thus it can be reasonably expected that average 50 cm. diameter breast height will be obtained in 80 years in case of this felled timber species. Hence rotation in such plantations is tentatively fixed at 80 years.

Keeping in view of the State Forest Department's objective about 40% of the plantations will be of soft wood species mainly of conifers like Cryptomeria japonica, Cupressus casimiriana, C. lucitanica, Pinus patula etc. The growth data obtained from Darjeeling hills clearly show that within 40 years Pinus patula attain an average girth of 137 cm. in 40 years C. lucitanica attains 132 cm. average girth in 20 years and Cryptomeria japonica attain 32.5 cm. average diameter b.h. in 35 years. Hence the rotation of this quick growing conifers species is tentatively fixed at 40 years.

It is observed that a sizeable portion of the growing stock in the area is mature and overmature. Thus a considerable portion of the growing stock is being wasted away due to decay or over maturity.

In spite of the aforesaid fact, the rotation period for broad leaved species can not be brought down as the growth rate of the broad-leaved species is rather slow and it is known how the planted crop will react at such a high altitude

It is, therefore, safe to adopt a conversion period of 80 years for broad leaved species.

4.2.3 Potential Annual Cut :

The management plan suggested for the area is based on the consideration that two types of work schedule will be followed. Sixty percent (60%) of the area will be worked at a rotation of 80 years where only broad-leaved species will be planted. The balance forty percent (40%) of the area will be worked at a rotation of 40 years where fast growing conifer species will be planted.

Sector - A.

Gross forest area in Sec.-A is 12515.60 ha. After excluding non-forest area viz. forest village, hut etc. net forest area works out to be 12454.31 ha. This area would be proportionately distributed under broad-leaved schedule (60% of the area) and under conifer schedule (40% of the area). As such the area demarcation would be (i) 7472.586 ha. under broad-leaved conversion and (ii) 4981.724 ha. under conifer conversion.

Sector- B.

The forest area in Sec.-B after exclusion of non-forest areas is 14821.69 ha. Keeping 50% of the area under broad-leaved conversion the net forest area works out to be 8893.014 & 5928.676 ha. respectively.

Fixing the conversion period at 80 years for broad-leaved and 40 years for conifers the annual felling area for Sec.-A, works out at 217.95 ha. out of which 93.41 ha. falls under broad-leaved conversion and the rest (124.54 ha.) under conifer conversion.

Similarly, in Sec.-B the coupe area for broad-leaved is 111.16 ha. and for conifers 148.22 ha. giving a total annual felling area of 259.38 ha.

The general pattern of management of the forest as discussed above is outlined as below :-

148.00
111

259

<u>1. Work-Schedule-Broad leaved</u>	<u>Sec. A</u>	<u>Sec. B</u>
Forest area (ha.) (including plantation but excluding Non-forest areas like forest village, hut etc.)	7472,586	8893.014
Conversion Period	80 years	80 years
Coupe area (ha.)	93.41	111.16
<u>2. Work-Schedule-Conifers</u>		
Net forest area (ha.)	4981.724	5928.676
Conversion period	40 years	40 years
Coupe area (ha.)	124.54	148.22

At the end of the rotation, the following yield will be expected for conifer work schedule.

2.4 Annual yield :

Estimated yield of timber which is likely to be made available from the project area utility classwise under the proposed cutting model is furnished below:-

ESTIMATED ANNUAL YIELD (M³) UTILITY CLASSWISE

Utility Class	<u>Sector - A</u>	<u>Total</u>	<u>Sector-B</u>	<u>Total</u>	<u>Total</u>
	Annual coupe 217.95 ha.		Annual coupe 259.38 ha.		yield of project area/year
	(m ³ /ha.)	(m ³)	(m ³ /ha.)	(m ³)	(m ³)
Ply timber	16.620	3622.329	23.557	6110.214	3732.543
Constructional timber	97.860	21328.587	94.028	24388.982	45717.569
Box planking	18.355	4000.472	30.621	7942.474	11942.946
Match wood	4.839	1054.660	3.753	973.453	2028.113
Firewood	65.322	14236.929	77.235	20033.214	34270.143

3 Certain aspect of future management proposals

Future management work is to be carried out as per the prescriptions proposed in the intensive management scheme to be drawn by the State Forest Deptt. It has been discussed with the State Forest Department Authorities and it was agreed upon that the existing staff, labour, land and machinery are quite capable of undertaking clear felling and raising of plantations of a total area of 477.33 hectare over the entire project area and actually at present most of the high hill plantations (out of total target of the State Forest Department's plantations programme) are being raised in these areas.

Plantations for cellulosic raw materials would be located at a comparatively easier part of the project area as less value per unit area is likely to be fetched here. Hill timber (hard wood) plantations should be raised at higher level.

In view of management problems, it is advisable to raise the plantations of hill timber species like Kapasi, Utis, Pipli, Champ, Walnut and other suitable species in blocks. And in each sector 40% area of the annual fellings will go under coniferous plantations and balance in hill timber plantations.

Annual coupe area for conifer plantation :-

Sector - A.	124.54 ha.
Sector - B.	148.22 ha.
<hr/>	<hr/>
Total	272.76 ha.

This area will give cellulosic raw material. In addition to this some thinning material would also be available as a subsidiary yield.

Taking yield of coniferous plantation as $300 \text{ m}^3/\text{ha}$. ~~year~~ total yield works out to be $1,09,104 \text{ m}^3/\text{year}$. This quantity will be sufficient for setting up of a 100 ton/day paper mill in this area.

C H A P T E R - VI

INDUSTRIAL POTENTIALITY

Supply and Demand Analysis :

Local population mainly consists of forest villagers, workers and village people adjacent to the small hamlets fringing around the project areas who are either solely or partially dependent upon these forests for the project area for the supply of their need for agricultural, constructional and domestic purposes. Accordingly, local demand may be categorically separated into two types as dealt below:-

A. The entire area consists of mainly reserved forests of limited habitations of forest villagers and workers. Their agricultural requirements are quite scanty as mostly they follow Taungys method of cultivation without ploughing. In such a hilly terrain, bullock cart finds no use. From the data furnished by the Forest Department it is found that there are 107 houses in the Sector-A and 25 houses in Sector-B. The total population is about 660. On taking up plantation programmes the numbers of Taungyadars will be increased and 60 extra houses are to be constructed to meet up the increased annual plantation target. These forest houses will be made of timber with about 3.5 m^3 of timber for each house. Thus there will be need of 210 m^3 of constructional timber for new construction. Besides, 132 houses will need annual repair and taking 10% as the requirement of timber for repairs compared to new construction, timber required for the repairs will be about 46 m^3 . Thus their total requirement will be 256 m^3 inside the project area.

B. There are 14 villages around the project area in Sector-A. and 8 villages around Sector-B and these villages consist of 475 houses with an estimated population of 2375, while 34,229 households are in rural areas of entire state which is quite sparsely populated. Considering the mountainous terrain and terraced nature of cultivation, plough has a limited use. Considering one plough needs $.056 \text{ m}^3$ of timber and at least one plough will be required for each house with a life of two years about 20 m^3 will be required annually for their requirement which is too scanty to be considered separately.

In these Himalayan ranges good quality of stone blocks are available for building construction and hence in these areas sizeable percentage of buildings are made of stones with limited timber use. The total quantity of timber required in these areas both new construction and repairs is considered to be quite insignificant on the basis of the fact that stone blocks are preferred to timber for the construction work.

Fire Wood :

The area is hilly and moist temperate. Firewood is the major source of energy. The total availability of fire wood is estimated to be about $34270 = 143 \text{ m}^3$. The estimation is based on the fact that annual per capita requirement is about 2 tones with a population of about 3035. Thus the total requirement is about 9592 m^3 (.61 tones = .964 m^3).

6.2. Status of existing wood based industries in and around the project area :

The project area is mountaineous and the infrastructure is not much developed for setting up of important wood based industries and hence at present there is no wood consuming industrial units within these forests. However, in the eastern part of Sikkim the following industries are found.

1) Fruit canning factory of Sikkim located at Singtam is a State Government Undertaking and they manufacture Jam, Jelly and other fruit products and sell these to the various parts of the country and also export abroad. They need timber boxes for transport of the produce. The boxes should have a carrying capacity of 20-30 kgs. per box and the dimensions are 20.25" x 12.14" x 10" (L x W x H). The thickness of the battons should be 5-8" and the factory needs approximately 1 lakh such boxes annually. At present the factory authorities are buying these boxes mostly from North Bengal and the species available are Simul, Haldu, Moyna (Tetrameles) & Gokul (Ailanthus). The box planking timber from Sikkim forests will find very good market in this factory. So the total quantity of estimated box planking wood is to be supplied to this factory only.

2) Furniture Industry:- It is situated at Bordang and it is a State Government Undertaking. This industry needs approximately 500m^3 of round wood per year. The species preferred by them are Champ, Walnut and other recommended species of a furniture timber. This industry has one saw mill attached to it with two band saws. Out of the selected species for plywood manufacture, most of these species are also good furniture timber. Therefore from the estimated available annual stock of plywood 6720 m^3 of such timber is reserved for this State Government Undertaking.

3) Sikkim Distillery:- This is also located near Rongpo and it is a private undertaking. The factory needs approximately 3 lakh boxes of almost same size as required by the Fruit Factory. Thus total annual requirement of timber for this factory is 18984 m^3 . This requirement of timber per box planking can be made available from the project area annually.

2.1 Net balance calculation:

The net wood balance of project area which is available for industrial uses annually is furnished below after deduction of the local requirement.

NET WOOD BALANCE TABLE

Utility Class	Estimated Availability (m ³)	Local requirement (m ³)	Surplus (m ³)
Ply	9732.543	6720	3012.543
Constructional	45717.569	Insignificant	45717.569
Box	11942.946	25310	N i l
Match	2028.113	N i l	2028.113
Fire wood	34270.143	9592	24678.143

C H A P T E R - V I I

Conclusions & Recommendations :

The project area of Sikkim is land-locked mountainous one with precipitous slope and no available sizeable flat land. The infrastructure is also not sufficiently developed in these high hills to attract suitable entrepreneurs in any plausible venture. The situation is markedly different in the foot hill areas like Jorethang where communications, power, labour and other associated infrastructural facilities exist. Rivers are perennial and hence water scarcity does not pose any serious problem. Though there is no railway linkage these areas are well connected to the National High Way and to the industrial belt at Simtang areas where industries are coming up.

Vast resources comprising of various categories of wood available in surplus are yet to be put to economic or commercial use to provide employment opportunities and efficient utilization of locked up resources. It is recommended that wood based industries of following types may be set up at suitable sites around the project area.

A. Saw Mill Industry:

The total quantity of constructional timber and box planking timber available annually from the project area is estimated to be 57660.515 m³. The entire quantity of constructional timber and box planking timber available is to be sawn and converted into suitable sizes before these are finally utilized thereby constituting the main raw material for the proposed saw mill. Sawn timber will find very good market at Gangtok, Siliguri, Kalimpong and Darjeeling as brisk constructional activities are being undertaken in these areas. The box planking timber after conversion in this saw mill is likely to be utilized by the Distillery and Fruit Preservation Factory whose demand is appreciably high. Hence sufficient timber is available to set up 2 saw mills with four band saws and initial conversion capacity of 70 m³ per day in two shifts. This is to start with, and subsequently with further development of infrastructure there is sufficient scope regarding expansion of the capacity of this saw mill.

B. Furniture Factory:

The existing furniture factory at Bardag can only utilize 500 m³ of sawn timber for the manufacture of various types of furnitures, Saw Mill which is a subsidiary unit to this factory has the capacity to convert 22.4 m³ of round timber per day in two shifts. Thus per year total quantity of furniture timber sawn by this saw mill unit can be 6720 m³ of timber annually which may yield about 3360 m³ of sawn timber. Thus it is clear that there is an immense scope for expansion of the furniture factory considerably so as to ensure efficient utilization of the outturn from the attached saw mill. Establishment of any new furniture industry is not recommended.

C. Plywood Industry:

There is no Plywood Factory in entire Sikkim. It is estimated that 3012.543 of ply-grade timber is available annually and it can produce approximately 4.51 lakh m² of plywood. Thus there is ample scope for starting a plywood factory in the area.

D. Match Industry:

A small match factory producing "Sun" brand match has of late started their production on an experimental basis in Singtam areas. This factory is likely to consume all match wood species available mostly from the foot hills as well as from certain selected species of the project area. In pursuance of the request of the Forest Department, a special study had been undertaken on the availability of Kharana (Simplacos theiifolia) and it was found that out of 97881 m³ of estimated match grade timber Kharana comes to 75227 m³. Kharana hitherto considered as less important species can now be utilized by match industry and logs above 20 cm. diameter will be useful. The total quantity of estimated match wood available annually is likely to be consumed by the local match factory.

Selection of site:-

Jorethang seems to be the best suitable site for establishment of ply wood mill and saw mill. It has considerable tract of flat land, adequate power facilities and it is only 30 kms. from the National Highway. Other suitable site for saw mill is Rabangla which suits best for proper utilization of raw materials from Sector - B.

However, detailed and thorough investigations regarding selection of mill sites are to be undertaken by the enterpreneurs.

A N N E X U R E - I

SPECIES CODE

Sl. No.	Scientific name	Varnacular or common name.	Species Code Number
1.	<i>Abies densa</i>	Silver fir, Gobresalla	01
2.	<i>Acer caepbellii</i>	Kapasi	02
3.	<i>Alnus nepalensis</i>	Utis	03
4.	<i>Beilschomeidia roxburghiana</i>	Thulotersing	04
5.	<i>Symingtonia populnea</i>	Pipli	05
6.	<i>Betula utilis</i>	Bhujnet	06
7.	<i>Betula elnoides</i>	Sour	07
8.	<i>Castanopsis species</i>	Katus	08
9.	<i>Cinnamomum impressinervum</i>	Sisso	09
10.	<i>Cedrela febrifuga</i>	Lakhtoon	10
11.	<i>Daphne cannabina</i>	Kagate	11
12.	<i>Sloanea dasycarpa</i>	Gobre	12
13.	<i>Engelhardtia spicata</i>	Mawa	13
14.	<i>Eurya japonica</i>	Jhingni	14
15.	<i>Evoidia roxburghii</i>	Khanakpa	15
16.	<i>Edgeworthia gardeneri</i>	Argayle	16
17.	<i>Eleocarpus species</i>	Bhadrasi	17
18.	<i>Juglans regia</i>	Walnut, Okher	18
19.	<i>Juniperus recurva</i>	Juniper	19
20.	<i>Laryx griffithii</i>	Bhagre salla	20
21.	<i>Litsaea species</i>	Rax Rk Pahnle	21
22.	<i>Machilus edulis</i>	Lapche, Kawla	22
23.	<i>Machilus gammicana</i>	Chiple kawla	23
24.	<i>Machilus odoratissima</i>	Lati kawla	24
25.	<i>Magnolia campbellii</i>	Ghoge champ	25
26.	<i>Alcimandra cathcartii</i>	Tite champ	26
27.	<i>Michelia doltsopa</i>	Rani champ	27
28.	<i>Michelia lanuginosa</i>	Phuare champ	28
29.	<i>Macaranga species</i>	Malata	29
30.	<i>Nyssa javanica</i>	Lekh chilaune	30
31.	<i>Prunus nepalensis</i>	Arupate	31
32.	<i>Phoebe attenuata</i>	Angare	32
33.	<i>Picea morindoides</i>	Tangre salla	33
34.	<i>Quercus lamellosa</i>	Buk	34
35.	<i>Quercus lineata</i>	Phalant	35
36.	<i>Quercus pachyphylla</i>	S. katus	36
37.	<i>Rhododendron campbellii</i>	Gurans	37
38.	<i>Rhododendron hadgsonii</i>	Korlinga	38
39.	<i>Symplocos theifolia</i>	Kharana	39
40.	<i>Syzygium species</i>	Jam	40
41.	<i>Taxus baccata</i>	Dhengresalla	41
42.	<i>Tsuga dumosa</i>	Tengresalla	42
43.	Others		43

A N N E X U R E - II

LIST OF REVENUE DISTRICTS, FOREST DIVISIONS, RANGES, BLOCK AND STRATUM ALONG WITH THE CORRESPONDING CODE.

<u>Revenue District</u>	<u>Name</u>	<u>Code</u>
	North Sikkim	01
	South Sikkim	02
	East Sikkim	03
	West Sikkim	04
<u>Forest Divisions.</u>	North Sikkim	01
	South Sikkim	02
	East Sikkim	03
	West Sikkim	04
<u>Ranges.</u>	Soreng	01
	Gezing	02
	Rabangla	03
	Namchi	04
	Mandan	05
<u>Blocks.</u>	Sombare	01
	Rabangla	02
	Temi	03
	Mandan	04

Mention the name of the block if it is found that grid point has been included in any other new block which has not been included in the above list.

Stratum - I	-	Area upto the limit of 2170 m. altitude.	01
Stratum - II	-	Area of altitude from 2170 m. to 2800 m.	02
Stratum - III	-	Area above 2800 m. altitude	03

A N N E X U R E - III

CODING INSTRUCTION FOR INVENTORY WORK.

