GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(DEPARTMENT OF AGRICULTURE)

PREINVESTMENT SURVEY OF FOREST RESOURCES

INTERIM INVENTORY RESULTS

CHENAB VALLEY
(JAMMU AND KASHMIR)

Contents

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FOREWORD

The Interim Inventory Results for the Chenab Valley of the State of Jammu and Kashmir as presented herein are designed to meet the immediate requirements of the users for guiding logging, transport, market and industrial feasibility studies. These will be replaced in due course by more detailed inventory results as in the case of Kashmir Valley.

Successful regeneration, practical silvicultural treatments and logging methods are the major factors affecting available annual cuts.

Although the data provided herein is not designed to arrive at any cutting models, it is expected to be sufficient for stimulating thinking on practical approaches on regeneration methods, silvicultural treatments and logging. Any additional data required in respect of possible approaches if conveyed to us could be planned and incorporated in the final results.

It is hoped that the present compilation will meet this limited objective and will help in formulating cutting principles which could be used for making realistic cutting calculation when the complete data is available.

NEW DELHI,
17th Nov. 1971.

S.H. MAHALAHA
CHIEF COORDINATOR.

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PREINVESTMENT SURVEY OF FOREST RESOURCES

JAMMU & KASHMIR

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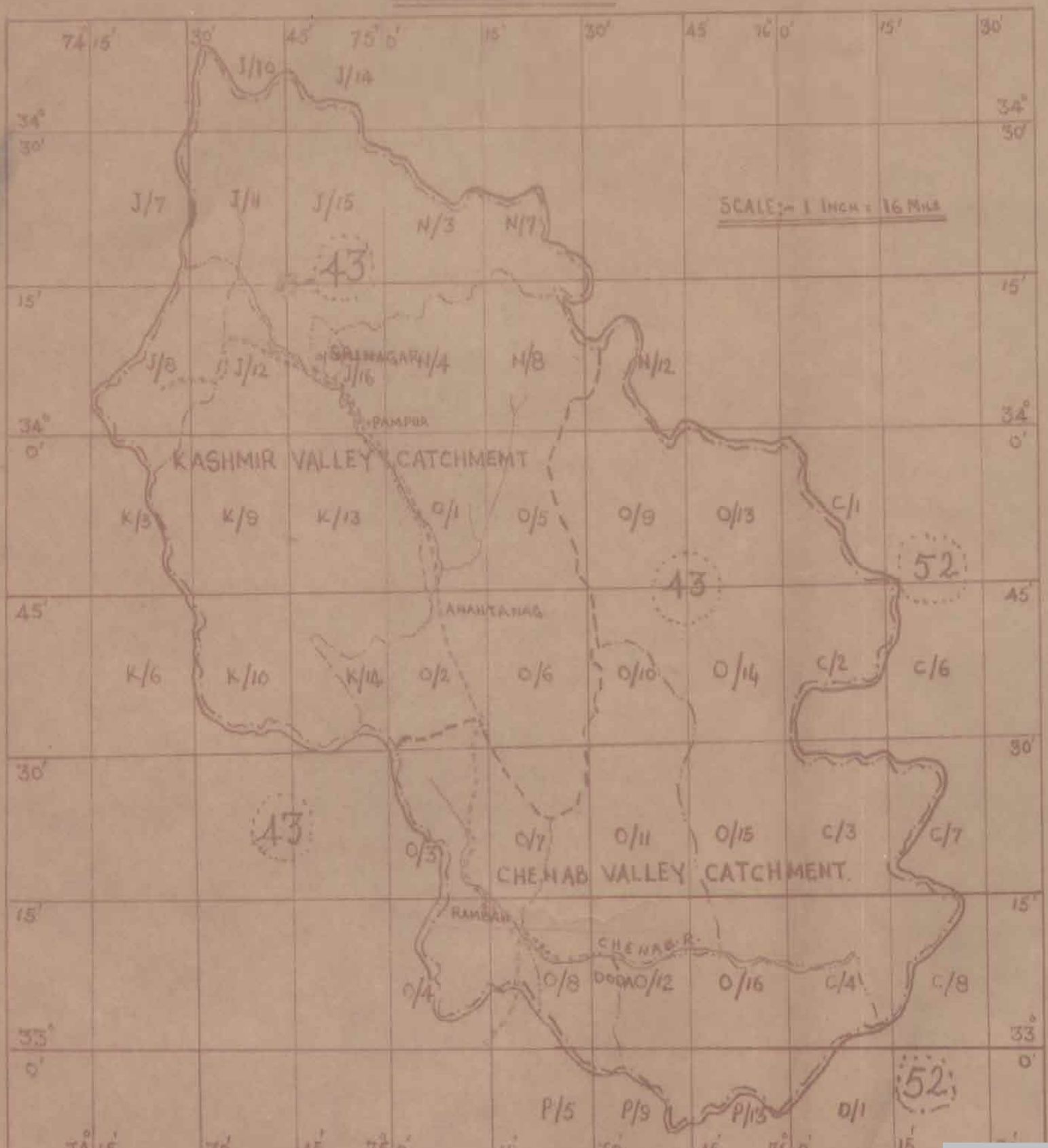