Plot Surrounding and Approach Form (Form No.1)

Instructions:-

1. Write the name of the project area at the top of the form.
2. Sl.No. 1-14 are self-explanatory.
3. Against Sl.No.17 - Description of forest of the surrounding area. Study about 50 ha. of area ground the plot and write as per instruction below:-
Sl.No.15(1) the legal classification percentage i.e. what percentage of the area falls within Reserved Forest, Protected Forest, Proposed Reserved Forest, Proposed Protected Forest, Village Forest, Sanctuary etc.
4. Against Sl.No.15(II)-Put the percentage of area covered by High Forests(i.e. Regular Forest); Regeneration Forest(i.e. Forest coming up after being cleared); Coppice Forest(i.e. Forest coming up out of the cut stumps of the regular forest); Manmade Forests, Scrub Jungle, Gross land or cleared land.
5. Against Sl.No.15(III)-Write a small note on the density variation in percentage of opening of the crown as given in the form. A note may also be written about % blank if any found within 50 ha. around the plot.
6. Against Sl.No.15(IV) - Write the names of the species forming the top most canopy, middle canopy and common under growth found.
7. Against Sl.No. 16(General topographical note)- Write a small note about the topography of the surrounding area viz. gently undulating, flat, hilly, precipitous, broken etc.
8. Fill up separate form for substitute point if taken.
9. Grid centre may be shifted upto 500 m. if original falls in a non-forest area. Shifting should be done to North first and if no forest land is available at the North shifting should be done to South, failing to East and lastly to the West. If no forest land is found within a radius of 500 m. substitute points are to be taken.

ANNEXURE - IV

CODING INSTRUCTION FOR PLOT DESCRIPTION FORM (FORM NO. 2)

Instructions:-

- 1) Fill up the Project area, Name and Data at the top of the form.

<u>Column</u>	<u>Description</u>	<u>Code.</u>
1	Job Number	To be filled in the office.
2-3	Block/Stratum	Put code no. for the block or strata as the case may be.
4-6	Grid Number	Write the no. of the grid
7	Plot Number	Write the plot number, where there is more than one plot one grid centre thus 20/1
8	Card design	To be filled in the office.
9-10	Map Sheet	Given separately (Annexure - II)
11	State - Sikkim	10
12-13	Revenue District	Code given separately (Annexure - II)
14-15	Forest Division	Code given separately (Annexure - II)
16-17	Range	Code given separately (Annexure-II)

ALTITUDE (COL. 18 - 19)

Read from the Map the altitudes at the starting and closing of the plot and note in meters. Last two digits will be truncated and remaining digits will be altitude code for the form as two-digit code number. Also the starting and closing altitudes should be furnished as

Starting altitude.
Closing altitude.

Example :- Starting altitude and closing altitude of plot are read from the map as 900 and 1010 respectively. Records are made as 09
10

TOPOGRAPHY (COL.20-21)

Study the topography of the plot and put the following code.

Single aspect	01.
Double aspect	02
Multiple aspect	03
Very broken	04
Valley	05
Plateau top	06
Plains	07

Slope of the plot is to be measured by Abney's level by standing at the base line and sighting the lowest point to other end. The codes are as follows:-

<u>Slope (in degree)</u>	<u>Code</u>
No Slope	00
1° - 5°	01
6° - 10°	02
11° - 20°	03
21° - 30°	04
31° - 40°	05
41° - 45°	06
More than 45°	07

POSITION OF SLOPE (COL. 24-25)

The position of the slope with reference to the hill on which it is located will be classified as follows:-

<u>Position of Slope</u>	<u>Code</u>
No Slope	10
Ridge top	11
Upper one third	12
Middle one third	13
Lower one third	14
Valley bottom	15

In case two hillocks involved, put ~~dx~~ code for maximum portion

ASPECT (COL. 26-27)

Aspect means the direction of slope covering maximum area of the plot. Therefore, you should stand at the center of the plot and should find the ~~fx~~ direction of the maximum slope by compass and record it.

<u>Aspect</u>	<u>Code</u>
No aspect	00
North	01
North - East	02
East	03
South - East	04
South	05
South - West	06
West	07
North - West	08

ACCESSIBILITY CLASSES (COL. 28-29)

The distance between the road, the path or the navigable water way from the nearest point of the plot has to be guessed and recorded as follows:-

<u>Road</u>	<u>Code</u>
If within 1000 m.	01
If 1001 - 3000 m.	02
If 3001 - 5000 m.	03

Note:- The road or a bridal path means a path with minimum width of 2 meters and can be used either by vehicular transport or by mule.

ROCK (COL. 30-31)

You will come across the following types of the rock in the area. Granite, Quartzite, Dolomite, Phyllite, Chlorite Schist, Sandstones, Slate-shales, Siltstones and Epidiorites etc. The coding will be as follows:-

<u>Rock</u>	<u>Code</u>
Quartzite	01
Slate, Phyllite, Mica schist	02
Dolomite, Lime-stone	03
Epidiorites, Chlorite schist	04
Carbonaceous Shale, Coal	06
Granite gneiss	07
Other rocks	08
Nonrock	09

If you cannot identify the rock or even otherwise, please collect a sample, put it in a polythene bag, mark the bag with a grid point index and block index and send it to the base camp for identification or for checking.

DEPTH AT WHICH ROCK FOUND (COL. 32-33)

<u>Depth of Rock</u>	<u>Code</u>
When the regular rock formation is found on the top surface	11
When the regular rock formation etc, found at 0 - 1 m. depth.	12
More than 1 m. depth	13

(Remember that if there is soil it can never have code 11)

LITTER (COL. 34-35)

The under composed litter will have the following codes depending on their thickness.

<u>Thickness(cm.)</u>	<u>Code</u>
0-2	11
3-4	12
5-6	13
7-8	14
9 +	15

If there is partly decomposed but recognisable litter than the code will be as follows:-

<u>Thickness(cm.)</u>	<u>Code</u>
0-2	21
3-4	22
5-6	23
7-8	24
9 +	25

In the case there is undecomposed material lying on partly decomposed material, always take coding for that item which is of greater thickness.

HUMUS (COL.36)

Depending on thickness the code will be as shown. The depth of humus will be measured by scraping off the litters and then digging a hole upto the regular soil.

<u>Depth (cm.)</u>	<u>Code</u>
0-4	1
5-8	2
9-12	3
13-16	4
16 +	5

STONINESS (COL. 37)

The quantities of stones in the soil will be coded as follows:

<u>Percentage by volume</u>	<u>Code</u>
No stones	0
1-5	1
6-25	2
26-50	3
51-75	4
76-100	5

COLOUR (COL. 38)

The predominant colour of the upper horizon of soil below humus layer will be determined and classified as below:-

<u>Predominant Colour</u>	<u>Code</u>
Black	1
Brown	2
Red	3
Yellow	4
Gray Brown	5
No soil	6

STRUCTURE (COL. 39)

The degree of development of the structure will be coded as given below:-

<u>Degree of Structure Development</u>	<u>Code</u>
Structureless	0
Weakly developed structure	1
Poorly developed structure	2
Well developed structure	3

CONSISTENCY (COL.40)

To evaluate consistency , select and attempt to crush in the hand a small soil mass that appears slightly moist and code as follows:-

<u>Consistence</u>	<u>Description</u>	<u>Code</u>
Loose	Non-coherent soil material	0
Very friable	Crushed with very gentle pressure and coherent when pressed together.	1
Friable	Soil material crushed, but with gentle to moderate pressure between thumb and fore 2-finger, and coherent when pressed together.	2
Firm	Soil material crushed with moderate pressure between thumb and forefinger but resistance is distinctly noticeable.	3
Very firm	Soil material crushed with a strong pressure; partly crushable between thumb and forefinger.	4

STICKNESS (COL.41)

Degree of adhesion to objects at field capacity (i.e. just saturated moisture).

<u>Stickness</u>	<u>Code</u>
Non-sticky	0
Slightly sticky	1
Sticky	2
Very sticky	3

TEXTURE (COL. 42)

Collect 500 gms. of soil sample at a depth of 15 cm. from the base of the litter or humus layer and put it in a polythene bag and mark it with block and grid code number. This sample should be sent to base camp at the earliest. Codes for different textures will be as follows:-

<u>Texture</u>	<u>Code</u>
Clay	1
Clay loam	2
Loam	3
Sandy loam	4
Sand	5
No soil	6

DEPTH OF SOIL (COL.43)

The depth of the soil will be estimated by digging a 15 cm. deep pit and guessing the remaining depth. Guess will be based on all available information e.g. exposed soil profil or luxuriance of ground vegetation.

<u>Item</u>	<u>Description</u>	<u>Code</u>
Very shallow	Less than 15 cm.	1
Shallow	15 to 30 cm.	2
Medium	31 to 90 cm.	3
Deep	90 and 180 cm.	4
Very deep	180 and above	5
No soil	N i l	6

PH (COL.44)

<u>PH</u>	<u>Code</u>
More than 8	1
8 - 7.1	2
7 - 6.1	3
6 - 5.1	4
5 - 4.1	5
4 and less	6

ROOTS (COL.45)

These roots will be coded as follows. Quantity should be estimated at a depth of 30 cm.

<u>Quantity of roots</u>	<u>Code</u>
Abundant roots	1
Medium	2
Fow	3
Nil	4

VEGETATION (COL.46)

Remember the following definition:

Forest means an area where the tree species stand on the soil. Shrubs means where shrubs are on the soil without any tree covering the shrubs. Grassland means where the grass is on the soil without any shrubs of tree covering the grass. Blank means where there is nothing or only herbs are on the soil. In this context the vegetation has to be noted and coded.

<u>Description</u>	<u>Code</u>
1-25% forest, balance shrubs, grassland etc.	1
26-50% " " " "	2
51-75% " " " "	3
76-100% " " " "	4
Plantation/Natural Regeneration	5
No forest, only blank	6
Orchards, Private gardens, Pastures, Large water areas, Forest villages, etc.	7

Plantation/Natural Regeneration means those which are manmad even if they are of very small height.

REGENERATION (COL. 47)

This will be estimated ocularly. For this the presence of seedlings, saplings and poles in the plot will be taken into consideration.

<u>Description</u>	<u>Code</u>
When one established seedling, sapling or pole of the timber species is found on an average in every 6 sq.m. it will be called as "Profuse".	1
When one in 20 sq.m. area on an average, it is "Adequate".	2
When one in more than 20 sq.m. but less than 200 sq.m. it is "Fair".	3
When more than 200 sq.m. it is nil	4

FOREST TYPE (COL. 48-49)

Put the code number of forest type as given in the separate sheet (Annexure-II).

NO. OF STOREYS (COL. 50)

The codes for different storeys are as follows:-

When there is no marked differentiation in the level of the canopy. 1

Two storeyd forest-where there is two well defined tiers in the canopy which can be recognised in the forest. 2

Multi-storeyed forest-where there are more than two tiers in the canopy of the forest. The variation among the tree species is so pronounced that distinct tiers are recognised in the same plot. 3

Note:-Normally pure forest (viz. Pine forest) & plantations will have only one storey. If in blanks regenerations cover the top canopy, it will not form more than one storey, but if the regeneration is found under another canopy i.e. if in the same place there are different age group forming distinct tiers these will be called two or multi storey forest as the case may be. Shrubs and grasses are not considered for this purpose.

CROWN DENSITY (COL. 51)

The density in the crown will be measured in the percentage of opening in the canopy. Study the canopy covering the plot, estimate the percentage of opening in the same. The following classes will be recognised for the purpose of crown density.

<u>Description</u>	<u>Code</u>
No opening in the crown	1
Upto 50% opening in the crown	2
More than 50% but less than 75% opening in the crown	3
More than 75% opening in the crown	4

TOP HEIGHT (COL. 52-53)

Study the canopy of the plot and put the approximate average height in metre of the predominant and co-dominant trees. The trees having the crown at the top most level of the forest will be called predominant trees and those just below the former one are called co-dominant tree.

GRAZING INCIDENCE (COL.54)

Depending on the intensity of grazing by cattles the area is subjected to, following classes will be recognised.

<u>Incidence</u>	<u>Code</u>
Heavily grazed	1
Moderately grazed	2
Grazing absent	3

FIRE INCIDENCE (COL. 55)

When the area is subjected to occasional and frequent fire	1
When such a fire hazard is not common in the area	2

LEGAL STATUS (COL. 56)

<u>Put the following code</u>	<u>Code</u>
Reserved Forest	1
Protected Forest	2
Proposed Reserved Forest	3
Proposed Protected Forest	4
Unclassed State Forest	5
Village Forest/Community Forest	6
Private Forest	7
No Forest	8

PRESENT LAND USE CLASS (COL. 57-58)

Study the plot and its situation. If the entire plot is situated in any of the following classes of land, put the code as given against each.

	<u>Code</u>
Forest Land	01
Agricultural land	02
Jhum land	03
Home-stead	04
Grazing land	05
Horticulture land	06
Water body	07
Other non forest land	08

If a portion of the plot fall in some other classes of land i.e. if the area is comprised of two types of land then first put the code number of the classes of land which covers the greater part of the plot then put the code no. for the other class of land. For example if a plot falls in an area where 80% of the plot falls in a-griculture land and 20% in forest land the code should be .21, Like-wise, for a combination of grazing land and horticulture land, the code should be 45. '0' should be ignored in a combined coding to make it a two-digit code.

PRESENT MANAGEMENT (COL. 59)

Enquire from the local forest staff about the system of forest management being carried on in the locality and write the codes accordingly.

<u>Forest Management System</u>	<u>Code</u>
Clear felling system	1
Selection felling system	2
Selection with standard felling system	3
Coppice system	4
No systematic management	5

Note:-

- Clear felling system - Where the entire area is felled.
- Selection felling system - Where the certain trees only are felled according to certain measurements.
- Selection with standard felling system - Where certain trees are retained as seed bearer even though those are suitable for felling according to the prescription of selection felling.
- Coppice felling - Where trees are felled with an aim to get regeneration of the area from coppice shoot.

ANNEXURE - V.

CODING INSTRUCTION FOR PLOT ENUMERATION FORM (FORM NO.III/B)

Write the name of the Project area, code number & name of the Crew Leader and date at the top of the form.

<u>Col.No.</u>	<u>Description</u>	<u>Code</u>
1	Job number	To be filled in the office Code given separately.
2	Sector	
3	Stratum	
4-6	Grid number	Write the grid number Write the number of the plot(only in case of cluster plots).
7	Plot number	
8-9	No. of bamboo clumps	Fill up the counts and measurements.
10-11	Total No. of trees	
12-13	Top height(in meters)	
14	Card design	To be filled in the office
15-16	Species code	Put the code No. as given in ANNEXTURE - 1.
45-46		
17-19	D.B.H. (1st.)	Put the dia. measurement at breast in nearest centimeter.
47-49		
20-22	D.B.H. (2nd.)	Put the diameter measure- ment at right angle to the first measurement in cm.
50-52		
23	Condition	Hollow - 1
53		Ratten - 2
		Crooked - 3
		Twisted - 4
		Top broken --5
		Heavily branched. - 6
		Others - 7
		Sound - 8
24	Outturn	Full outturn - 1
54		3/4 outturn - 2
		1/2 outturn - 3
		1/4 outturn - 4
		No outturn - 5

Note :-

- 1) For remaining column entries are to be made in the same manner.
- 2) For top height average height of the predominant and co-dominant trees are to be recorded to nearest metre.
- 3) Dia. measurements are to be taken at breast height i.e. at 1.37 m. from up hill side. Two measurements are to be taken at right angle to each other. In case there is an abnormal swelling or buttress at breast height the measurements should be taken just above the defects.
- 4) DO NOT GET CONFUSED with two sets of column numbers. These are meant for proper utilization of cards and have nothing to do with enumeration.
- 5) Trees on the northern and eastern boundary lines of the plot are to be treated as Out of the plot and these on the southern and western boundary lines are to be treated as In-side the plot. In case of cluster plots the trees on the common boundary should be recorded in the latter plot.

A N N E X . U R E - V I

CODING INSTRUCTION FOR SAMPLE TREE FORM - FORM NUMBER III/

Put the name of the Project area, code number and name of the crew leader and date at the top of the form.

Column No. 1 - Job no. to be filled in the office.
 Column No. 2 - Sector Fill up as usual. Plot no.
 Column No. 3 - Stratum will be only in case of
 Column No. 4-6 - Grid Number cluster sampling.
 Column No. 7 - Plot Number

Column No. 8-10 - Total No. of trees - fill up after actual counting.

Column No. 11-12 - Card Design - To be filled up in office.

Note:- For other columns see notes below.

Name of species :- Put the name of the tree being enumerated. If botanical name is not known local name should be enquired and entered.

<u>Col. No.</u>	<u>Serial No. :-</u>	
13-15		Last serial No. and the total no. of trees in column 8-10 should be the same.
30-32		
47-49		
64-66		
16-17	Species code:-	Should be followed as given in table - 1.
33-34	n u m b e r.	
50-51		
67-68		
18-20	D.B.H (O.B.):-	Over bark diameter in cm. has to be taken at breast height and before under bark diameter is measured.
35-37		
52-54		
69-71		
21-23	D.B.H.(U.B.):-	Under bark measurements should be taken after removing the bark carefully. While taking out the bark, care should be taken to see that sap wood is not scraped out along with the bark.
38-40		
55-57		
72-74		
24-25	Total height:-	To be expressed in nearest metre. (in case of branches below breast height. The branches should be treated as separate trees).
41-42		
58-59		
75-76		

26-27
43-44
60-61
77-78

Bole height :- Should be the height of the main trunk up to the first branching.

Defects :- Code for defects are as follows:-

28
45
62
79

Hollow - 1 Top broken -5
Rotten - 2 Havily branched -6
Crooked - 3 Others -7
Twisted - 4 Sound -8

Col.No. Expected outturn :- Code for expected outturn are as follows:-

29
46
63
80

Full outturn - 1
3/4th outturn - 2
1/2th outturn - 3
1/4th outturn - 4
No outturn - 5

Note:- Do NOT GET CONFUSED with 4 sets of column numbers. These are only meant for proper utilization of the punching cards and have nothing to do with enumeration.

A N N E X U R E - VII

CODING INSTRUCTION FOR TREE VOLUME & CULL STUDY(FORM NO.VI

Definite instructions regarding number of species in different categories of trees to be felled and the area felling will be intimated in the field. (In case of Andama method of felling and logging will depend on the local situation and definite directions will be given there).

Method of felling, Logging and Measurements:

The D.B.H. over bark and the height of the standing tree should be accurately measured with the help of Caliper and Abney's level and entire in the col.no. 18-20 & 14-15 respectively. The height of the tree should be measured upto the top of the leading sheet. Thereafter, the tree is to be felled flush to the ground and all portion which have diameter (U.B.) below 5 cm. should be rejected. By trial and error, the exact point where the diameter of the main stem becomes less than 30 cm. and 20 cm. (O.B.) have to be clearly marked. Cut the stem in these two obligatory points. In the same way mark the different branches where diameter (O.B.) becomes equal to 30 cm. and 20 cm. and cut sections in these points also. Thus large wood portion of the tree, which is by definition wood upto 30 cm. diameter (O.B.) is separated from the residual timber of the range 30 cm. to 20 cm. (O.B.). The balance wood is "small wood" portion from 20 cm. diameter (O.B.) to 5 cm. dia.(U.B.).

Design:

For large wood and residual timber portion has to be cross cut at 2.5 m. intervals. Thus the last section may be more than 2.5 m. but less than 3 m. If any excess portion is left separate measurements should be recorded whatever be the length. Each section is to be measured now for volume determination. Take diameter measurement over bark and under bark at the butt end of each section. Two measurements in each case is to be taken. The small wood portion may be cross cut at a convenient length and measurement is to be taken at the mid-point of the sections along the length.

Note:- In case of any abnormality at the point of cut (either at 2.5m. or at obligatory point, measurements should be the theoretical average of the point. This should be calculated by taking two measurements, one at the lower end and other at the upper end of the abnormal portion and by calculating the average on these two measurements. Care should be taken not to include any abnormal portion in these two measurements. For example if there is a branching at the point of cut take one measurement at the beginning of the swell due to the branching and other at the end of the swell. Calculate the average and put the measurement as such.

(COL.NO. 1-14)

The columns are self explanatory and proper code may be used.

HEIGHT OF THE TREE (COL.NO.15-16 & 17-18)

Height of the tree should be measured before felling. The measurement will be rounded up to the nearest m. and entered in Col.No.15-16.

After felling of the tree the total length of the tree so felled should be measured in nearest metre and should be entered in Col. No.17-18.

D.B.H.(O.B.)COL.NO.19-21)

Diameter at breast height should be measured before felling. Two measures at right angles to each other should be taken and the average is to be entered in this column.

TOTAL NO. OF SECTIONS (COL.NO. 22-24)

Total no. of sections given to the felled tree should be entered in this column.

CONDITION OF THE TREE (COL. NO.25)

The following codes should be used for condition of the tree:-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Dead	1
2	Hollow	2
3	Rot	3
4	Top broken	4
5	Twist	5
6	Others	6

TREE PORTION (COL.NO.26)

The following code for tree portion may be used.

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Main stem (upto 5 cm. dia. under bark)	1
2	First branch(upto 5cm. dia. under bark)	2
3	2nd branch (do)	3
4	Remaining branches (do)	4

TREE SECTIONS (COL.NO.26-28)

Put the Sl.No. of sections.

UTILITY CLASS (COL.NO. 29)

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Large wood (upto 30cm. dia. over bark)	1
2	Residual timber (below 30cm. to 20cm. dia. over bark).	2
3	Small wood (below 20cm. dia. over bark to 5cm. dia. under bark).	3

LENGTH OF SECTIONS (COL.NO.30-32)

Take the correct measurement upto nearest cm. of the length of each section after cutting and enter in this column

DIAMETER MEASUREMENT AT THE LOWER END OF THE LOG AT RIGHT ANGLE (COL.NO.33-35 to 42-44)

Take the correct measurement of diameter to the nearest cm. at the butt end of each log. Two measurements should be taken at right angle to each other and entered in Col.No. 33-35 and 36-38 respectively. Then the diameter of the log excluding the bark portion should be measured correctly. Measurements should be taken two times at right angle to each other and entered in columns No.39-41 & 42-44 respectively.

CULL STUDY CODE (COL.NO.45)

Use the following code :-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Cull absent	0
2	Partial cull present	1
3	Total cull present	2

Note:- When it is found that a particular section has defects to the extent that it can be used for any purpose other than fire wood this will be treated as total cull.

When it is found that after excluding the defective portion certain timber is available it will be called a partial cull.

TWIST (COL.NO.46)

When the tree has a twisted formation which can be easily detected by the twisted fibre of the tree, put code no. 1 if absent put code no.0

BEND (COL.NO.47)

Put the following code:-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	No band	0
2	Single bend present	1
3	Double bend present	2
4	Crooked	3

Note:- If the axis of the logs deviates more than 5cm. for every metre length, from a straight line joining the two ends, it will be treated as bend and if the deviation is less than 5cm. for every metre length, the log will be treated as without bend.

If there are two bends it will be called as double bend and if there are more than 2 bends it will be called crooked.

Bend Double bend Crooked

ROT (COL.NO.48)

a) Type of rot.

The following code may be used:-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	No rot	0
2	Fibrous rot	1
3	Sponge rot	2

b) AVERAGE DIAMETER(COL.NO.49-51)

Take the average diameter(in cm.) of the rot and record it in 3 digits.

c) DEPTH (COL. NO. 52-54)

Measure the depth of the rot with the help of a stell wire and record it in cmt., in three digits.

d) POSITION OF THE ROT (COL.NO.55)

The following code may be used:-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Rot at the pith(i.e. rot in the centre)	1
2	Rot in the heart wood	2
3	Rot on the surface of the log.	3

Note:- Pith the central soft portion at the cut end.

Heart wood:- The portion between the Sap wood and the pith.

Hollow

a) AVERAGE DIAMETER IN CM. (COL.NO.56-58)

If there is no hollowness put '000'. If there is hollowness measure diameter of the hollowness and put the average diameter in nearest cm. in 3 digits.

b) THE LENGTH OF THE HOLLOWNESS (COL.NO.59-61)

Measure the depth of the hollowness in cm. and record it in 3 digits.

KNOTS (COL.NO. 62-64)

If there is no knot put '000'. If there is DEAD knot, measure the maximum length in cm. and record in 3 digits.

Note:- In case of live knot it will be treated as knot absent. This can be verified by chopping of a portion of the knot to find out any dead portion inside the knot. If dead wood is present inside the knot it will be a dead knot and length should be recorded.

SHAKE (COL.NO.65)

a) The following code may be used:-

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Shake absent	0
2	Cup shake (Semi circular)	1
3	Ring shake (Circular)	2
4	Radial shake	3
5	Star shake	4
6	Split	5

Note:- Cup shake-Distortion of fibre in semi circular manner. Radial shake-Distortion of fibre beginning from the pith and spreading towards the surface.

Star shake - Multiple Radial shake.

Split - Distortion of Fibre across the cut and from one side of the circumference to the other.

b) DEPTH (COL. NO. 66-68)

Measure depth of the shake with the help of a steel wire and enter in 5 digits in the nearest cm.

c) DIAMETER (COL. NO. 69-71)

Measure the diameter in nearest cm. of ring or cup shake only and enter in 3 digits. In case of other shakes '000' may be given.

ECCENTRICITY. (COL.NO.72-73)

<u>Sl.No.</u>	<u>Description</u>	<u>Code</u>
1	Eccentricity absent	00
2	Less than $\frac{1}{3}$ eccentric	01
3	More than $\frac{1}{3}$ eccentric	02
4	More than $\frac{2}{3}$ eccentric	03

Note:- If the pith of a log is not situated at the geometrical centre of the log it will be called on eccentric log. Measure the diameter of the log and find out the deviation of the centre from geometrical centre and put the code accordingly.

A N N E X U R E - V I I I

List of Jeepable Roads & Bridal Paths:

Sector - A.

A. Jeepable roads:

- (i) Nayabazar - Chakum - Sorent - Siribadam - Bermek - Higaon - Dehtam - Uttare. (85km.)
- (ii) Nayabazar - Dharamdin - Sombare - Okhra - Nagi - Hilley. (85 km.)
- (iii) Nayabazar - Chakum (15 km.)

B. Bridal Paths:

- (i) Uttare - Chiabhenjan (20 km.)
- (ii) Hilley - Bhoreng (15 km.)
- (iii) Bhorang - Hilltop (85 km.)
- (iv) Hilltop - Phalut - via - Gorkhe (14 km.)
- (v) Dentam - Phalut - Soreng - Sombore.

Sector - B.

A. Jeepable Roads:

- (i) Rabangla - Keozing (8 km.)
- (ii) Rabangla - Damthang (11 km.)
- (iii) Damthang - Namchi - Nayabazar (35 km.)
- (iv) Rabangla - Temi (37 km.)
- (v) Rabangla - Rayang (6 km.)
- (vi) Rabangla - Yangang (29 km.)
- (vii) Rabangla - Ralang (15 km.)

B. Bridal Paths:

- (i) Rabangla - Brang (16 km.)
- (ii) Brang - Phantam - Sada (17 km.)
- (iii) Rabangla - Ralang (10 km.)
- (iv) Yangang - Lingi (12 km.)
- (v) Rabangla - Menomgompha (18 km.)
- (vi) Lingo - Peong.

A N N E X U R E - I X

LIST OF SPECIES SHOWING VARIOUS UTILITY CLASSES AND SPECIFICATIONS.

	<u>Botanical name</u>	<u>Local name</u>
a) <u>Furniture wood:</u> <u>and Plywood.</u> (30cm. d.o.b. and up).	<u>Toona febrifuga</u> <u>Mangnolia campbellii</u> <u>Alcimandra cathcartii</u> <u>Michelia daltsopa</u> <u>Michelia lanuginosa</u>	Lekh toon Goge champ Tite champ Rani champ Phusne champ Gruay champ
	<u>Acer campbellii</u> <u>Juglans regia</u> <u>Betula utilis</u> <u>Betula alnoides</u> <u>Cinnamomum impressinervum</u>	Kapasi Okhar Bhujpat Saur Sissi
b) <u>Constructional timber</u> (30cm. d.o.b. and up)	<u>Abies densa</u> <u>Castanopsis hystrix</u> <u>Machilus edulis</u> <u>Machilus gamicana</u> <u>Quercus lamellosa</u> <u>Quercus pachyphylla</u> <u>Quercus lineata</u>	Gobre salla Katus Lapche kawla Chiple kawla Buk, Bajrat Songre katus Phalant
Also to be used for charcoal.	<u>Symingtonia populnea</u> <u>Prunus nepalensis</u> <u>Soloanea dasycarpa</u> <u>Tsuga dumosa</u> <u>Symplocos theifolia</u> <u>Castanopsis hystrix</u> <u>Eurya japonica</u> <u>Nyssa javanica</u> <u>Pieris ovalifolia</u> All 'Others'	Pipli Arupate Gobre Tengra salla Kharane Katus Jhingane Lekh chilaune Angere
c) <u>Box planking:</u> (30cm. d.o.b. and up).	<u>Syzigium species</u> <u>Echinocarpus dasycarpus</u> <u>Alnus nepalensis</u> <u>Evodia roxburghii</u> <u>Litsea species</u>	Gobre Khakpa
d) <u>Match wood</u> (20cm. d.o.b. and up)	<u>Machilus species</u> <u>Beilschmiedia roxburghiana</u> <u>Macaranga species</u> <u>Symplocos theifolia</u>	Thulo tarsing Kharane
e) <u>Charcoal:</u> (Total wood by weight).	<u>Quercus</u> (all species)	

B I B L I O G R A P H Y

1. Loetsch, F. Zohren, F. and Haller, K.E. 1973
Forest Inventory Volum I & II Munchen : BLV
Verlagsgesellschaft.
 2. Cochran W.G. 1963. Sampling techniques (2nd Edition)
Newyork, Wiley & Sons.
 3. Annonymous - Data of State Forest Department
Government Of Sikkim.
 4. Fisher, R.A. & Yates, F. Statistical Tables
(6th Edition) for biological, agricultural
and medical researck.
-

D I A M E T E R C L A S S E S (I N C M .)											
Species	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
30	0.800	0.291	0.728	0.145	0.218	0.218	0.072	-	0.072	0.072	2.616
31	0.072	0.145	0.218	0.291	0.145	0.072	0.072	-	-	-	1.015
32	0.509	0.364	0.145	-	0.072	0.072	-	-	-	-	1.162
34	0.145	0.291	0.218	0.218	0.218	0.291	0.218	0.145	0.218	0.728	2.690
35	-	0.364	0.291	-	0.291	0.218	-	-	-	0.072	1.236
36	0.291	0.436	0.218	0.218	0.291	0.364	0.364	0.218	0.072	0.072	2.544
37	-	-	0.072	0.072	-	-	-	-	-	-	0.144
39	24.024	7.279	0.582	0.072	-	-	-	-	-	-	31.957
41	0.072	-	0.072	0.072	-	-	-	-	-	-	0.216
42	0.145	-	-	0.072	-	-	-	-	-	-	-
43	32.491	17.908	5.314	1.601	0.728	0.509	-	-	0.072	-	58.623
Total	71.207	37.624	14.402	7.631	5.233	4.942	2.538	1.306	1.013	3.561	149.457

Table No. 1.1.2

NO. OF STEM PER HA. BY SPECIES AND DIAMETER CLASSES

SECTOR - A STRATUM- II Species Code	D I A M E T E R C L A S S E S (I N C M)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	
2	1.359	1.121	0.883	0.985	0.169	0.237	0.272	0.034	0.068	0.068	5.196
3	0.272	0.169	0.068	-	0.101	-	0.034	-	-	-	0.538
4	0.034	0.101	0.068	-	-	0.634	-	-	-	-	0.204
5	0.136	-	0.034	-	-	-	-	-	-	-	0.102
6	-	0.034	-	0.068	-	-	-	-	-	-	0.406
7	0.203	0.034	0.101	0.068	-	-	-	-	-	-	8.218
8	1.937	1.257	0.781	0.611	0.713	0.713	0.509	0.305	0.407	0.985	4.586
9	2.141	0.951	0.883	0.237	0.205	0.068	0.068	-	-	0.034	0.645
10	0.407	-	0.068	0.068	0.034	0.068	-	-	-	-	0.441
12	0.136	0.068	-	0.034	-	-	0.034	-	-	0.169	0.407
13	0.101	0.068	0.136	-	-	-	0.068	-	-	0.034	11.489
14	7.071	3.093	1.019	0.272	0.034	-	-	-	-	-	0.236
15	0.136	0.068	0.034	-	-	-	-	-	-	-	1.458
17	0.272	0.339	0.272	0.101	0.068	0.068	0.237	0.101	-	-	0.577
18	0.577	-	-	-	-	-	-	-	-	-	11.453
21	2.923	4.590	2.447	0.849	0.441	0.101	0.068	-	-	0.034	3.382
22	0.985	0.917	0.645	0.441	0.136	0.136	0.034	-	-	0.068	2.476
23	0.544	0.849	0.373	0.305	0.169	0.101	0.101	0.034	-	-	14.952
24	1.597	3.909	3.331	2.549	1.835	0.951	0.475	0.237	0.034	0.034	1.728
25	0.101	0.039	0.577	0.272	0.136	0.101	0.101	0.101	0.000	-	0.170
26	0.136	0.034	-	-	-	-	-	-	-	-	3.054
27	1.088	0.407	0.339	0.272	0.272	0.169	0.068	0.101	0.101	0.237	0.034
28	-	0.034	-	-	-	-	-	-	-	-	0.170
29	0.068	0.068	-	-	0.034	-	-	-	-	-	0.746
30	0.339	0.272	0.101	0.034	-	-	-	-	-	-	-

Species Code	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
31	0.378	0.727	0.272	0.305	0.203	0.136	0.034	-	-	-	2.070
32	2.039	0.713	0.272	0.136	-	-	-	-	-	-	3.160
34	1.019	0.879	0.781	0.713	0.747	0.645	0.917	0.747	0.475	1.189	7.912
35	0.815	0.645	0.815	0.781	1.019	0.645	0.237	0.203	0.136	0.169	5.465
36	1.903	1.563	2.345	1.291	1.937	1.495	0.917	0.718	0.577	1.461	14.202
37	0.781	1.529	0.883	0.169	0.136	-	-	-	-	-	3.498
38	0.237	0.136	0.068	0.034	-	-	-	-	-	-	0.475
39	54.127	17.169	0.985	0.101	-	-	-	0.034	-	-	72.416
42	0.034	0.101	0.169	0.272	0.169	0.136	0.169	0.169	0.101	0.068	1.388
43	19.236	8.704	3.569	1.563	0.645	0.373	0.373	0.068	-	0.068	34.599
Total	103.127	50.708	22.312	12.531	9.201	6.177	4.716	2.847	1.899	4.618	218.143