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PART - I
(Text)

1. INTRODUCTION

Object of Report

During the year 1970-71 the project "Preinvestment Survey of Forest Resources" carried out a comprehensive survey in Chenab valley of Jammu and Kashmir State, the purpose of which was to find out the economic availability of raw material for forest industries development in the region. The data collected during the survey is presently under processing and final report is expected to be published sometime in the year 1972. In the meantime urgent requests have been made to the organization for providing a preliminary assessment of inventory data for guiding subsequent logging, transport, market and industrial feasibility studies. The present report is mainly outcome of these demands and intends to present basic inventory results like area, volume, growth and decay within reasonable confidence limits to help planning the above studies better. These inventory results may be looked upon merely as tentative figures to be replaced by more efficient estimates.

Survey Area:

Location map of the project is given on the front page of the report. It covers a total geographical area of 9,85,600 ha. spread over Bhadarwah, Doda, Kishtwar and Ramban forest divisions of Jammu & Kashmir State. Survey was started in the year 1970 and completed in the year 1971.

Contents

Data Collection:

All area related informations were obtained from maps prepared from complete aerial photointerpretation and informations on number of stems, volume, growth and decay with help of a systematic ground sampling spread over the entire project area with an intensity of about 0.01%.

Data Processing:

Pending compilation of general volume tables for Chenab Valley, equation from coniferous forests of U.P. and Himachal were accepted as starting point. From these equations local volume tables were derived using sample tree data of Chenab valley which formed the basis for calculation of individual tree volume.

Precision of Estimates:

No precision limits have been calculated for various estimates on account of two main reasons: Firstly office and computer checking of basic input is not yet over and secondly the bias and sampling error associated with use of present volume equation for Chenab valley cannot yet be accurately assessed. However, in light of past experience with similar data, it can be said with high degree of certainty that sampling errors (including volume table error) will not exceed ± 10% limit at 95% probability for total volume and ± 15% for Fir volume.

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2. FINDINGS

Main findings of study are:

Land use:

Area under various classes are:-

Land use	Area in ha.	Area as %.
Forest	375,000	38
Scrub	85,000	9
Others	526,000	53
	986,000	100

Forest Land:

Forest in the survey area occur in a variety of altitudinal zones ranging from 500 to 3500 metres. As per Champion and Seth, forests of this region can be broadly classified as Montane subtropical and temperate forests consisting mainly of conifers with some admixture of broadleaved species. Coniferous forests comprise of only a few tree species which show a marked tendency for gregariousness and strong affinity to various altitudinal zones.

Five strata have been identified in the survey area representing four dominant coniferous species viz. Fir, Bluepine, Deodar and Chir and the fifth one representing the broadleaved forests which occurs on almost all altitudinal zones.

Contents

Distribution of area and volume in various strata and also in total forest area is given below:

Stratum	Fir/Spruce	Bluepine	Deodar	Chirpine	Broad-Leaved	Total
Total area (in ha.)	175,700	8,100	44,500	13,600	52,800	374,700
% composition by area.	47%	23%	12%	4%	14%	100%
Volume in 1000 cu.m.	52,172	16,166	14,195	1,502	5,843	89,878
% composition by volume	58%	18%	16%	2%	6%	100%
Volume/ha. in cu.m.	297	184	319	110	110	240

Above table shows that Fir forest predominates both in terms of area as well as volume. It is followed by bluepine. Both together constitute about 70% of forest area and 76% of the growing stock.

A detailed break up of forest area by forest division is given in tables 3-4 (see enclosure).

FIR STRATUM:

Fir forests cover an area of 175,700 ha. (47% of total forest area) and contribute 52,172,000 cubic metre of volume (58% of total volume).

Average volume per ha. is about 297 cubic metres. Other species occurring in the Fir type are Spruce, Bluepine, Deodar and Oaks. Their relative abundance is as follows:-

Contents

Species	Fir	Spruce	Kail	Deodar	Broad-leaved	Total
No. of stems per ha.	160	38	19	4	49	270
Volume/ha. in cubic metre	200	44	15	12	26	297

This shows that Fir/Spruce alone constitute about 82% of total growing stock in the Fir stratum.

The distribution of number of stems in this stratum as a whole appears to be more satisfactory specially in lower diameter classes than in the fir forests of Kashmir valley as shown in Fig.1 and also in the following table.

Distribution of No. of trees per ha. by diameter classes (for Fir stratum)

Valley	Diameter class in cm.								
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90+
Chenab	97	34	19	12	9	7	6	5	6
Kashmir	28	27	22	20	14	11	10	6	4

The situation however may look somewhat different if stem distribution is studied for each age classes separately (which is a correct approach). This study will be carried out subsequently.

A sample study of felled tree data indicates that incidence of cull is likely to be smaller compared to that in Kashmir valley forest as shown in following table.

Diameter class (in cm.)	Cull percentage	
	Chenab valley	Kashmir valley
30 - 40	11	5
40 - 50	8	13
50 - 60	10	21
60 - 70	11	24

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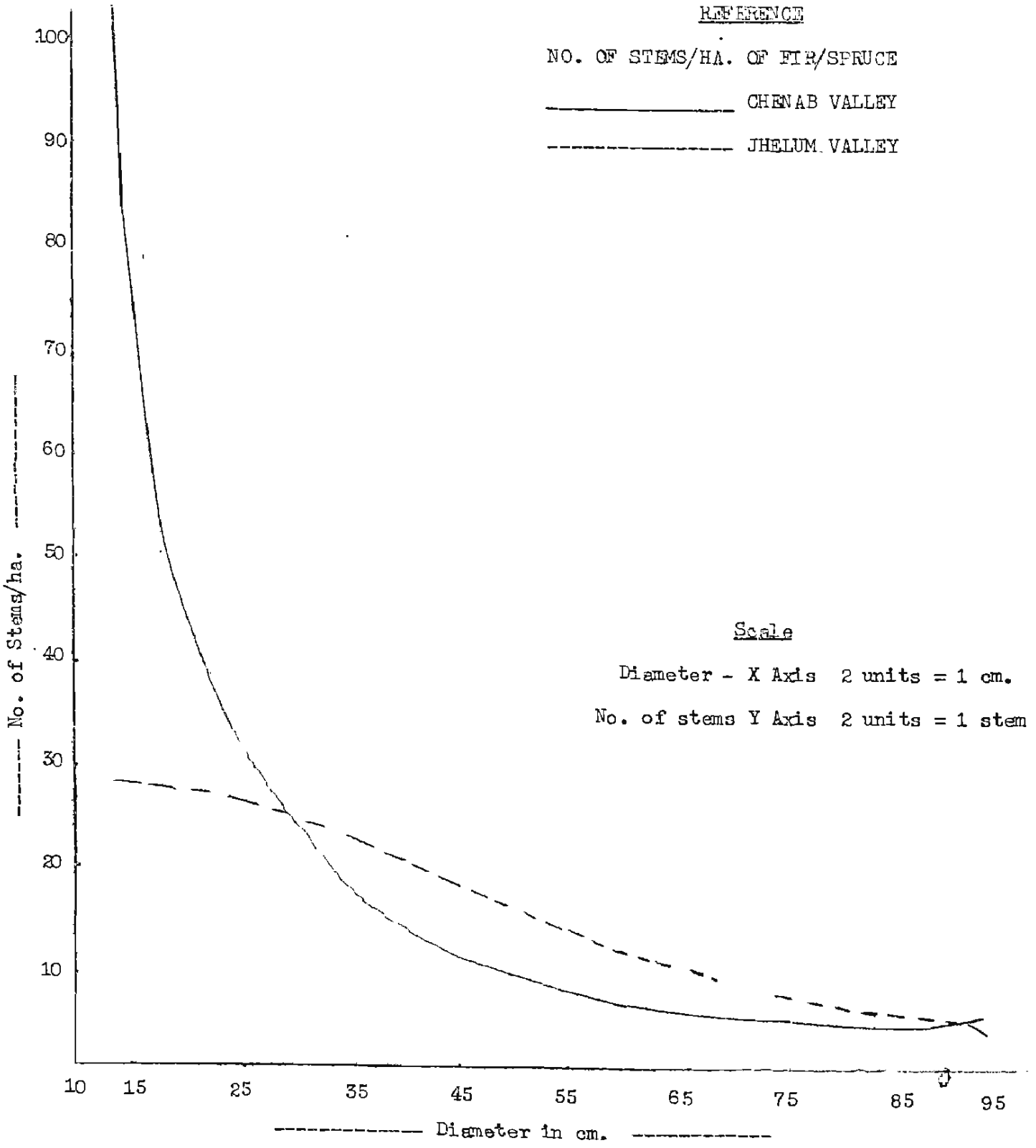
CHENAB AND JHELUM VALLEY

STRATUM - FIR

FIG. 1



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Growth data (stump and stem analysis) show that trees above 50 cm. diameter have followed a growth pattern similar to that of natural forests of Kashmir or Kulu valley where a tree takes about 200 years to reach a diameter of 60 cm. under natural condition on an average. However it is rather disquieting to observe a much slower growth rate between 20 to 50 cm. diameter class as is clear from following statement.

Diameter class (in cm.)	No. of rings at breat height (1.37 m)
20 - 30	65
30 - 40	110
40 - 50	170

There [illegible]ars a likelihood that lower diameter group is growing under a completely different environment as compared to their elders resulting in a different course of growth curve.

BLUE PINE STRATUM:

These forests occupy an area of 83,10[illegible] [illegible]. (23% of total forest area) and contribute 16,166,000 cubic metre of volume (18% of the total growing stock). Average volume is 184 cubic metre per ha.

In this stratum blue pine is the most important species. Next in order are deodar, fir, spruce and oaks as shown below:

Species	Blue pine	Deodar	Fir/Spruce	Broadleaved	Total
No. of stems per ha.	130	22	9	15	176
Volume/ha. in cubic metre.	151	17	9	7	184

Distribution of stems/ha. is much below optimum level in various diameter classes as following table shows. (See Fig.2).