Table No. 1.1.3

SECTOR - A.
STRATUM - III

Species Code.	NO. OF STEMS PER HECTARE BY SPECIES AND DIAMETER-CLASSES.										Total
	DIAMETER CLASSES (IN C.M.)										
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
1	2.150	2.433	1.018	0.792	0.226	0.735	0.396	0.113	-	-	7.863
2	2.773	1.131	1.414	0.905	0.452	0.169	0.056	0.113	-	-	7.013
6	4.471	2.490	1.641	0.905	0.169	0.452	-	-	-	-	10.128
7	0.509	0.226	0.226	0.169	0.056	-	-	-	-	-	1.186
8	0.113	0.113	0.056	-	-	0.056	-	-	-	0.113	0.451
9	0.226	-	0.113	-	-	-	0.056	-	-	-	0.395
13	-	-	-	-	-	-	-	-	-	0.056	0.056
14	7.018	1.075	0.226	-	-	-	-	-	-	-	8.319
21	0.848	2.150	0.962	0.565	0.282	-	0.056	-	-	-	4.863
23	0.396	0.509	0.282	0.282	0.396	0.396	0.169	-	-	-	2.430
24	-	0.056	0.169	-	-	-	-	-	-	-	0.281
25	1.358	1.358	1.414	0.565	0.565	0.452	0.169	0.169	0.056	0.056	6.162
27	-	-	-	-	0.056	-	-	-	-	-	0.056
29	0.339	0.339	-	-	-	-	-	-	-	-	0.678
30	0.056	0.113	-	-	-	-	-	-	-	-	0.169
31	1.018	0.792	0.452	0.113	-	-	-	-	-	-	2.375
32	0.622	0.226	-	-	-	-	-	-	-	-	0.848
34	-	-	-	0.169	-	-	-	-	-	-	0.169
35	0.452	0.452	0.282	0.792	0.735	0.396	0.056	-	0.113	-	3.730
36	4.301	3.112	1.584	1.697	1.414	1.754	1.924	0.509	0.452	1.301	18.048
37	52.751	12.055	7.640	6.225	2.490	1.245	0.169	0.282	0.113	-	82.970
38	11.037	5.093	1.754	0.679	0.226	0.113	-	-	-	-	18.902
39	14.319	1.075	0.169	0.056	-	-	-	-	-	-	15.619
41	-	0.056	-	0.452	0.282	0.113	-	0.113	-	-	1.072
42	1.075	0.452	0.339	0.339	0.056	0.169	0.056	0.169	0.113	0.056	3.164
43	23.288	5.829	1.528	1.245	0.679	0.226	0.282	0.169	-	0.282	33.528
Total	129.120	41.135	21.269	15.950	8.084	6.276	3.785	1.750	0.903	2.372	230.644

Table No. 1.2.1
NO. OF STEMS PER HECTARE BY SPECIES AND DIAMETER CLASSES

SECTOR - B STRATUM - I Species Code.	D I A M E T E R C L A S S E S (I N C M .)										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
2	0.396	-	0.339	0.339	-	0.113	0.169	-	-	-	-	1.356
3	0.339	0.113	0.679	0.962	0.565	0.396	0.056	-	-	-	-	3.110
4	0.113	0.056	0.282	0.169	-	0.056	0.396	0.113	0.056	-	-	1.241
5	-	-	-	0.056	0.169	-	-	-	-	-	-	0.225
6	0.056	-	0.113	-	-	-	-	-	-	-	-	0.169
7	-	-	-	0.113	0.056	-	-	-	-	-	-	0.169
8	1.980	1.867	1.358	0.905	0.962	1.188	0.905	0.848	0.226	1.471	-	11.710
9	0.792	0.792	1.131	0.565	0.452	0.169	-	-	0.056	-	-	3.957
10	-	-	-	-	-	0.113	-	-	-	-	-	0.113
11	0.056	-	-	-	-	-	-	-	-	-	-	0.056
12	0.452	0.226	0.282	0.169	0.056	0.622	0.339	0.226	0.396	0.282	-	3.050
13	0.056	0.056	0.339	0.396	0.339	0.169	-	-	-	-	-	1.355
14	3.452	2.886	0.622	0.226	-	-	-	-	-	-	-	7.186
15	0.282	0.113	0.056	-	-	-	-	-	-	-	-	0.451
17	0.169	0.282	0.282	0.282	0.113	0.339	0.113	0.056	0.056	0.113	-	1.805
18	-	0.056	-	-	-	-	-	-	-	-	-	0.056
21	0.339	0.962	0.565	0.282	-	-	-	-	-	-	-	2.148
22	-	0.169	0.565	0.339	0.226	0.056	0.113	0.056	-	-	-	1.584
23	-	0.565	0.905	0.282	0.282	0.226	0.056	0.113	0.056	0.113	-	2.598
24	0.848	0.905	1.980	1.471	0.848	0.622	0.509	0.226	0.056	-	-	7.465

Species Code.	D I A M E T E R C L A S S E S (I N C M .)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
26	-	0.056	0.113	-	0.169	-	-	-	-	-	0.338
27	0.056	0.292	0.226	0.452	0.226	0.056	0.169	-	-	0.056	1.523
28	-	0.056	-	0.056	0.169	-	-	-	-	-	0.281
29	0.962	0.226	0.113	0.056	-	-	-	-	-	-	1.357
30	0.169	0.339	0.679	0.509	0.169	0.169	-	0.056	0.000	0.113	2.203
31	0.339	0.282	0.509	0.509	0.226	0.056	0.056	-	-	-	1.977
34	0.339	0.169	0.339	0.792	0.339	0.509	0.565	0.452	0.396	1.188	5.098
35	0.339	0.452	0.509	0.563	0.452	0.452	0.169	-	0.113	-	3.051
36	-	-	-	-	-	-	-	-	-	0.056	0.056
38	-	0.056	-	-	-	-	-	-	-	-	0.056
39	53.486	16.753	1.131	0.056	-	-	-	-	-	-	71.486
40	-	-	-	-	-	-	-	-	-	-	-
43	38.194	12.563	2.943	0.735	0.848	0.452	-	0.113	0.056	0.056	55.962
Total	103,214	40,284	16,060	10,286	6,666	5,763	3,615	2,239	1,467	5,504	193,118

Table No. 1.2.2
NO. OF STEMS PER HECTARE BY SPECIES AND DIAMETER CLASSES

SECTOR - B,
STRATUM - II.

Species Code.	DIAMETER CLASSES (IN C.M.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	2.227	1.067	1.206	1.391	0.927	0.927	0.695	0.324	0.139	0.278	9.181
3	-	-	0.046	0.046	-	-	-	-	-	-	0.092
4	-	-	-	0.092	0.046	0.046	0.046	-	-	-	0.230
6	-	0.046	-	-	-	-	-	-	-	-	0.046
8	0.649	0.742	0.092	0.371	0.278	0.417	0.324	0.139	0.046	1.206	4.264
9	0.185	-	0.046	0.092	-	0.046	-	-	-	0.046	0.415
10	-	-	-	-	-	-	-	-	-	0.046	0.046
11	0.092	-	-	-	-	-	-	-	-	-	0.092
12	-	-	0.046	-	-	0.046	-	-	-	0.231	0.323
14	4.222	1.345	0.092	0.046	0.046	-	-	-	-	-	5.751
15	1.067	0.788	0.371	-	-	-	-	-	-	-	2.226
17	0.046	-	0.139	0.046	-	-	-	-	0.046	-	0.277
20	-	-	-	-	-	-	-	-	-	0.046	0.046
21	11.228	13.595	7.887	2.691	1.252	0.556	0.046	-	-	0.046	37.301
22	0.974	1.624	1.113	0.742	0.371	0.139	0.046	0.046	-	-	5.055
23	2.273	3.433	2.180	1.577	0.742	0.742	0.185	0.092	0.046	-	11.270
24	4.686	6.217	7.238	5.521	3.665	1.763	0.278	0.139	0.046	0.092	29.645
25	-	0.185	0.046	0.139	0.185	0.185	0.139	0.092	0.046	0.046	1.063
26	0.046	-	0.046	0.046	-	-	-	-	-	-	0.138
27	0.417	0.278	0.185	0.231	0.092	0.231	0.139	0.046	0.092	0.231	1.942
28	0.046	0.278	0.417	0.371	0.278	0.092	-	-	0.046	-	1.528
29	0.046	0.046	0.046	-	-	-	-	-	-	-	0.138
31	1.252	0.556	0.139	0.371	0.603	0.139	-	-	0.046	-	3.106
32	1.391	0.835	0.139	-	-	-	-	-	-	-	2.365
34	1.160	0.927	0.881	0.371	0.556	0.974	0.835	0.603	0.278	2.180	8.765
35	0.835	0.881	0.974	0.927	0.742	0.185	0.417	0.139	0.046	0.278	5.424
36	0.324	0.417	0.278	0.556	0.371	0.510	0.371	0.139	0.139	2.273	5.378
37	0.092	0.046	-	-	0.046	-	-	-	-	-	0.184
38	3.248	2.830	2.087	1.206	0.324	0.092	0.046	-	-	-	9.833
39	35.727	8.816	0.371	0.046	-	-	-	-	-	-	44.960
43	18.462	10.532	3.387	2.041	1.299	0.742	0.463	0.417	0.185	0.139	37.667
Total	90.695	55.484	29.452	18.920	11.823	7.832	4.030	2.176	1.201	7.138	228.751

SECTOR - A Table No. 2.1.1
STRATUM - I TOTAL STEMS (1000' UNITS) BY SPECIES AND DIAMETER CLASSES

Species Code	DIAMETER CLASSES (IN C.M.)										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
2	0.706	0.529	0.529	0.706	0.529	0.529	0.174	-	-	-	-	3.702
3	1.941	1.058	0.174	1.174	-	0.351	0.174	-	0.174	-	-	5.046
4	0.529	0.706	0.883	0.174	0.174	0.883	1.058	0.351	-	0.706	-	5.464
5	-	-	0.174	-	-	-	-	-	-	-	-	0.174
6	3.002	1.767	2.119	1.589	1.767	1.941	1.058	0.883	0.706	3.708	-	18.540
9	1.941	1.767	0.883	0.706	1.235	0.706	0.174	-	0.174	-	-	7.586
10	0.174	0.174	-	0.351	0.174	0.174	-	-	-	-	-	1.047
12	0.883	1.058	1.235	0.529	0.883	0.351	0.706	0.351	0.174	1.235	-	7.405
13	1.235	1.235	3.002	3.356	1.235	1.235	0.351	0.351	-	0.174	-	12.174
14	15.371	16.954	2.473	1.412	0.174	-	-	-	-	-	-	30.384
15	0.351	0.174	-	-	-	-	-	-	-	-	-	0.525
17	0.529	-	0.174	0.351	0.174	0.174	0.174	-	-	-	-	1.576
18	0.174	0.174	-	-	-	-	-	-	-	-	-	0.348
19	1.235	1.058	0.706	0.174	0.174	-	0.174	-	-	-	-	3.521
22	0.351	-	0.174	0.529	0.706	-	-	0.174	-	0.351	-	2.285
23	-	0.351	0.529	0.351	-	-	0.174	-	-	-	-	1.405
24	1.589	3.002	2.473	1.235	0.706	0.883	-	0.174	-	-	-	10.062
26	-	0.174	-	-	-	-	-	-	-	-	-	0.348
27	0.351	0.174	0.174	0.174	-	0.529	0.174	-	0.174	-	-	1.750
29	0.351	1.235	0.174	-	-	-	-	-	-	0.174	-	1.760
30	1.941	0.706	1.767	0.351	0.529	0.529	0.174	-	-	-	-	6.345
31	0.174	0.351	0.529	0.706	0.351	0.174	0.174	-	0.174	0.174	-	2.459
32	1.235	0.883	0.351	-	0.174	0.174	-	-	-	-	-	2.817
34	0.351	0.706	0.529	0.529	0.529	0.706	0.529	0.351	0.529	1.767	-	6.526
35	-	0.883	0.706	-	0.706	0.529	-	-	-	-	-	2.998
36	0.706	1.058	0.529	0.529	0.706	0.883	0.883	0.529	0.174	0.174	-	6.171
37	-	-	0.174	0.174	-	-	-	-	-	-	-	0.348
39	58.312	17.668	1.412	0.174	-	-	-	-	-	-	-	77.566
41	0.174	0.174	0.174	0.174	-	-	-	-	-	-	-	0.696
42	0.351	-	-	0.174	-	-	-	-	-	-	-	0.525
43	77.788	43.467	12.898	3.886	1.767	1.235	-	0.174	-	-	-	141.215
Total	171.745	91.486	34.945	19.508	12.693	11.993	6.151	3.194	2.453	8.637	362.768	

SECTOR - A.
STRATUM - II

Table No.2.1.2

TOTAL OF STEMS('000 UNITS) BY SPECIES AND DIAMETER CLASSES

Species Code	D I A M E T E R C L A S S E S (I N C M)										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
2	6.007	4.955	3.903	4.354	0.747	1.047	1.202	0.150	0.300	0.300	0.300	22.965
3	1.202	0.747	0.300	0.300	-	-	-	-	-	-	-	2.549
4	0.150	0.446	0.300	-	0.446	-	0.150	-	-	-	-	1.492
5	0.601	-	0.150	-	-	0.150	-	-	-	-	-	0.901
6	-	0.150	-	0.300	-	-	-	-	-	-	-	0.450
7	0.897	0.150	0.446	0.300	-	-	-	-	-	-	-	1.793
8	8.562	5.556	3.452	2.700	3.151	3.151	2.250	1.348	1.799	4.354	0.150	36.323
9	9.464	4.203	3.903	1.047	0.897	0.300	0.300	-	-	0.150	-	20.264
10	1.799	-	0.300	0.300	0.150	0.300	-	-	-	-	-	2.849
11	-	-	-	-	-	-	-	-	-	-	-	-
12	0.601	0.300	-	0.152	-	-	0.150	-	-	0.747	-	1.950
13	0.446	0.300	0.601	-	-	-	0.300	-	-	0.150	-	1.797
14	31.257	13.672	4.504	1.202	0.150	-	-	-	-	-	-	50.785
15	0.601	0.300	0.150	-	-	-	-	-	-	-	-	1.051
16	-	-	-	-	-	-	-	-	-	-	-	-
17	1.202	1.498	1.202	0.446	0.300	0.300	1.047	0.446	-	-	-	6.441
18	2.550	-	-	-	-	-	-	-	-	-	-	2.550
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	12.921	20.290	10.817	3.753	1.949	0.446	0.300	-	-	-	-	50.626
22	4.354	4.055	2.851	1.949	0.601	0.601	0.150	-	-	0.150	-	14.859
23	2.404	3.753	1.648	1.348	0.747	0.446	0.446	0.150	-	-	-	10.942
24	7.059	17.279	14.724	11.267	8.111	4.203	2.099	1.047	0.150	0.150	-	66.089
25	0.446	1.498	2.550	1.202	0.601	0.446	0.446	0.446	-	-	-	7.635

D I A M E T E R C L A S S E S (I N C M .)

Species Code.	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
26	0.601	0.150	-	-	-	-	-	-	-	-	0.751
27	4.809	1.799	1.498	1.202	1.202	0.747	0.300	0.446	0.446	1.047	13.496
28	-	0.150	-	-	-	-	-	-	-	-	0.150
29	0.300	0.300	-	-	0.150	-	-	-	-	-	0.750
30	1.498	1.202	0.446	0.150	-	-	-	-	-	-	3.296
31	1.648	3.302	1.202	1.348	0.897	0.601	0.150	-	-	-	9.148
32	9.013	3.151	1.202	0.601	-	-	-	-	-	-	13.967
34	4.504	3.001	3.452	3.151	3.302	2.851	4.053	3.302	2.099	5.256	34.971
35	3.602	2.851	3.602	3.452	4.504	2.851	1.047	0.897	0.601	0.747	24.154
36	8.412	6.909	10.366	5.706	8.562	6.608	4.053	3.151	2.550	6.458	62.775
37	3.452	6.759	3.903	0.747	0.601	-	-	-	-	-	15.462
38	1.047	0.601	0.300	0.150	-	-	-	-	-	-	2.098
39	239.270	75.896	4.354	0.446	-	-	-	0.150	-	-	320.116
42	0.150	0.446	0.747	1.202	0.747	0.601	0.747	0.747	0.446	0.300	6.133
43	84.819	38.476	15.776	6.909	2.851	1.648	1.648	0.300	-	0.300	152.727
Total	455.648	224.143	98.649	55.684	40.666	27.297	20.838	12.580	8.391	20.409	964.305

SECTOR - A Table No. 2.1.3
STRATUM - III TOTAL STEMS (in '000' units) BY SPECIES AND DIAMETER CLASSES

Species Code	DIAMETER CLASSES (IN C.M.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	
1	6.003	6.794	2.842	2.211	0.631	2.052	1.105	0.315	-	21.953	
2	7.743	3.158	3.948	2.527	1.262	0.471	0.156	0.315	-	19.580	
6	12.485	6.953	4.582	2.527	0.471	1.262	-	-	-	28.280	
7	1.421	0.631	0.631	0.471	0.156	-	-	-	-	3.310	
8	0.315	0.315	0.156	-	-	-	-	0.315	-	1.257	
9	0.631	-	0.315	-	-	0.156	-	-	-	1.102	
13	-	-	-	-	-	-	-	0.156	-	0.156	
14	19.597	3.001	0.631	-	-	-	-	-	-	23.229	
21	2.368	6.003	2.686	1.577	0.787	-	0.156	-	-	13.577	
23	1.105	1.421	0.787	0.787	1.105	1.105	0.471	-	-	6.781	
24	-	0.156	0.471	-	-	-	-	-	-	0.783	
25	3.792	3.792	3.948	1.577	1.577	1.262	0.471	0.471	0.156	17.202	
27	-	-	-	-	0.156	-	-	-	-	0.156	
29	0.946	0.946	-	-	-	-	-	-	-	1.892	
30	0.156	0.315	-	-	-	-	-	-	-	0.471	
31	2.842	2.211	1.262	0.315	-	-	-	-	-	6.630	
32	1.736	0.631	-	-	-	-	-	-	-	2.367	
34	-	-	-	0.471	-	-	0.156	-	-	0.627	
35	1.262	1.262	0.787	2.211	2.052	1.105	1.105	0.315	0.315	0.942	
36	12.010	8.690	4.423	4.738	3.948	4.999	5.372	1.421	0.156	10.411	
37	147.307	33.663	21.334	17.363	6.953	3.476	0.471	0.787	3.633	50.395	
38	30.820	14.222	4.898	1.896	0.631	0.315	-	-	-	231.689	
39	39.985	3.001	0.471	0.156	-	-	-	-	-	52.782	
41	-	0.156	-	1.262	0.787	0.315	-	-	-	43.613	
42	3.001	1.262	0.946	0.946	0.156	0.471	0.156	0.315	0.156	2.991	
43	65.100	16.277	4.266	3.476	1.896	0.631	0.787	0.471	1.105	8.829	
Total	360.625	114.860	59.384	44.531	22.568	17.519	10.562	4.881	2.519	6.620	674.059