Distribution of No. of stems/ha. by diameter classes for Kail and Deodar.

Valley	Diameter classes in cm.								
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90+
Chenab	34	40	22	21	15	5	3	1	1

DEODAR STRATUM:

Deodar forests cover an area of 44,500 ha. (12% of the total forest area) and contribute 14,195,000 cubic metres of volume (16% of the total growing stock). Concentration of volume is quite high as evident from highest stocking of 319 cubic metres per ha. compared to other strata.

The relative species composition in this stratum is as follows:

Species	Deodar	Bluepine	Spruce	Fir	Broad-leaved	Total
No. of stems/ha.	381	29	8	5	25	448
Volume/ha. in cubic metre.	264	30	11	6	9	319

The distribution of number of stems/ha. appears rather satisfactory as is evident from the following table.

Species	Diameter class in cm.							
	10-20	20-30	30-40	40-50	50-60	60-70	70+	Total
Deodar	211.40	68.33	38.50	27.69	16.26	9.11	9.73	381.02

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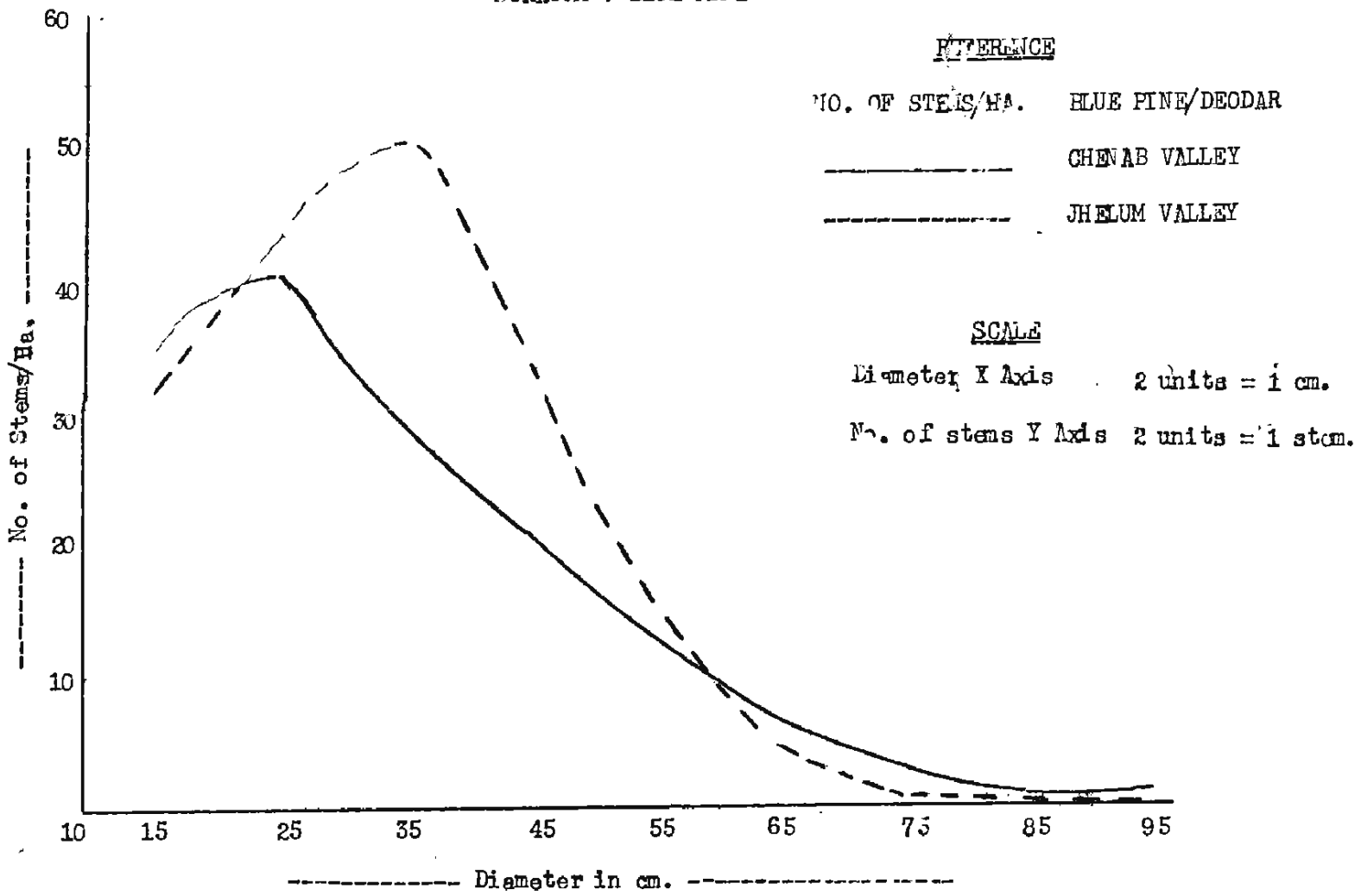
CHENAB AND JHELUM VALLEY

STRATUM : BLUE PINE



CHIR PINE STRATUM:

This stratum occupies rather a small area of 13,600 ha. (4% of total forest area). The total growing stock is 1,502,000 cubic metres (2% of total growing stock). Main constituent species in this stratum are oaks and other broad leaved species.

The relative species composition is as follows:

Species	Chirpine	Broadleaved sp.	Total
No. of stems/ha.	115	16	131
Volume/ha. in cubic metre.	108	2	110

BROADLEAVED FORESTS:

This stratum includes all forest types where broadleaved species predominate irrespective of their location starting from Chir pine forests at lower elevation to high level zone of Fir.

The total area covered by this stratum is 52,800 ha. (18% of total forest area) with a growing stock of 5,843,000 cubic metre (8% of total growing stock). Per hectare stocking in these forests is 110 cubic metre.

On account of wide range of variation almost all coniferous and broadleaved species of the temperate and subtropical region occur e.g. Chir, deodar, blue pine, fir, all oaks and other broad-leaved species. The relative species composition in this stratum is as follows:

Species	Bluepine	Fir	Deodar	Spruce	Chirpine	Broad-leaved	Total
No. of stems per ha.	15	12	2	1	(0.2)	336	366
Volume/ha. in cubic metre.	14	7	2	2	(0.2)	85	110

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3. SUMMARY

1. Total area surveyed by the project including all land use classes is 985,600 ha.

2. Total forest area is 374,700 ha. (which is 38% of total land area) with total volume of 89,878,000 cubic metre and average stocking of 240 cu.m./ha.

3. Fir forests cover 175,700 ha. (47% of the total ~~survey~~ forest area) and contribute 52 million cubic metre of volume (58% of the total growing stock). Average stocking is 297 cubic metres per hectare.

Distribution of number of stems/ha. in the fir forest as a whole is fair. This does not preclude abnormal variations in individual localities.

Tentative indications are that:

(a) Incidence of cull is likely to be less in Chenab Valley (about 10%) as compared to that in Kashmir Valley (about 20%). Decay, however, appears to be more uniformly spread over all diameter classes.

(b) Growth behaviour of trees over 50 cm. diameter is similar to that of Fir in Kashmir or Kulu valley, viz. it takes on an average about 200 years to reach a diameter of 60 cm. It is, however, disquieting to find a comparatively very slow growth of trees between diameter classes 20 to 50 cm.

4. Blue pine forests contribute 88,100 ha. (23%) by area and 16 million cubic metre (18%) by volume. Average stocking is 184 cubic metre per hectare.

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Stem distribution on per hectare basis does not appear to be very satisfactory.

Tentative indications are that like Kashmir valley incidence of cull is likely to be low (less than 10%).

Diameter growth appears to be slightly slower than forests of Kashmir valley.

5. Deodar forests cover 44,500 ha. of area (12%) and contribute 14 million cubic metre of volume (16%). Average stocking is 319 cubic metres per hectare.

Distribution of number of stems per hectare appears rather satisfactory.

6. Chirpine and broadleaved forests cover an area of 66,400 ha. (18%) and contribute 7 million cubic metres (8%) of volume. They have an average stocking of 110 cubic metre/ha.

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P A R T - II
(ENCLOSURES)

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P A R T - II

1. SURVEY DESIGN AND ANALYSIS

Area:

All area related informations have been obtained with the help of complete aerial photointerpretation. For this purpose eight main forest types viz. Fir, Fir-Bluepine, Bluepine-Fir, Bluepine, Deodar, Chir, Broadleaved forests and Scrub and five stocking classes 5-19%, 20-39%, 40-59%, 60-79% and 80% + were delineated on photos of scale 1:40,000 and 1:60,000 taken in the year 1965 and 1961 respectively. The forestry information was then transferred to topographical maps prepared by Survey of India on scale 1:50,000. Area summaries by one inch sheet, forest type and crown density have been obtained from this map by dot counting. It is hoped that these stock maps will be of great value for planning forest management and subsequent logging studies.

Volume, Growth and Decay:

Volume, Growth and Decay informations are derived with the help of ground survey. Sampling units consist of a cluster of 8 plots distributed systematically at intervals of 8 km x 8 km. (Fig.3). On each of the plots following 3 types of field forms are filled in (forms 1-3).

(i) Plot description form: It contains all important descriptive information about the plot.

(ii) Plot Enumeration: On a square plot of 0.1 ha. area all trees more than 5 cm. diameter are measured by species and diameter.

(iii) Tally Sheet: With help of a relaskop of BAF 2 Sq.m/ha. a sweep is taken from plot centre and all in trees are recorded by species and diameter.

On alternate plots of the cluster detailed observations are made on all in trees about height, clear bole, dominance, external defect and growth (measurements for two successive decades are recorded) (form 4.).

Contents

A small sample of measured clusters is then selected and all tallied trees are felled and measured section-wise for assessment of volume and decay (forms 5-6). On a sub-sample of felled trees detailed growth studies (Stem analysis - see form 7-8) are made for providing long term growth prediction.