SECTOR - B
STRATUM - II

Table No. 2.2.2.
TOTAL STEMS ('000' units) BY SPECIES AND DIAMETER CLASSES

Species Code	D I A M E T E R C L A S S E S (I N C M .)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	12.041	5.769	6.520	7.521	5.012	5.012	3.757	1.751	0.751	1.503	49.637
3	-	-	0.248	0.248	-	-	-	-	-	-	0.496
4	-	-	-	0.497	0.248	0.248	0.248	-	-	-	1.241
6	-	0.248	-	-	-	-	-	-	-	-	0.248
8	3.509	4.011	0.497	2.005	1.503	2.254	1.751	0.751	0.248	6.520	23.049
9	1.000	-	0.248	0.497	-	0.248	-	-	-	0.248	2.241
10	-	-	-	-	-	-	-	-	-	0.248	0.248
11	0.497	-	-	-	-	-	-	-	-	-	0.497
12	-	-	0.248	-	-	0.248	-	-	-	1.248	1.744
14	22.828	7.272	0.497	0.248	0.248	-	-	-	-	-	31.093
15	5.769	4.260	2.005	-	-	-	-	-	-	-	12.034
17	0.248	-	0.751	0.248	-	-	-	-	0.248	-	1.45
20	-	-	-	-	-	-	-	-	-	-	-
21	60.708	73.507	42.644	14.550	6.769	3.006	0.248	-	-	0.248	0.248
22	5.266	8.780	6.017	4.011	2.005	0.751	0.248	0.248	-	0.248	201.680
23	12.282	18.561	11.787	8.526	4.011	4.011	1.000	0.497	-	-	27.326
24	25.336	33.614	39.135	29.851	19.816	9.532	1.503	0.751	0.248	-	60.930
25	-	1.000	0.248	0.751	1.000	1.000	0.751	0.497	0.248	0.248	5.743
26	0.248	-	0.248	0.248	-	-	-	-	-	-	0.744
27	2.254	1.503	1.000	1.248	0.497	1.248	0.751	0.248	0.497	1.248	10.494
28	0.248	1.503	2.254	2.005	1.503	0.497	-	-	0.248	-	8.258
29	0.248	0.248	0.248	-	-	-	-	-	-	-	0.744
31	6.769	3.006	0.751	2.005	3.260	0.751	-	0.248	-	-	16.790
32	7.521	4.514	0.751	-	-	-	-	-	-	-	12.786
34	6.272	5.012	4.763	2.005	3.006	5.266	4.514	3.260	1.503	11.787	47.388
35	4.514	4.763	5.266	5.012	4.011	1.000	2.254	0.751	0.248	1.503	29.322
36	1.751	2.254	1.503	3.006	2.005	2.757	2.005	0.751	0.751	12.289	29.072
37	0.497	0.248	-	-	0.248	-	-	-	-	-	0.993
38	17.561	15.304	11.282	6.520	1.751	0.497	0.248	-	-	-	53.162

Species		D I A M E T E R C L A S S E S (I N C M .)										
Code		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
39		193,173	47,667	2,005	0,248	-	-	-	-	-	-	243,093
43		99,850	56,945	18,383	11,035	7,023	4,011	2,503	2,254	1,000	0,751	203,755
Total		490,397	299,386	159,301	102,285	63,916	42,337	21,781	11,759	6,486	38,586	1236,834

Table No. 2.2.3

SECTOR - B STRATUM - III Species Code	TOTAL STEMS ('000 units) BY SPECIES AND DIAMETER CLASSES										100 + Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
1	1.408	5.641	11.989	5.641	1.763	1.763	0.702	0.351	0.351	0.351	28.907
2	18.356	8.816	6.347	1.408	1.408	1.057	0.702	-	-	-	38.074
3	0.351	-	-	-	-	-	-	-	-	-	0.351
5	-	-	0.351	-	-	-	-	-	-	-	0.351
6	7.053	6.347	8.816	8.110	1.408	1.408	0.351	-	-	-	33.493
7	0.351	4.229	0.702	3.172	2.820	1.057	2.114	1.057	0.351	1.763	23.963
8	6.698	-	0.351	-	-	-	-	-	-	-	0.702
9	0.351	-	-	-	-	-	-	-	-	-	0.351
14	3.526	-	-	-	-	-	-	-	-	-	3.526
15	-	0.702	0.351	0.351	-	-	-	-	-	-	1.404
21	17.279	8.110	2.114	2.466	0.702	0.351	-	-	-	-	31.022
23	0.702	0.351	-	-	-	-	-	-	0.351	-	1.404
24	4.935	6.347	2.466	2.114	1.408	1.057	0.351	-	-	-	18.678
25	1.408	0.702	1.408	1.057	1.408	0.702	-	-	-	-	6.685
27	-	0.351	-	0.702	-	-	-	-	-	-	1.053
29	-	-	-	0.351	-	-	-	-	-	-	0.351
30	3.526	2.466	0.702	0.351	-	-	-	-	-	-	7.045
31	1.057	0.351	0.702	-	-	-	-	-	-	-	2.110
32	32.092	10.931	1.763	0.702	-	0.351	-	-	-	-	45.839
33	1.057	0.702	1.057	-	-	-	-	-	-	-	2.816
38	-	0.351	0.351	-	-	-	-	-	-	-	0.702
37	53.252	9.168	2.820	0.351	-	0.351	-	-	-	-	65.942
38	61.717	52.462	45.141	12.343	5.641	2.114	0.351	-	-	-	179.769
39	0.351	1.057	-	-	-	-	-	-	-	-	1.408
43	51.761	26.801	15.164	3.878	4.229	2.114	0.351	-	-	-	104.651
Total	265.805	141.652	96.347	49.345	24.665	12.325	5.983	1.408	0.702	2.466	600.597

Table No. 3
UTILITY CLASSWISE VOLUME DISTRIBUTION/HA. (in m³)

SECTOR - A

STRATUM - I Utility Class	C L A S S (in cm.)										Total
	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
Ply wood	0.348	1.209	2.416	3.416	1.284	1.319	1.981	1.319	1.981	11.973	
Constructional wood	2.796	4.056	6.089	7.334	5.990	4.878	51.642	4.525	51.642	87.310	
Box Planking wood	0.581	1.219	1.844	1.989	2.279	1.540	14.529	1.376	14.529	25.357	
Match wood	1.448	0.532	0.150	0.197	1.147	2.047	4.667	-	4.667	11.178	

STRATUM - II

Ply wood	1.497	2.780	2.006	2.512	2.992	1.495	1.586	4.389	19.257
Constructional wood	3.235	6.054	9.994	11.765	11.005	9.352	52.866	9.943	114.214
Box Planking wood	1.878	3.545	4.098	3.137	2.452	1.284	7.003	0.215	23.612
Match wood	2.971	0.482	0.341	-	0.141	0.135	-	-	4.157

STRATUM - III

Ply wood	1.995	3.236	2.951	3.265	1.473	2.086	0.467	1.011	16.484
Constructional wood	1.696	5.285	6.698	11.051	14.028	6.772	5.066	30.548	81.144
Box Planking wood	0.369	0.713	1.078	1.002	0.784	-	-	-	3.946
Match wood	0.285	0.045	-	-	-	-	-	-	0.408

SECTOR - B

STRATUM - I

Ply wood	1.051	2.254	2.469	1.994	1.897	0.685	0.806	11.156
Constructional wood	2.611	4.307	6.834	9.889	7.313	8.579	44.643	91.123
Box Planking wood	1.545	3.657	3.876	5.898	4.175	3.289	7.508	33.871
Match wood	2.966	0.724	0.396	0.194	1.857	0.778	0.436	7.351

STRATUM - II

Ply wood	1.025	3.271	4.087	6.168	5.696	3.839	3.038	13.671	40.795
Constructional wood	2.486	6.331	8.162	8.503	8.104	5.768	3.900	84.488	127.742
Box Planking wood	5.042	8.896	9.385	8.122	2.006	1.269	0.567	7.399	42.686
Match wood	1.507	0.196	0.144	0.094	0.130	0.199	-	-	2.270

STRATUM - III

Ply wood	2.332	3.508	2.911	3.418	1.887	-	-	-	14.056
Constructional wood	2.412	6.363	7.066	4.644	5.567	2.464	1.515	10.183	40.214
Box Planking wood	0.428	1.350	1.024	1.093	0.388	-	-	-	4.285
Match wood	0.018	0.169	0.209	-	-	-	-	-	0.396

SECTOR - A

Table No. 4.1.1
Per Hectare Stem Distribution Of Ply Wood Species

STRATUM - I									
Species Code	Diameter Class (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.218	0.291	0.218	0.218	0.072	-	-	-	1.01
9	0.364	0.291	0.509	0.291	0.072	-	0.072	-	1.59
10	-	0.145	0.072	0.072	-	-	-	-	0.28
26	-	-	-	-	-	-	0.072	-	0.07
27	0.072	0.072	-	0.218	0.072	-	-	0.072	0.50
Total	0.654	0.799	0.799	0.799	0.216	-	0.144	0.072	3.48

STRATUM - II									
Species Code	Diameter Class (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.883	0.985	0.169	0.237	0.272	0.034	0.068	0.068	2.71
6	-	0.068	-	-	-	-	-	-	0.068
7	0.101	0.068	-	-	-	-	-	-	0.169
9	0.883	0.237	0.203	0.068	0.068	-	-	0.034	1.49
10	0.068	0.068	0.034	0.068	-	-	-	-	0.238
25	0.577	0.272	0.136	0.101	0.101	0.101	-	-	1.28
27	0.339	0.272	0.272	0.169	0.068	0.101	0.101	0.237	1.55
Total	2.851	1.970	0.814	0.643	0.509	0.236	0.169	0.339	7.531

STRATUM - III									
Species Code	Diameter Class (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	1.414	0.905	0.452	0.169	0.056	0.113	-	-	3.109
6	1.641	0.905	0.169	0.452	-	-	-	-	3.169
7	0.226	0.169	0.056	-	-	-	-	-	0.451
9	0.113	-	-	-	0.056	-	-	-	0.169
25	1.414	0.565	0.565	0.452	0.169	0.169	0.056	0.056	3.446
27	-	-	0.056	-	-	-	-	-	0.056
Total	4.808	2.544	1.298	1.073	0.281	0.282	0.056	0.056	10.398

Table No.4.2.1

Sector - B

Per Hectare Stems Distribution Of Ply Wood Species

STRATUM - I

Species Code.	Diameter Classes (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.339	0.339	-	0.113	0.169	-	-	-	0.960
6	0.113	-	-	-	-	-	-	-	0.113
7	-	0.113	0.056	-	-	-	-	-	0.169
10	1.131	0.565	0.452	0.169	-	-	0.056	-	2.373
26	0.113	-	0.169	-	-	-	-	-	0.282
27	0.226	0.452	0.226	0.056	0.169	-	-	0.056	1.185
28	-	0.056	0.169	-	-	-	-	-	0.225
Total	1.922	1.525	1.072	0.338	0.338	-	0.056	0.056	5.307

Table No. 4.2.2

STRATUM - II

2	1.206	1.391	0.927	0.927	0.695	0.324	0.159	0.278	5.887
9	0.046	0.092	-	0.046	-	-	-	0.046	0.230
10	-	-	-	-	-	-	-	0.046	0.046
25	0.046	0.139	0.185	0.185	0.139	0.092	0.046	0.046	0.878
26	0.046	0.046	-	-	-	-	-	-	0.092
27	0.185	0.231	0.092	0.231	0.139	0.046	0.092	0.231	1.247
28	0.417	0.371	0.278	0.092	-	-	0.046	-	1.204
Total	1.946	2.270	1.482	1.481	0.973	0.462	0.323	0.647	9.584

Table No. 4.2.3

STRATUM - III

2	2.041	0.453	0.453	0.340	0.226	-	-	-	3.513
6	2.835	2.608	0.453	0.453	0.113	-	-	-	6.462
9	0.113	-	-	-	-	-	-	-	0.113
25	0.453	0.340	0.453	0.226	-	-	-	-	1.472
27	-	0.226	-	-	-	-	-	-	0.226
Total	5.442	3.627	1.359	1.019	0.339	-	-	-	11.786

SECTOR - A

- 79 -

Table No.5.1.1.
Per Hectare Stem Distribution of Constructional timber :

Species Code.	Stratum - I								Total
	Diameter Classes (in cm.)								
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
5	0.072	-	-	-	-	-	-	-	0.072
8	0.873	0.655	0.728	0.800	0.436	0.364	0.291	1.528	5.675
12	0.509	0.218	0.364	0.145	0.291	0.145	0.072	0.509	2.253
14	1.019	0.582	0.072	-	-	-	-	-	1.673
22	0.072	0.218	0.291	-	-	0.072	-	0.145	0.798
23	0.218	0.145	-	-	0.072	-	-	-	0.455
30	0.728	0.145	0.218	0.218	0.072	-	0.072	0.072	1.525
31	0.218	0.291	0.145	0.072	0.072	-	-	-	0.798
32	0.145	-	0.072	0.072	-	-	-	-	0.289
35	0.291	-	0.291	0.218	-	-	-	-	0.872
36	0.218	0.218	0.291	0.364	0.364	0.218	0.072	0.072	1.817
39	0.582	0.072	-	-	-	-	-	-	0.654
42	-	0.072	-	-	-	-	-	-	0.072
43	5.314	1.601	0.728	0.509	-	-	0.072	-	8.224
Total	10.259	4.217	3.200	2.398	1.307	0.799	0.579	2.398	25.157

* See Annexure - I for species code.

SECTOR - A

Table No.5.1.2

Per Hectare Stem Distribution Of Constructional Timber : Sikkim.

Species Code.	Stratum - II								Total
	Diameter Classes (in cm.)								
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
5	0.034	-	-	0.034	-	-	-	-	0.068
8	0.781	0.611	0.713	0.713	0.509	0.305	0.407	0.985	5.024
12	-	0.034	-	-	0.034	-	-	0.169	0.237
14	1.019	0.272	0.034	-	-	-	-	-	1.325
22	0.645	0.441	0.136	0.136	0.034	-	-	0.068	1.460
23	0.373	0.305	0.169	0.101	0.101	0.034	-	-	1.083
30	0.101	0.034	-	-	-	-	-	-	0.135
31	0.272	0.305	0.203	0.136	0.034	-	-	-	0.950
32	0.272	0.136	-	-	-	-	-	-	0.408
35	0.815	0.781	1.019	0.645	0.237	0.203	0.136	0.169	4.005
36	2.345	1.291	1.937	1.495	0.917	0.713	0.577	1.461	10.736
39	0.985	0.101	-	-	-	0.034	-	-	1.120
42	0.169	0.272	0.169	0.136	0.169	0.169	0.101	0.068	1.253
43	3.569	1.563	0.645	0.373	0.373	0.068	-	0.068	6.659
Total	11.380	6.146	5.025	3.769	2.408	1.526	1.221	2.988	34.463

Sector - A

Table No. 5.1.3

Per Hectare Stem Distribution Of Construction^{al} Timber : Sikkim

Stratum - III

Species Code.	Diameter Classes (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
1	1.018	0.792	0.226	0.755	0.396	0.113	-	-	3.280
8	0.056	-	-	0.056	-	-	-	0.113	0.225
14	0.226	-	-	-	-	-	-	-	0.226
23	0.282	0.282	0.396	0.396	0.159	-	-	-	1.525
31	0.452	0.113	-	-	-	-	-	-	0.565
35	0.282	0.792	0.735	0.396	0.396	0.113	0.056	0.056	2.826
36	1.584	1.697	1.414	1.754	1.924	0.509	0.452	1.501	10.635
39	0.169	0.056	-	-	-	-	-	-	0.225
42	0.339	0.339	0.056	0.169	0.056	0.169	0.113	0.396	1.637
43	1.528	1.245	0.679	0.226	0.282	0.169	-	0.282	4.411
Total	5.936	5.316	3.506	3.732	3.223	1.073	0.621	2.148	25.555

Sector - B

Table No. 5.2.1

Per Hectare Stem Distribution Of Constructional Timber : Sikkim

Stratum - I

Species Code.	Diameter Classes (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
5	-	0.056	0.169	-	-	-	-	-	0.225
8	1.358	0.905	0.962	1.188	0.905	0.848	0.226	1.471	7.863
12	0.282	0.169	0.056	0.622	0.339	0.226	0.396	0.282	2.372
14	0.622	0.226	-	-	-	-	-	-	0.848
22	0.565	0.339	0.226	0.056	0.113	0.056	-	-	1.355
23	0.905	0.282	0.282	0.226	0.056	0.113	0.056	0.113	2.033
30	0.679	0.509	0.169	0.169	-	0.056	-	0.113	1.695
31	0.509	0.509	0.226	0.056	0.056	-	-	-	1.356
35	0.509	0.565	0.452	0.452	0.169	-	0.113	-	2.260
36	-	-	-	-	-	-	-	0.056	0.056
39	1.131	0.056	-	-	-	-	-	-	1.187
43	2.943	0.735	0.848	0.452	-	0.113	0.056	0.056	5.203
Total	9.503	4.351	3.390	3.221	1.638	1.412	0.847	2.091	26.453