Data Processing:

General volume equations developed during F.A.O./G.O.I. Project were accepted as starting point to save time. With their help and sample tree data collected for Chenab valley (form No.4) local volume equations were calculated (see Enclosure 3 for coefficients of general and local volume equation).

From felled tree data of Chenab valley 20 trees of Fir and 10 trees of Blue pine were selected with help of random numbers to provide a check on above equations and to obtain eventual correction factor. A comparison showed that present equation tend to under estimate volume of fir trees in higher diameter class but over estimate the same in lower diameter classes. Blue pine equations appear satisfactory.

From these data following graphs were prepared for Fir and Blue pine. Results are summarised in Table-10.

(1) Diameter breast height - Gross volume to 20 cm. top.

(2) No. of rings at breast height - Diameter.

(3) Percentage relationship between volume 20 cm. top and volume 5 cm. top.

For reference diameter-age and diameter-net volume graphs from Jhelum are attached in Enclosure 3.

Contents

From local volume equations referred to earlier volume of tallied trees was calculated which is subsequently multiplied with appropriate weight factor to get per ha. volume contribution by each tree. The final data file contains one record of information for each tree consisting of its species, diameter, volume, stratum and location. From this file all tables given in part II of the report are compiled.

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SAMRLING DESIGN

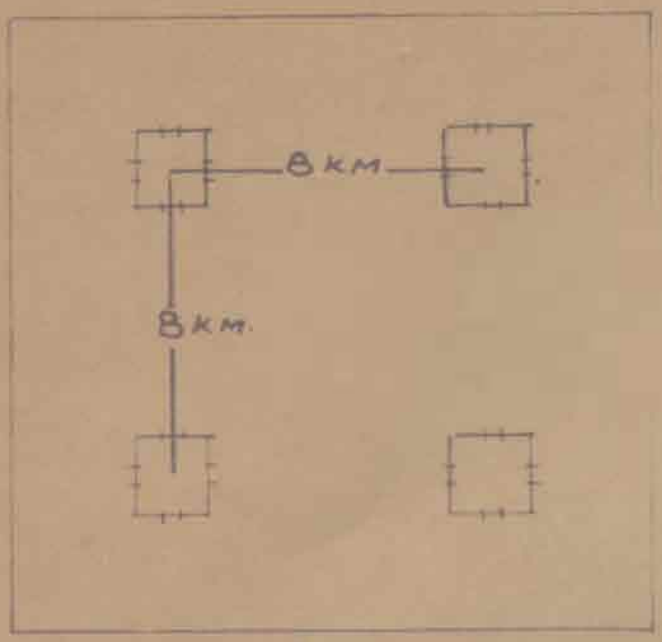

FIG I
DISTRIBUTION OF 8 KM × 8 KM GRIDS

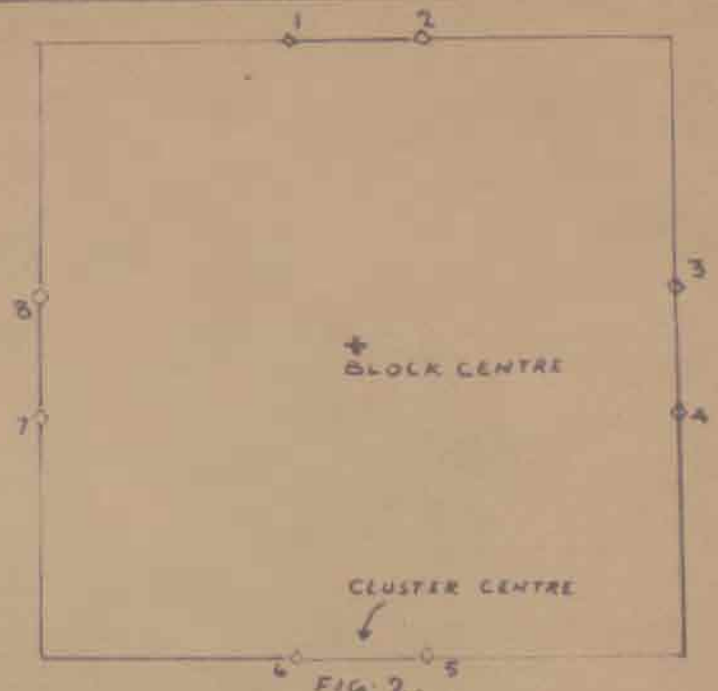

FIG. 2.
ENLARGED SKETCH OF A BLOCK WITH 4 CLUSTERS OF 2 PLOTS EACH

SKETCH OF A SAMPLE PLOT
0·1 ha IN AREA

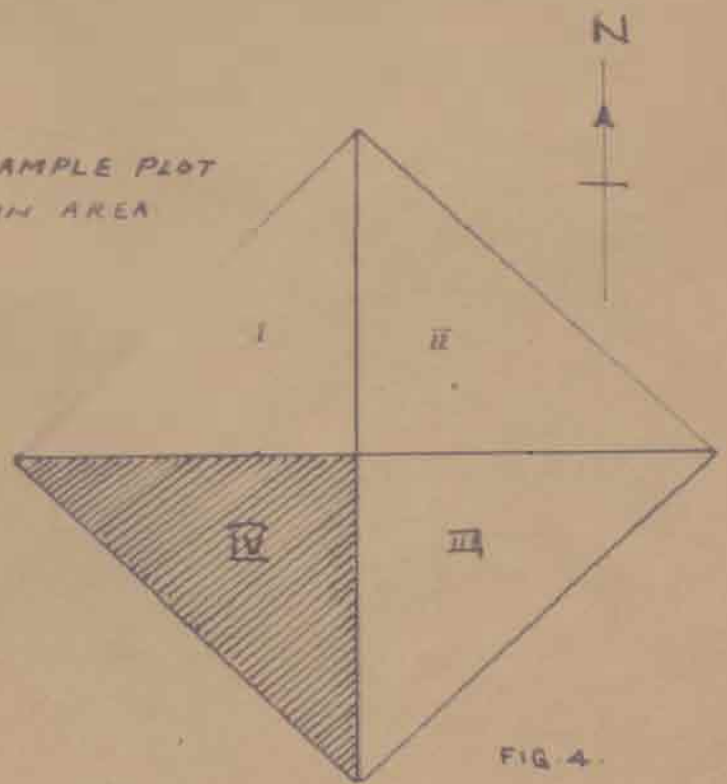

FIG 4.

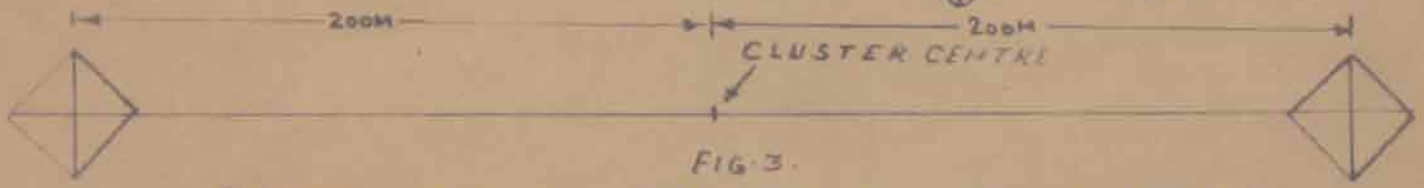

FIG 3.
SKETCH OF A CLUSTER WITH 2 PLOTS 400 METRES APART

FIG 3. LAY OUT OF SAMPLING UNIT.

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PLOT DESCRIPTION FORM

Job	Card Design	Report Number	Sub R. Number	Crew Leader
1-3	4-5	6-7	8	9-10

Date:

PREINVESTMENT SURVEY OF FOREST RESOURCES

NORTHERN ZONE

Grid zone	Block centre Grid reference	Inventory Design
70	71-78	79-80

Name of C.L.

State	Revenue District	Forest Division	Land Class	Legal Status	TERRAIN Altitude	Topo	Slope	P.O.H.	Aspect	SOIL Stoniness	Humus	Consiste	Textr.	Depth	Vegetation	Forest & open For. Origin	Forest Type	Storeys	Top height	Size/Age	Stocking	Regn.	COST	Plot classification	Species stocking in Forest Spp.	%	Spp.	%	Spp.	%		F. Plot	Plot No.
11-12	13-14	15-16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	33-34	35	36-37	38	39	40		54	55-57	58	59-61	62	63-65	66	67	68	69

17. LAND CLASS - Forest Land (1) Farm Wood Land (2) Non Forestry Plantation (3) Agricultural Crop Land (4) Pasture Land (5) Urban, Village & Industrial Lands (6) Barren Land (7) Others (8).

18. LEGAL STATUS - Reserved(1) Protected (2) National Park & Wood Preserves (3) Govt. Bauni (4) Community Forests(5) Private (6) Undetermined(7).

21. TOPOGRAPHY - Precipitous (1) Very Hilly (2) Hilly (3) Gently Rolling (4) Flat (5)

22. SLOPE - ≥70°(1) 60° to <70°(2) 45° to <60°(3) 20° to <45°(4) 0 to <20°(5).

23. P.O.H. - Ridge Top (1) Upper 1/3(2) Middle 1/3 (3) Lower 1/3 (4) Valley (5).

24. ASPECT - N (1) NE(2) E(3) SE(4) S(5) SW(6) W(7) NW(8) None (9)

STONINESS - ≥60%(1) 30 to 60% (2) <30%(3) Stones Absent(4)

HUMUS - 5 cm or more (1) 2 cm. to <5cm(2) <2 cm(3) Humus Absent (4).

SOIL CONSISTANCE - Friable(1) Slightly compact(2) Compact(3) No soil (4).