Sector - B

Table No. 5.2.2

Per Hectare Stem Distribution Of Constructional Timber :

S t r a t u m - II

Species Code.	<u>D i a m e t e r C l a s s e s (i n c m .)</u>								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
8	0.092	0.371	0.278	0.417	0.324	0.139	0.045	1.206	2.873
12	0.046	-	-	0.046	-	-	-	0.231	0.323
14	0.092	0.046	0.046	-	-	-	-	-	0.184
22	1.113	0.742	0.371	0.139	0.046	0.046	-	-	2.457
23	2.180	1.577	0.742	0.742	0.185	0.092	0.046	-	5.564
31	0.139	0.371	0.603	0.139	-	-	0.046	-	1.298
32	0.139	-	-	-	-	-	-	-	0.139
35	0.974	0.927	0.742	0.185	0.417	0.139	0.046	0.278	3.708
36	0.278	0.556	0.371	0.510	0.371	0.139	0.139	2.273	4.637
39	0.371	0.046	-	-	-	-	-	-	0.417
43	3.387	2.041	1.299	0.742	0.463	0.417	0.185	0.139	8.673
Total	6.811	6.677	4.452	2.920	1.806	0.972	0.508	4.127	30.273

Table No. 5.2.3

S t r a t u m - III

1	1.814	3.855	1.814	0.567	0.567	0.113	0.113	-	8.843
5	0.113	-	-	-	-	-	-	-	0.113
8	0.226	1.020	0.907	0.340	0.680	0.340	0.113	0.567	4.193
23	-	-	-	-	-	-	-	0.113	0.113
30	0.226	0.113	-	-	-	-	-	-	0.339
31	0.113	0.226	-	-	-	-	-	-	0.339
32	0.567	0.226	-	0.113	-	-	-	-	0.906
35	0.340	-	-	-	-	-	-	-	0.340
36	0.113	-	-	-	-	-	-	-	0.113
39	0.340	-	-	-	-	-	-	-	0.340
43	4.876	1.247	1.360	0.680	0.113	-	-	0.113	8.389
Total	8.728	6.687	4.081	1.700	1.360	0.453	0.226	0.793	24.028

Sector - A

Table No. 6.1.1

Per Hectare Stem Distribution Of Box Planking :

S t r a t u m - I

3	0.072	0.072	-	0.145	0.072	-	0.072	-	0.435
12	0.509	0.218	0.364	0.145	0.291	0.145	0.072	0.509	2.253
21	0.291	0.072	0.072	-	0.072	-	-	-	0.507
22	0.072	0.218	0.291	-	-	0.072	-	0.145	0.798
23	0.218	0.145	-	-	0.072	-	-	-	0.435
24	1.019	0.509	0.291	0.364	-	0.072	-	-	2.255
Total	2.181	1.234	1.018	0.654	0.507	0.289	0.144	0.654	6.681

Sector - A

Table No. 6.1.1

S t r a t u m - I I

Species Code.	Diameter Classes (in cm.)								Total
	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
3	0.068	0.068	-	-	-	-	-	-	0.136
12	-	0.034	-	-	0.034	-	-	0.169	0.237
15	0.034	-	-	-	-	-	-	-	0.034
21	2.447	0.849	0.441	0.101	0.068	-	-	0.034	3.940
22	0.645	0.441	0.136	0.136	0.034	-	-	0.068	1.460
23	0.373	0.305	0.169	0.101	0.101	0.034	-	-	1.083
24	3.331	2.549	1.835	0.951	0.475	0.237	0.034	0.034	9.446
Total	6.898	4.246	2.581	1.289	0.712	0.271	0.034	0.305	16.336

Table No. 6.1. 2.

S t r a t u m - I I I

21	0.962	0.565	0.282	-	0.056	-	-	-	1.865
23	0.282	0.282	0.396	0.396	0.169	-	-	-	1.325
24	0.169	-	-	-	-	-	-	0.056	0.225
Total	1.413	0.847	0.678	0.396	0.225	-	-	0.056	3.615

Sector - B

Table No. 6.2.1

S t r a t u m - I

3	0.679	0.962	0.565	0.396	0.056	-	-	-	2.658
12	0.282	0.169	0.056	0.622	0.339	0.226	0.396	0.282	2.372
15	0.056	-	-	-	-	-	-	-	0.056
21	0.565	0.282	-	-	-	-	-	-	0.847
22	0.565	0.339	0.226	0.056	0.113	0.056	-	-	1.355
23	0.905	0.282	0.282	0.226	0.056	0.113	0.056	0.113	2.033
24	1.980	1.471	0.848	0.622	0.509	0.226	0.056	-	5.712
40	-	-	-	-	-	-	-	0.056	0.056
Total	5.032	3.505	1.977	1.922	1.073	0.621	0.508	0.451	15.089

S t r a t u m - I I

1	0.046	0.046	-	-	-	-	-	-	0.092
2	0.046	-	-	0.046	-	-	-	0.231	0.323
5	0.371	-	-	-	-	-	-	-	0.371
1	7.887	2.691	1.252	0.556	0.046	-	-	-	12.432
2	1.113	0.742	0.371	0.139	0.046	0.046	-	-	2.457
3	2.180	1.577	0.742	0.742	0.185	0.092	0.046	-	5.564
4	7.238	5.521	3.665	1.763	0.278	0.139	0.046	0.092	18.742
Total	18.881	10.577	6.030	3.246	0.555	0.277	0.092	0.323	39.981

Table No.8

Sector - A.

Distribution Of Volume Utility Class-wise

Stratum	Net forest area (in ha.)	PLY WOOD		CONSTRUCTIONAL TIMBER		BOX PLANKING		MATCH WOOD	
		Volume/ha. (in M ³)	Total available volume in the stratum (m ³)	Volume/ha. (in M ³)	Total available volume in the stratum (m ³)	Volume/ha. (in M ³)	Total available volume in the stratum (m ³)	Volume/ha. (in M ³)	Total available volume in the stratum (m ³)
I	2427.27	11.973	29061	87.310	211924	25.357	61548	11.178	27132
II	4420.54	19.257	85126	114.214	504887	23.612	104377	4.157	18376
III	2792.50	16.484	46031	81.144	226594	3.946	11019	0.408	1139
Total	9640.31	16.620	160218	97.860	943405	18.355	176944	4.839	46647

Sector - B.

I	5132.77	11.156	57261	91.123	467713	33.871	173852	7.351	37730
II	5406.92	40.795	220575	127.740	690679	42.686	230799	2.270	12273
III	3110.00	14.056	43714	40.214	125065	4.283	13320	0.396	1231
Total	13649.69	23.557	321550	94.028	1283457	30.621	417971	3.753	51234

Table No. 9

UTILITY CLASS-WISE VOLUME DISTRIBUTION ACCORDING TO THE PERCENTAGE OF
TOTAL (U.B.) VOLUME.

S I K K I M

<u>Diameter</u> <u>Class</u> <u>(in cm.)</u>	<u>Plywood</u>	<u>Constructional</u> <u>wood</u>	<u>Match wood</u>	<u>Box Planking</u> <u>wood</u>
10-19				
20-29			61.5	
30-39	49.5	44.0	74.5	41.0
40-49	73.5	74.5	85.0	69.0
50-59	84.5	85.0	90.0	80.0
60-69	90.0	89.0	92.0	85.0
70-79	93.9	92.0	92.5	86.5
80-89	96.0	93.0	94.5	88.0
90-99	97.0	94.0	94.5	90.0
100 +	97.5	95.0	95.0	91.0

Table No.10
Distribution Of Stems Utility Class-Wise

SECTOR - A.

STRATUM	Net forest area (in ha.)	PLY WOOD		CONSTRUCTIONAL TIMBER		BOX PLANKING		MATCH WOOD	
		No. of stems /ha.	Total available stems in the stratum	No. of stems /ha.	Total available stems in the stratum.	No. of stems /ha.	Total available stems in the stratum	No. of stems /ha.	Total available stems in the stratum
I	2427.27	3.483	8454	25,157	61062	6.681	16216	10.549	25605
II	4420.54	7.531	33291	34,463	152345	16,336	72213	18,695	82641
III	2792.50	10,398	29835	25,555	71362	3,615	10094	1,639	4576
Total	9640.31	7,342	70781	29,539	284769	10,220	98523	11,703	112822

SECTOR - B

I	5132.77	5,807	27239	26,453	135777	15,089	77448	19,463	99899
II	5406.92	9,584	51819	30,273	163683	30,981	216174	9,555	51663
III	5110.00	11,786	36654	24,028	74727	4,530	14088	0,566	1760
Total	15649.69	8,477	115712	27,414	374187	22,543	307710	11,233	153322

Table No. 11
Stems Per Ha. By Species And Diameter Classes (in cm.)

SECTOR - A.

Stratum	D I A M E T E R (in cm.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
I	71.207	37.624	14.402	7.631	5.233	4.942	2.538	1.306	1.013	3.561	149.457
II	103.127	50.708	22.314	12.531	9.201	6.177	4.716	2.847	1.899	4.618	218.143
III	129.120	41.135	21.269	15.950	8.084	6.276	3.785	1.750	0.903	2.372	230.644

SECTOR - B.

Stratum	D I A M E T E R (in cm.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
I	103.214	40.284	16.060	10.286	6.666	5.763	3.615	2.259	1.467	3.504	193.118
II	90.695	55.484	29.452	18.620	11.823	7.832	4.030	2.176	1.201	7.138	228.751
III	85.313	45.238	31.178	16.095	7.933	3.965	1.925	0.453	0.226	0.793	193.119

SECTOR - A.

Table No. 12

Total Stems (in '000 units) Diameter Class-wise And Stratum Wise

STRATUM	Net Forest area (in ha.)	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
I	2427.27	171745	91486	34945	19508	12693	11986	6151	3164	2453	8637	362768
II	4420.54	455648	224143	98649	55684	40666	27297	20238	12580	8391	20409	964305
III	2792.50	360625	114860	59384	44531	22568	17519	10562	4881	2519	6620	644069
Total	9640.31	988018	430489	192978	119723	75927	56802	37551	20625	13363	35666	1971142
Per Ha. :		102.498	44.657	20.037	12.332	7.889	5.903	3.907	2.148	1.392	3.707	204.470

SECTOR - B.

I	5132.77	529816	206761	82426	52788	34210	29574	18551	11593	7526	17982	991227
II	5406.92	490397	299986	159301	102285	63916	42337	21781	11759	6486	38586	1236834
III	3110.00	265805	141652	96347	49345	24665	12325	5983	1408	702	2465	600597
Total	13649.69	1286018	648399	338074	204418	122791	84236	46315	24760	14714	59033	2828658
Per ha. :		94.105	47.445	24.821	15.041	9.007	6.181	3.400	1.818	1.083	4.331	207.232

SECTOR - A. Table No. 13
 Per Ha. Volume (M³) Distribution Stratum Wise

STRATUM	D	I	A	M	E	T	E	R	C	L	A	S	S	Total	
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+					
I	6.518	9.447	9.447	10.939	13.013	18.261	13.644	8.548	9.044	76.341	175.202				
II	9.402	13.622	15.856	17.515	21.271	21.582	23.694	16.623	16.542	82.127	240.234				
III	12.108	10.367	14.391	21.507	18.326	20.652	18.041	11.846	7.777	33.194	168.209				

SECTOR - B.

I	9.561	10.539	11.822	15.796	16.565	20.979	17.842	14.655	12.802	73.793	204.354				
II	8.026	14.780	20.204	25.313	26.183	27.376	20.758	14.901	10.844	148.937	316.822				
III	7.778	12.399	22.496	21.109	17.123	12.899	9.069	2.651	1.613	10.719	117.856				

Table No. 14

Total Volume (in'000 m³) Diameter Classwise

SECTOR - A.

S I K K I M

Stratum Net Forest area(in ha.)	D I A M E T E R C L A S S (in cm.)										100 + Total	
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
I	2427.27	15820	22930	22930	26551	31586	44324	33117	20748	21952	185300	425258
II	4420.54	41561	60216	70092	77425	94029	95404	104740	82323	73124	363045	1061959
III	2792.50	33811	28949	40186	60058	51175	57670	50379	33079	21717	92694	469718
Total	9640.31	91192	112095	133208	164034	178790	197398	188236	136150	116793	641039	1956935
Per Ha. :	9.459	11.627	13.817	17.015	18.339	20.476	19.526	14.124	12.116	66.496	202.995	

SECTOR - B.

I	5132.77	49074	54094	60679	81077	85024	107680	91578	75220	65709	378762	1048897
II	5406.92	42478	93389	109406	136851	128264	148819	112229	80563	55922	805105	1713026
III	3110.00	24189	38560	69962	65648	53252	40115	28204	8244	5016	33336	366526
Total	13649.69	115741	186043	240047	263576	266540	296614	232011	164027	126647	1217203	3128449

Per Ha. :

8.547	12.643	17.574	20.776	20.502	21.672	16.998	12.017	9.279	89.188	229.196		
-------	--------	--------	--------	--------	--------	--------	--------	-------	--------	---------	--	--

Table No. 15.3

STUDY ON SYMLOCOS THEIFOLIA (Sp. 39)

PER HA. STEM DISTRIBUTION

S I K K I M

SECTOR - A.

Species	STRATUM - I					Total			
	20-29	30-39	40-49	50-59	60-69		70-79	80-89	90-99
Symplocos theifolia	7.279	0.582	0.072	-	-	-	-	-	7.933

Species	STRATUM - II			Total
	Upto 2171	2171 - 2800m.	Above 2800m.	
Symplocos theifolia	17.169	0.985	0.101	18.289

Species	STRATUM - III			Total
	Upto 2171	2171 - 2800m.	Above 2800m.	
Symplocos theifolia	1.075	0.169	0.056	1.300

SECTOR - B.

Species	STRATUM - I					Total			
	20-29	30-39	40-49	50-59	60-69		70-79	80-89	90-99
Symplocos theifolia	16.753	1.131	0.056	-	-	-	-	-	17.940

Species	STRATUM - II			Total
	Upto 2171	2171 - 2800m.	Above 2800m.	
Symplocos theifolia	8.816	0.371	0.046	9.233

Species	STRATUM - III			Total
	Upto 2171	2171 - 2800m.	Above 2800m.	
Symplocos theifolia	0.113	0.340	-	0.453

TOTAL NO. OF SYMPLICOS THEIFOLIA SPECIES

SECTOR - A.	STRATUM - I					100 +	Total		
	20-29	30-39	40-49	50-59	60-69			70-79	80-89
Species	17668	1412	174	-	-	-	-	-	19254
	75896	4354	446	-	-	150	-	-	88846
	3001	471	156	-	-	-	-	-	3628
	STRATUM - II								
	STRATUM - III								
SECTOR - B.	STRATUM - I							92051	
	85989	5805	287	-	-	-	-	-	92051
	STRATUM - II							49920	
	47667	2005	248	-	-	-	-	-	49920
	STRATUM - III							1408	
	351	1057	-	-	-	-	-	-	1408

Sector	Stratum	Area (in Ha.)	Stems/ha.	Estimation
A	I	2429.27	7.933	19254
	II	4420.54	18.289	80846
	III	2792.50	1.300	3628
Total		9640.31	10.759	103728

Sector	Stratum	Area (in ha.)	Stems/ha.	Estimation
B	I	5732.77	17.940	92081
	II	5406.92	9.233	49920
	III	3110.00	0.453	1408
Total		13649.69	10.506	143409

Table No.15.2
 STUDY ON SYMPOCCOS THEIFOLIA PER H.A. VOLUME DISTRIBUTION

		20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
<u>SECTOR - A.</u>											
<u>STRATUM - I</u>											
Species											
Symplocos theifolia	2.022	0.373	0.074	-	-	-	-	-	-	-	2.469
<u>Stratum - II</u>											
Symplocos theifolia	4.772	0.598	0.103	-	-	-	-	0.142	-	-	5.616
<u>Stratum - III</u>											
Symplocos theifolia	0.325	0.105	0.054	-	-	-	-	-	-	-	0.484
<u>SECTOR - B.</u>											
<u>Stratum - I</u>											
Symplocos theifolia	4.703	0.636	0.060	-	-	-	-	-	-	-	5.399
<u>Stratum - II</u>											
Symplocos theifolia	2.432	0.216	0.043	-	-	-	-	-	-	-	2.691
<u>Stratum - III</u>											
Symplocos theifolia	0.031	0.229	-	-	-	-	-	-	-	-	0.260
<u>SECTOR - A.</u>											
<u>Stratum - I</u>											
		4907	905	179	-	-	-	-	-	-	5991
<u>Stratum - II</u>											
		21094	2643	455	-	-	627	-	-	-	24819
<u>Stratum - III</u>											
		907	293	150	-	-	-	-	-	-	1350
<u>TOTAL NO. OF SYMPOCCOS THEIFOLIA</u>											

Total No. Of Symplocos theifolia

SECTOR - B. Stratum - I

20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
24139	3264	308	-	-	-	-	-	-	27711

Stratum - II

13149	1167	232	-	-	-	-	-	-	14548
-------	------	-----	---	---	---	---	---	---	-------

Stratum - III

96	712	-	-	-	-	-	-	-	808
----	-----	---	---	---	---	---	---	---	-----

Sector	Stratum	Area (in ha.)	Volume/ha.	Estimation
A	I	2427.27	2.469	5991
	II	4420.54	5.615	24819
	III	2792.50	0.484	1350
Total		9640.31	3.336	32160

Sector	Stratum	Area (in ha.)	Volume/ha.	Estimation
B	I	5132.77	5.399	27711
	II	5406.92	2.691	14548
	III	3110.00	0.260	808
Total		13649.69	3.155	43067

Sector - A
STRATUM - I
3 Table No. 16.1.1
Volume/Hectare (in M) By Species And Diameter Classes

Species Code.	D I A M E T E R C L A S S (in cm.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.024	0.146	0.269	0.616	0.801	1.232	0.464	-	-	-	3.554
3	0.111	0.257	0.073	0.151	0.783	0.783	0.540	-	0.889	-	2.804
4	0.022	0.071	0.256	0.103	0.219	1.247	2.214	1.048	-	4.913	10.093
5	0.116	0.221	0.704	0.945	1.774	2.924	2.182	2.404	2.482	35.777	0.082
8	0.097	0.358	0.397	0.575	1.769	1.411	0.524	-	0.820	-	49.529
9	0.013	0.027	0.372	0.372	0.289	0.401	-	-	-	-	5.951
10	0.035	0.131	0.372	0.349	0.977	0.485	1.480	1.004	0.640	13.798	1.102
12	0.053	0.141	0.911	2.073	1.316	1.802	0.798	0.905	-	1.189	19.271
13	0.598	0.922	0.538	0.728	0.130	-	-	-	-	-	9.188
14	0.023	0.040	-	-	-	-	-	-	-	-	2.916
15	0.021	0.021	0.065	0.211	0.180	0.271	0.323	-	-	-	0.063
17	0.006	0.023	-	-	-	-	-	-	-	-	1.071
18	0.048	0.123	0.162	0.096	0.167	-	0.307	-	-	-	0.029
21	0.013	0.043	0.063	0.257	0.571	-	-	0.349	-	-	0.903
22	0.042	0.414	0.605	0.721	0.589	0.071	0.307	-	-	2.168	3.421
23	0.012	0.015	0.038	0.081	-	-	-	0.395	-	-	0.684
24	-	-	-	-	-	0.750	0.379	-	0.540	-	3.837
26	-	-	-	-	-	-	-	-	-	-	0.558
27	-	-	-	-	-	-	-	-	-	2.032	3.307

Species	D I A M E T E R C L A S S (in cm.)										
Code	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
29	0.012	0.260	0.085	-	0.376	0.663	0.307	-	0.483	0.626	0.357
30	0.063	0.071	0.453	0.213	0.376	0.663	0.307	-	0.483	0.626	3.255
31	0.005	0.033	0.141	0.335	0.271	0.250	0.340	-	-	-	1.375
32	0.033	0.099	0.090	-	0.117	0.222	-	-	-	-	0.561
34	0.015	0.085	0.135	0.312	0.513	1.045	1.579	0.952	1.979	13.844	20.459
35	-	0.129	0.204	-	0.698	0.782	-	-	-	1.187	3.000
36	0.027	0.108	0.194	0.377	0.747	1.246	1.894	1.487	0.674	0.801	7.555
37	-	-	0.047	0.093	-	-	-	-	-	-	0.140
39	2.035	2.022	0.373	0.074	-	-	-	-	-	-	4.504
41	0.006	-	0.041	0.084	-	-	-	-	-	-	0.131
42	0.008	-	-	0.083	-	-	-	-	-	-	0.091
43	3.080	3.688	3.007	1.898	1.509	1.676	0.006	0.004	0.537	0.006	15.411
Total	6.518	9.447	9.447	10.939	13.013	18.261	13.644	8.548	9.044	76.341	175.202

SECTOR - A
STRATUM - II

Table No. - 16.1.2
in (M³) By Species and Diameter Classes

Species	Volume/ Ha										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
2	0.195	0.546	1.138	2.256	0.637	1.290	1.959	0.322	0.831	1.064	10.238	0.335
3	0.014	0.058	0.090	0.173	-	-	0.153	-	-	-	0.513	0.244
4	0.004	0.030	0.049	-	0.277	-	-	-	-	-	0.093	-
5	0.002	-	0.049	-	-	0.193	-	-	-	-	-	-
6	-	0.007	-	0.086	-	-	-	-	-	-	-	-
7	0.032	0.012	0.121	0.133	-	-	-	-	-	-	0.298	-
8	0.180	0.381	0.592	0.960	1.781	2.630	2.551	2.025	3.503	14.515	29.118	-
9	0.246	0.447	1.059	0.537	0.757	0.332	0.454	-	-	0.488	4.320	-
10	0.032	-	0.089	0.137	0.137	0.361	-	-	-	-	0.756	-
12	0.012	0.002	-	0.046	-	-	0.164	-	-	5.444	5.668	-
13	0.008	0.015	0.097	-	-	-	0.366	-	-	0.584	1.070	-
14	0.651	0.550	0.566	0.278	0.056	-	-	-	-	-	2.101	-
15	0.015	0.043	0.034	-	-	-	-	-	-	-	0.092	-
17	0.025	0.092	0.221	0.162	0.166	0.266	1.269	0.714	-	-	2.915	-
18	0.019	-	-	-	-	-	-	-	-	-	0.019	-
21	0.259	1.211	1.568	0.992	0.833	0.287	0.279	-	-	0.268	5.697	-
22	0.077	0.258	0.419	0.579	0.311	0.380	0.120	-	-	1.685	3.829	-
23	0.056	0.286	0.273	0.357	0.334	0.312	0.390	0.179	-	-	2.187	-
24	0.149	1.093	2.195	2.989	3.644	2.712	1.880	1.287	0.239	0.298	16.486	-

Species Code	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
25	0.009	0.081	0.367	0.292	0.287	0.334	0.455	0.579	-	-	2.404
26	0.009	0.006	-	-	-	-	-	-	-	-	0.015
27	0.116	0.129	0.249	0.349	0.556	0.472	0.317	0.657	0.804	2.950	6.599
28	-	0.006	-	-	-	-	-	-	-	-	0.006
29	0.011	0.028	-	-	0.102	-	-	-	-	-	0.141
30	0.029	0.058	0.049	0.043	-	-	-	-	-	-	0.179
31	0.035	0.224	0.153	0.367	0.314	0.369	0.132	-	-	-	1.594
32	0.158	0.173	0.185	0.154	-	-	-	-	-	-	0.868
34	0.109	0.240	0.638	1.052	1.826	2.303	4.592	5.006	4.087	20.822	40.675
35	0.087	0.205	0.620	1.156	2.522	2.118	1.199	1.358	1.107	3.070	13.422
36	0.197	0.505	1.768	2.001	4.820	5.415	4.624	4.613	4.933	28.430	57.306
37	0.068	0.337	0.528	0.190	0.284	-	-	-	-	-	1.407
38	0.023	0.045	0.051	0.041	-	-	-	-	-	-	0.160
39	4.787	4.772	0.598	0.106	-	-	-	0.142	-	-	10.402
42	0.002	0.028	0.093	0.339	0.361	0.547	1.034	1.302	1.033	1.538	6.277
43	1.786	1.754	1.999	1.743	1.266	1.261	1.756	0.439	0.005	0.971	12.980
Total	9.402	13.622	15.856	17.515	21.271	21.582	23.694	18.623	16.542	82.127	240.234

SPECTR - A
STRATUM - III

Table No. 16.1.3

Volume/Hectare in M³ Species and Diameter Classes

Species Code	Diameter Class (in cm.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
1	0.311	0.773	0.700	0.948	0.440	2.109	1.427	0.580	-	-	7.288
2	0.344	0.549	1.722	2.196	1.592	0.772	0.408	1.055	-	-	8.638
6	0.370	0.581	1.097	1.148	0.309	1.320	-	-	-	-	4.825
7	0.067	0.144	0.251	0.399	0.199	-	-	-	-	-	1.060
8	0.016	0.050	0.052	-	0.189	-	-	-	-	1.395	1.702
9	0.031	-	0.122	-	-	-	0.367	-	-	-	0.520
14	0.638	0.220	0.124	-	-	-	-	-	-	-	0.982
21	0.085	0.667	0.586	0.713	0.589	-	0.242	-	-	-	2.882
23	0.033	0.152	0.189	0.320	0.758	1.179	0.664	-	-	-	3.295
24	-	0.008	0.127	-	-	-	-	-	-	-	0.135
25	0.124	0.271	0.839	0.660	1.260	1.536	0.793	1.118	0.482	1.037	8.120
27	-	-	-	-	0.132	-	-	-	-	-	0.132
29	0.055	0.139	-	-	-	-	-	-	-	-	0.194
30	0.007	0.041	-	-	-	-	-	-	-	-	0.048
31	0.076	0.202	0.265	0.129	-	-	-	-	-	-	0.672
32	0.042	0.045	-	-	-	-	-	-	-	-	0.087
34	-	-	-	0.267	-	-	0.266	-	-	-	1.495
35	0.051	0.155	0.189	1.211	1.736	1.319	1.886	0.841	0.450	0.703	8.541
36	0.435	0.955	1.197	2.637	3.492	6.330	9.610	3.418	3.784	21.497	53.355
37	4.868	2.390	4.523	7.562	5.181	3.816	0.713	1.678	0.941	-	31.672
38	1.066	1.474	1.265	0.919	0.642	0.393	-	-	-	-	5.759
39	1.258	0.325	0.105	0.053	-	-	-	-	-	-	1.741
41	-	0.015	-	0.543	0.537	0.396	-	0.711	-	-	2.202
42	0.081	0.102	0.177	0.405	0.108	0.623	0.309	1.476	1.155	7.999	12.435
43	2.150	1.109	0.861	1.397	1.351	0.670	1.356	0.969	0.003	0.563	10.429
Total	12.108	10.367	14.391	21.507	18.326	20.652	18.041	11.846	7.777	33.194	168.209

SECTOR - B
STRATUM - I
Table No. 16.2.1
Volume/Hectare in M³ By Species And Diameter Classes

Species Code	Diameter Class (in cms.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.055	-	0.454	0.820	-	0.554	1.184	-	-	-	3.067
3	0.026	0.060	0.874	2.185	1.964	1.999	0.414	-	-	-	7.522
4	0.011	0.027	0.206	0.283	-	0.211	2.008	0.824	0.462	-	4.032
15	-	-	-	0.111	0.688	-	-	-	-	-	0.799
6	0.002	-	0.052	-	-	-	-	-	-	-	0.054
7	-	-	-	0.286	0.178	-	-	-	-	-	0.464
8	0.202	0.325	1.100	1.387	2.503	4.222	4.534	5.738	1.955	30.470	52.736
9	0.100	0.396	1.391	1.290	1.570	0.907	-	-	0.707	-	6.351
10	-	-	-	-	-	0.580	-	-	-	-	0.580
11	0.004	-	-	-	-	-	-	-	-	-	0.004
12	0.050	0.051	0.211	0.244	0.131	2.244	1.695	1.569	3.563	4.183	13.941
13	0.006	0.023	0.260	0.591	0.815	0.596	-	-	-	-	2.291
14	0.318	0.570	0.366	0.232	-	-	-	-	-	-	1.486
15	0.043	0.063	0.081	-	-	-	-	-	-	-	0.187
17	0.016	0.090	0.259	0.393	0.314	1.153	0.561	0.445	0.474	2.759	6.464
18	-	0.030	-	-	-	-	-	-	-	-	0.030
21	0.036	0.273	0.317	0.364	-	-	-	-	-	-	0.990
22	-	0.050	0.387	0.390	0.498	0.175	0.415	0.311	-	-	2.226
23	-	0.182	0.539	0.349	0.547	0.676	0.238	0.619	0.358	2.311	5.819
24	0.079	0.301	1.357	1.765	1.705	1.842	2.063	1.237	0.437	-	10.786

Species Code	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	Total
26	-	0.007	0.083	-	0.377	-	-	-	-	-	0.467
27	0.010	0.102	0.141	0.599	0.453	0.174	0.837	-	-	0.827	3.143
28	-	0.008	-	0.072	0.343	-	-	-	-	-	0.423
29	0.083	0.093	0.130	0.123	-	-	-	-	-	-	0.429
30	0.010	0.114	0.450	0.656	0.358	0.555	-	0.299	-	7.124	9.566
31	0.031	0.093	0.287	0.619	0.452	0.146	0.221	-	-	-	1.849
34	0.038	0.053	0.272	1.235	0.802	1.837	2.823	2.920	3.327	21.456	34.763
35	0.038	0.141	0.427	0.847	1.146	1.649	0.843	-	1.002	-	6.093
36	-	-	-	-	-	-	-	-	-	0.730	0.730
38	-	0.019	-	-	-	-	-	-	-	-	0.019
39	4.843	4.703	0.636	0.060	-	-	-	-	-	-	10.242
40	-	-	-	-	-	-	-	-	-	-	-
43	3.560	2.465	1.542	0.895	1.721	1.459	0.006	0.693	0.517	1.756	15.035
Total	9.561	10.539	11.822	15.796	16.565	20.979	17.842	14.655	12.802	73.793	204.354

Stratum - II
 SECTOR - B
 Table No. 16.2.2
 Volume/Hectare (in M³) By Species And Diameter Classes.

Species Code	D	I	A	M	E	F	E	R	C	L	A	S	S	E	S	(in cms.)	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +							
2	0.214	0.540	1.605	3.257	3.371	4.917	4.839	3.108	1.573	6.431							29.855
3	-	-	0.084	0.085	-	-	-	-	-	-							0.149
4	-	-	-	0.127	0.105	0.142	0.216	-	-	-							0.590
6	-	0.007	-	-	-	-	-	-	-	-							0.007
8	0.070	0.245	0.068	0.555	0.680	1.579	1.615	1.005	0.400	27.777							33.994
9	0.023	0.022	0.046	0.211	0.351	0.268	-	-	-	1.991							2.912
11	0.008	-	-	-	-	-	-	-	-	-							0.008
12	-	-	0.040	-	-	0.202	-	-	-	-							0.202
14	0.383	0.257	0.042	0.062	0.076	-	-	-	-	7.213							7.455
15	0.148	0.419	0.449	-	0.156	-	-	-	-	-							0.820
17	0.003	-	0.087	0.067	-	-	-	-	0.407	-							1.172
21	0.916	3.582	4.826	3.161	2.276	1.593	0.178	-	-	0.373							0.564
22	0.084	0.485	0.744	0.912	0.778	0.390	0.169	0.222	-	-							10.905
23	0.196	0.888	1.411	1.930	1.436	2.092	0.777	0.523	0.341	-							3.784
24	0.377	1.793	4.761	6.804	7.084	5.276	1.195	0.697	0.289	0.543							9.594
25	-	0.043	0.024	0.166	0.392	0.638	0.590	0.583	0.409	1.219							28.819
26	0.004	-	0.027	0.070	-	-	-	-	-	-							4.064
27	0.054	0.090	0.136	0.280	0.190	0.741	0.637	0.310	0.769	4.379							0.101
28	0.004	0.083	0.230	0.465	0.530	0.288	-	-	0.380	-							7.586
29	0.008	0.019	0.048	-	-	-	-	-	-	-							1.980
31	0.106	0.122	0.090	0.445	1.169	0.406	-	-	-	-							0.075
32	0.091	0.206	0.075	-	-	-	-	-	0.345	-							2.683
34	0.126	0.241	0.678	0.470	1.192	3.657	4.224	3.997	2.365	-							0.372
35	0.083	0.237	0.774	1.537	1.769	0.712	2.110	0.975	0.577	45.061							62.011
36	0.035	0.141	0.275	0.873	0.961	1.833	1.816	0.909	1.156	6.178							14.552
37	0.009	0.013	-	-	0.103	-	-	-	-	45.173							53.172
38	0.327	0.794	1.561	1.645	0.823	0.296	0.206	-	-	-							0.125
39	2.999	2.431	0.215	0.042	-	-	-	-	-	-							5.652
43	1.758	2.122	1.928	2.349	2.741	2.346	2.186	2.572	1.533	2.599							5.687
Total	8.026	14.780	20.204	25.313	26.183	27.376	20.758	14.901	10.344	148.937							316.822

SECTOR - B
STRATUM - III
Volume/Ha. In M³ By Species And Diameter Classes.

SPECIES	D I A M E T E R C L A S S (IN CMS)										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
1	0.194	0.194	1.538	4.888	3.419	1.581	2.221	0.554	0.689	-	-	14.884
2	0.653	1.407	2.393	0.898	1.532	1.846	1.540	-	-	-	-	10.269
3	0.014	-	-	-	-	-	-	-	-	-	-	0.014
5	-	-	0.138	-	-	-	-	-	-	-	-	0.138
6	0.174	0.600	1.927	3.219	0.899	1.266	0.470	-	-	-	-	8.555
7	0.012	-	-	-	-	-	-	-	-	-	-	0.012
8	0.219	0.442	0.180	1.521	2.114	1.102	3.258	2.095	0.922	8.312	-	20.165
9	0.012	-	0.123	-	-	-	-	-	-	-	-	0.135
14	0.108	-	-	-	-	-	-	-	-	-	-	0.108
15	-	0.110	0.123	0.296	-	-	-	-	-	-	-	0.529
21	0.446	0.670	0.426	0.900	0.388	0.281	-	-	-	-	-	3.111
23	0.012	0.021	-	-	-	-	-	-	-	-	-	1.133
24	0.115	0.527	0.495	0.761	0.892	1.006	0.449	-	-	1.100	-	4.245
25	0.041	0.057	0.268	0.400	0.898	0.865	-	-	-	-	-	2.529
27	-	0.042	-	0.256	-	-	-	-	-	-	-	0.298
29	-	-	-	0.247	-	-	-	-	-	-	-	0.247
30	0.090	0.203	0.128	0.112	-	-	-	-	-	-	-	0.533
31	0.040	-	0.075	0.247	-	-	-	-	-	-	-	0.362
32	0.683	0.798	0.334	0.281	-	0.376	-	-	-	-	-	2.472
35	0.037	0.066	0.201	-	-	-	-	-	-	-	-	0.304
36	-	0.025	0.064	-	-	-	-	-	-	-	-	0.089
37	1.589	0.504	0.458	0.104	-	0.302	-	-	-	-	-	2.957
38	1.980	4.874	10.794	5.481	4.082	2.289	0.556	-	-	-	-	30.056
39	0.015	0.030	0.228	-	-	-	-	-	-	-	-	0.273
43	1.538	1.829	2.803	1.498	2.899	1.985	0.575	0.002	0.002	1.307	-	14.438
Total	7.778	12.399	22.496	21.109	17.123	12.899	9.069	2.651	1.613	10.719	117.856	

Table No. 17.1.1

SECTOR - A
STRATUM - I
SPECIES

		Total Volume (in '000' M ³) By Species And Diameter Classes.										Total				
		D	I	A	M	E	T	E	R	C	L	A	S	S	(in cms.)	100 +
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +					
2		0.060	0.359	0.654	1.497	1.945	2.992	1.128	-	-	-	-	-	-	-	8.635
3		0.270	0.624	0.178	0.366	-	1.901	1.311	-	2.158	-	-	-	-	-	6.808
4		0.054	0.174	0.622	0.250	0.532	3.027	5.374	2.545	-	11.927	-	-	-	-	24.505
5		-	-	0.200	-	-	-	-	-	-	-	-	-	-	-	0.200
8		0.282	0.537	1.710	2.295	4.308	7.098	5.297	5.835	6.024	86.842	120.228	-	-	-	14.453
9		0.237	0.869	0.965	1.397	4.295	3.427	1.273	-	1.990	-	-	-	-	-	2.677
10		0.033	0.065	-	0.902	0.702	0.975	-	-	-	-	-	-	-	-	2.677
12		0.086	0.319	0.903	0.848	2.371	1.177	3.594	2.439	1.555	33.492	46.784	-	-	-	46.784
13		0.130	0.344	0.221	5.032	3.194	4.374	1.937	2.497	-	2.836	20.315	-	-	-	20.315
14		1.453	2.239	1.307	1.767	0.316	-	-	-	-	-	-	-	-	-	7.082
15		0.060	0.099	-	-	-	-	-	-	-	-	-	-	-	-	0.159
17		0.051	-	0.158	0.514	0.439	0.659	0.786	-	-	-	-	-	-	-	2.607
18		0.015	0.057	-	-	-	-	-	-	-	-	-	-	-	-	0.072
21		0.118	0.298	0.393	0.233	0.406	-	0.745	-	-	-	-	-	-	-	2.193
22		0.032	-	0.155	0.624	1.388	-	-	0.849	-	5.264	8.312	-	-	-	8.312
23		-	0.104	0.346	0.466	-	-	0.745	-	-	-	-	-	-	-	1.661
24		0.103	1.006	1.468	1.750	1.430	2.601	-	0.960	-	-	-	-	-	-	9.318
26		-	0.045	-	-	-	-	-	-	1.311	-	-	-	-	-	1.356
27		0.030	0.037	0.092	0.196	-	1.821	0.920	-	-	4.953	8.029	-	-	-	8.029
29		0.029	0.633	0.207	-	-	-	-	-	-	-	0.869	-	-	-	0.869
30		0.154	0.174	1.100	0.517	0.912	1.610	0.745	-	1.174	1.519	7.905	-	-	-	7.905
31		0.012	0.082	0.343	0.813	0.657	0.607	0.825	-	-	-	3.339	-	-	-	3.339
32		0.081	0.241	0.219	-	0.285	0.538	-	-	-	-	1.364	-	-	-	1.364
34		0.038	0.206	0.328	0.758	1.297	2.538	3.833	2.311	4.805	33.604	49.718	-	-	-	49.718
35		-	0.314	0.496	-	1.695	1.898	-	-	-	2.882	7.285	-	-	-	7.285
36		0.065	0.262	0.471	0.916	1.813	3.026	4.598	3.610	1.636	1.945	18.342	-	-	-	18.342
37		-	-	1.158	0.226	-	-	-	-	-	-	1.384	-	-	-	1.384
39		4.941	4.910	0.906	0.180	-	-	-	-	-	-	10.937	-	-	-	10.937
41		0.014	-	0.102	0.205	-	-	-	-	-	-	0.321	-	-	-	0.321
42		0.021	-	-	0.202	-	-	-	-	-	-	0.223	-	-	-	0.223
43		7.451	8.932	8.228	4.597	3.601	4.055	0.006	0.002	1.299	0.006	38.177	-	-	-	38.177
Total		15.820	22.930	22.930	26.551	31.586	44.324	33.117	20.748	21.952	185.300	425.258	-	-	-	425.258

Table No. 17.1.2
 TOTAL VOLUME (in'000) BY SPECIES AND DIAMETER CLASSES.

SECTOR - STRATUM - SPECIES	D I A M E T E R C L A S S (in cms.)										100 +	Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +		
2	0.863	2.416	5.030	9.975	2.816	5.706	8.662	1.424	3.676	4.704	45.272	
3	0.065	0.260	0.400	0.767	-	-	-	-	-	-	1.492	
4	0.020	0.135	0.218	-	1.224	-	0.679	-	-	-	2.276	
5	0.012	-	0.217	-	-	0.856	-	-	-	-	1.085	
6	-	0.034	-	0.382	-	-	-	-	-	-	0.416	
7	0.141	0.055	0.538	0.591	-	-	-	-	-	-	1.325	
8	0.799	1.685	2.618	4.246	7.876	11.627	11.281	8.955	15.489	64.166	128.742	
9	1.091	1.976	4.683	2.375	3.348	1.469	2.009	-	-	2.158	19.109	
10	0.144	-	0.394	0.565	0.608	1.596	-	-	-	-	3.307	
12	0.057	0.093	-	0.206	-	-	0.726	-	-	-	25.147	
13	0.039	0.069	0.430	-	-	-	1.621	-	-	24.065	4.744	
14	2.881	2.432	2.502	1.230	0.248	-	-	-	-	2.585	9.293	
15	0.068	0.191	0.151	-	-	-	-	-	-	-	0.410	
17	0.113	0.470	0.980	0.719	0.738	1.175	5.611	3.15.8	-	-	12.964	
18	0.086	-	-	-	-	-	-	-	-	-	0.086	
21	1.147	5.356	6.933	4.389	3.684	1.268	1.235	-	-	1.185	25.197	
22	0.344	1.143	1.854	2.561	1.374	1.676	0.533	-	-	7.452	16.937	
23	0.248	0.958	1.207	1.581	1.478	1.382	1.724	0.794	-	-	9.372	
24	0.659	4.831	9.705	13.213	16.112	11.989	8.313	5.689	1.058	1.318	72.887	

SPECIES	D I A M E T E R C L A S S (in cms.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	
25	0.042	0.359	1.622	1.290	1.268	1.480	2.011	2.560	-	-	10.632
26	0.040	0.028	-	-	-	-	-	-	-	-	0.068
27	0.516	0.572	1.104	1.546	2.460	2.089	1.405	2.905	3.555	13.041	29.193
28	-	0.030	-	-	-	-	-	-	-	-	0.030
29	0.052	0.126	-	-	0.452	-	-	-	-	-	0.630
30	0.131	0.259	0.219	0.193	-	-	-	-	-	-	0.802
31	0.157	0.994	0.677	1.625	1.389	1.635	0.586	-	-	-	7.063
32	0.702	0.765	0.810	0.684	-	-	-	-	-	-	2.961
34	0.485	1.062	2.820	4.654	8.072	10.181	20.302	22.129	18.068	92.047	179.820
35	0.385	0.909	2.741	5.111	11.150	9.363	5.301	6.006	4.897	13.573	59.436
36	0.875	2.232	7.816	8.847	21.310	23.938	20.444	20.394	21.810	125.679	253.345
37	0.304	1.491	2.339	0.846	1.259	-	-	-	-	-	6.235
38	0.103	0.202	0.227	0.182	-	-	-	-	-	-	0.714
39	21.161	21.096	2.647	0.458	-	-	-	0.631	-	-	45.993
42	0.010	0.126	0.411	1.498	1.599	2.422	4.574	5.755	4.566	6.800	27.761
43	7.821	7.861	8.800	7.694	5.564	5.552	7.723	1.923	0.005	4.272	57.215
TOTAL	41.561	60.216	70.092	77.425	94.029	95.404	104.740	82.323	73.124	363.045	1061.959

Table No. 17.1.3
TOTAL VOLUME (in '000' M³) BY SPECIES AND DIAMETER CLASSES.

SECTOR - A
STRATUM - III

SPECIES	Diameter Class (in cms)										100 + Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
1	0.870	2.159	1.957	2.649	1.229	5.891	3.985	1.620	-	-	20.360
2	0.961	1.535	4.809	6.133	4.446	2.155	1.139	2.946	-	-	24.124
6	1.034	1.623	3.063	3.207	0.864	3.687	-	-	-	-	13.478
7	0.188	0.402	0.701	1.115	0.555	-	-	-	-	-	2.961
8	0.045	0.140	0.147	-	-	0.528	-	-	-	3.896	4.756
9	0.087	-	0.341	-	-	-	1.025	-	-	-	1.453
14	1.782	0.616	0.347	-	-	-	-	-	-	-	2.745
21	0.238	1.864	1.636	1.993	1.646	-	0.677	-	-	-	8.054
23	0.093	0.425	0.528	0.895	2.119	3.293	1.856	-	-	-	9.209
24	-	0.025	0.356	-	-	-	-	-	-	-	0.381
25	0.347	0.757	2.342	1.844	3.519	4.290	2.216	3.124	1.347	2.897	22.683
27	-	-	-	-	0.368	-	-	-	-	-	0.368
29	0.153	0.389	-	-	-	-	-	-	-	-	0.542
30	0.021	0.114	-	-	-	-	-	-	-	-	0.135
31	0.214	0.564	0.741	0.361	-	-	-	-	-	-	1.880
32	0.119	0.125	-	-	-	-	-	-	-	-	0.244
34	-	-	-	0.746	-	-	0.744	-	-	-	0.244
35	0.143	0.432	0.528	3.384	4.849	3.684	5.266	-	2.686	-	4.176
36	1.214	2.669	3.344	7.365	9.752	17.677	26.836	2.350	1.257	1.963	23.856
37	13.594	6.674	12.632	21.118	14.468	10.656	11.993	9.546	10.569	60.030	149.002
38	2.979	4.116	3.534	2.567	1.793	1.098	-	4.686	2.629	-	88.450
39	3.514	0.908	0.294	0.150	-	-	-	-	-	-	16.087
41	-	0.043	-	1.517	1.502	1.107	-	-	-	-	4.866
42	0.193	0.286	0.496	1.131	0.302	1.742	0.865	1.985	-	-	6.154
43	6.022	3.083	2.390	3.883	3.763	1.862	3.777	4.123	3.227	22.338	34.703
TOTAL	33.811	28.949	40.186	60.058	51.175	57.670	50.379	33.079	21.717	92.694	469.718

Table No. 17.2.1
TOTAL VOLUME (IN '000' M³) BY SPECIES AND DIAMETER CLASSES.

SECTOR - B
STRATUM - I

SPECIES	D I A M E T E R C L A S S (in. cms.)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
2	0.385	-	2.334	4.211	-	2.846	6.078	-	-	-	15.754
3	0.138	0.309	4.486	11.219	10.074	10.262	2.125	-	-	-	38.613
4	0.059	0.139	1.061	1.453	-	1.084	10.311	4.233	2.376	-	20.716
5	-	-	-	0.570	3.535	-	-	-	-	-	4.105
6	0.014	-	0.270	-	-	-	-	-	-	-	0.284
7	-	-	-	1.468	0.916	-	-	-	-	-	2.384
8	1.040	3.209	5.649	7.120	12.851	21.671	23.272	29.452	10.036	156.396	270.696
9	0.515	2.036	7.144	6.623	8.059	4.655	-	-	3.630	-	32.662
10	-	-	-	-	-	2.978	-	-	-	-	2.978
11	0.024	-	-	-	-	-	-	-	-	-	0.024
12	0.261	0.262	1.087	1.257	0.674	11.522	8.703	8.056	18.291	21.474	71.587
13	0.032	0.120	1.337	3.036	4.186	3.063	-	-	-	-	11.774
14	1.634	2.927	1.882	1.192	-	-	-	-	-	-	7.634
15	0.222	0.327	0.420	-	-	-	-	-	-	-	0.969
17	0.086	0.462	1.333	2.021	1.612	5.918	2.882	2.288	2.436	14.161	33.199
18	-	0.154	-	-	-	-	-	-	-	-	0.154
21	0.186	1.404	1.628	1.868	-	-	-	-	-	-	5.086
22	-	0.260	1.990	2.005	2.558	0.902	2.132	1.600	-	-	11.447
23	-	0.957	2.770	1.791	2.811	3.474	1.226	3.180	1.840	11.862	29.891

SPECIES	D I A M E T E R C L A S S (in cms)										Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +	
24	0.410	1.545	6.965	9.063	8.754	9.458	10.589	6.351	2.243	-	55.378
26	-	0.038	0.430	-	1.937	-	-	-	-	-	2.405
27	0.055	0.528	0.725	3.074	2.329	0.897	4.297	-	-	4.246	16.151
28	-	0.043	-	0.371	1.760	-	-	-	-	-	2.174
29	0.427	0.482	0.667	0.636	-	-	-	-	-	-	2.212
30	0.055	0.586	2.314	3.572	1.842	2.851	-	1.537	-	36.569	49.126
31	0.162	0.477	1.476	3.179	2.324	0.751	1.135	-	-	-	9.504
34	0.199	0.272	1.399	6.343	4.420	9.428	14.490	14.991	17.079	110.131	178.452
35	0.196	0.728	2.195	4.348	5.885	8.467	4.531	-	5.144	-	31.294
36	-	-	-	-	-	-	-	-	-	3.750	3.750
38	-	0.097	-	-	-	-	-	-	-	-	0.097
39	24.859	24.140	3.267	0.312	-	-	-	-	-	-	52.578
40	-	-	-	-	-	-	-	-	-	9.013	9.013
43	18.215	12.612	7.850	4.546	8.797	7.453	0.007	3.540	2.634	11.160	76.814
TOTAL	49.074	54.094	60.679	81.077	85.024	107.680	91.578	75.228	65.709	378.762	1048.897

Table No.18.0

VOLUME TABLE SIKKIM

Diameter Class (in cm.)	Volume (in m ³)									
	Form Class I	Form Class II	Form Class III	Form Class IV	Abies densa	Anus nepalensis.	Michelia daltsoa	Symplocos thieifolia.	Tsugadu moso.	Others
10-19	0.0463	0.0857	0.0659	0.0896	0.1270	0.0463	0.1122	0.0858	0.0712	0.0837
20-29	0.5029	0.2845	0.2584	0.3166	0.3297	0.5029	0.3317	0.3148	0.2285	0.2047
30-39	1.2309	0.7412	0.6421	0.7803	0.6948	1.2309	0.7203	0.6611	0.6132	0.5735
40-49	2.2455	1.4559	1.2169	1.4809	1.2223	2.2465	1.3131	1.1248	1.3144	1.2021
50-59	3.5861	2.4285	1.9830	2.4183	1.9122	3.5861	2.1358	1.7059	2.3924	2.0785
60-69	5.2374	3.6591	2.9403	3.5924	2.7644	5.2374	3.2045	2.4045	3.8785	3.2067
70-79	7.2005	5.1476	4.0888	5.0034	3.7791	7.2005	4.5257	3.2204	5.7754	4.5867
80-89	9.4754	6.8940	5.4284	6.6511	4.9562	9.4754	6.0963	4.1537	8.0571	6.2185
90-99	12.0621	8.8984	6.9593	8.5357	6.2957	12.0621	7.9036	5.2045	10.6684	8.1021
100 +	14.9606	11.1608	8.6814	10.6571	7.7976	14.9606	9.9251	6.3726	13.5257	10.2375

Cull percentage.

Table No. 19

Dia. - Class (in cm.)	Cull % total (U.B.) Volume
10-19	0.05
20-29	0.10
30-39	0.20
40-49	0.45
50-59	1.25
60-69	2.40
70-79	3.70
80-89	5.00
90-99	6.20
100 +	7.50

BARK PERCENTAGE ACCORDING TO FORM CLASS AND SOME

INDIVIDUAL SPECIES

Table No. 20

Diameter Class	Abies densa	Alnus nepalensis	Michelia doltsopa	Symplocos theifolia	Tsuga Dumosa	Form Class II	Form Class III	Form Class IV	Others.
10-19	16.7	15.5	15.3	13.9	15.2	15.4	14.8	16.4	15.0
20-29	15.3	12.7	14.4	11.8	13.9	13.6	13.2	14.7	12.9
30-39	14.2	12.2	13.6	10.5	12.3	12.1	12.1	13.0	10.9
40-49	13.6	11.7	12.8	9.4	11.0	10.4	11.2	12.0	9.2
50-59	13.1	11.2	12.2	-	10.3	9.4	10.6	11.3	8.0
60-69	12.5	10.8	11.6	-	9.8	8.7	10.1	10.7	7.0
70-79	11.9	10.3	11.1	-	9.4	8.0	9.5	10.1	6.4
80-89	10.9	9.9	10.6	-	9.0	7.8	8.6	9.0	5.9
90-99	9.9	9.5	10.0	-	8.6	7.4	-	8.4	-
100 +	8.9	9.1	9.5	-	7.9	6.7	-	7.9	-