29. TEXTURE - Clayey (1) Clayey Loam (2) <Sandy Loam (4) Sandy (5) Pebbles (6) No soil (7). <Loam (3)

30. SOIL DEPTH - 30 cm(1) 20 to 30 cm (2) 10 to 20 cm(3) 5 to 10 cm(4) 5 cm(5) No soil (6).

31. VEGETATION - Forest (1) Open Forest (2) Tree in line (3) Scrub(4) Open scrub (5) Grasses(6) Others (7).

33-34 FOREST TYPE - Chir(01) Blue Pine (02) Deodar (03) Spruce (04) Fir (05) Spruce-Fir(06) Spruce-Fir-Blue pine (07) Deodar-Blue pine (08) Chir-Ban Oak (09) Blue pine-Moru Oak (10) Blue pine-Kharsu Oak (11) Deodar-Moru Oak (12) Deodar Ban Oak (13) Fir-Spruce-Kharsu Oak (14) Fir-Spruce-Moru Oak (15) Other Hard Woods (16) Willows (17) Poplars (18) Walnut (19) Oaks (20) Deodar-Fir-Spruce (21).

38. SIZE/AGE - Regeneration (1) Young(2) Middle Aged (3) Mature(4) Over Mature (5).

39. STOCKING - <1.5M(1) 1.5 to <3M(2) 3 to <4.5M(3) 4.5 to <6M(4) 6 to <7.5(5) 7.5 to <9M(6) 9 to <10.5M(7) 10.5 to <12M(8) ≥12M(9).

40. REGENERATION - Profuse ≥60(1) Adequate 30 - <60(2) Scanty 10 - <30(3) Nil <10(4) Damaged(5) Not reqd.(6).

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PLOT ENUMERATION FORM/TALLY SHEET (BAF-2)

Job	Card Design	Report Number	Sub R Number
1-3	4-5	6-7	8

PREINVESTMENT SURVEY OF FOREST RESOURCES

NORTHERN ZONE

Total No. of trees	Plot No.	Grid Zone	Block centre Grid reference	Inventory Design
66-68	69	70	71-78	79-80

Date:

Name of C.L.

Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam	Species Code	Species Diam
9-11	12-14	15-17	18-20	21-23	24-26	27-29	30-32	33-35	36-38	39-41	42-44	45-47	48-50	51-53	54-56	57-59	60-62		

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PREINVESTMENT SURVEY OF FOREST RESOURCES
NORTHERN ZONE

SAMPLE TREE FORM

Job	Card Design	Report Number	Sub R. Number
1-3	4-5	6-7	8

Total No. of trees	Plot No.	Grid Zone	Block centre Grid ref:	Inventory Design
67-68	69	70	71-78	79-80

Date:

Name of C.L.

Species Local name or Botanical name.	S.No.	Species Code	Dominance	C D.B.H. O.B.t	MTotal Height	MClear Bole	Defect Natural	Defect others	Last 10 years height growth	Towards P.C. At B.H. Bark Thickness	Towards P.C. At B.H. Last 10 Years Radial Incre.	Towards P.C. At B.H. Last 20 Yrs. Radial Incre.	Opp. to P.C. At B.H. Bark Thickness	Opp. to P.C. At B.H. Last 10 Yrs. Radial Incre.	Opp. to P.C. At B.H. Last 20 Yrs. Radial Incre.
				CM	M	M			DM	DM	MM	MM	MM	MM	MM
	9-10	11-13	14	15-17	18-19	20-21	22	23	24-25	26-27	28-29	30-31	32-33	34-35	36-3
	38-39	40-42	43	44-46	47-48	49-50	51	52	53-54	55-56	57-58	59-60	61-62	63-64	65-6

PREINVESTMENT SURVEY OF FOREST RESOURCES
NORTHERN ZONE

TREE VOLUME STUDY FORM (For all tallied trees 5 Cms. and over in d.b.h.)

JOB NO.	CARD DESIGN	CREW LEADER
1-3	4-5	6-7

DATE:-

TOTAL NO. OF TREES	STATE	FOREST DIVISION	ALTITUDE	SLOPE	ASPECT	ORIGIN	FOREST TYPE	NO. OF STOREYS.	TOP HEIGHT	SIZE/AGE	STOCKING	PLOT NO.	GRID ZONE	BLOCK CENTRE GRID REFERENCE	INVENTORY DESIGN
51-52	53-54	55-56	57-58	59	60	61	62-63	64	65-66	67	68	69	70	71-78	79-80

TREE NO.	SPECIES	DOMINANCE	D.B.H. TOWARDS P.C. mm.	O.B. in DIRECTION mm.	TOTAL HT. M.	CLEAR BOLE M.	DEFECT AT	DEFECT OTHER	TREE F/N	STEM LENGTH Cm.	NO. OF PARTS	
8-9	10-12	13	14-17	18-21	22-23	24-25	26	27	28	29-32	33-34	

PREINVESTMENT SURVEY OF FOREST RESOURCES
NORTHERN ZONE

SEEDLING HEIGHT FORM

Job No.	Card Design	Crew Leader
1-3	4-5	6-7

DATE

Plot No.	Grid Zone	BLOCK CENTRE Grid Reference	Inv. Design
69	70	71-78	79-80

Seedling No.	Species	Diameter at Collar mm	Diameter at B.H. mm	Height in cm.	No. of Rings at Collar	No. of Rings at B.H.
8-9	10-12	13-16	17-20	21-23	24-26	27-29

GROWTH STUDY FORM

Job No.	Card Design	Crew Leader	Tree No.	Species.
1-3	4-5	6-7	8-9	10-12

PREINVESTMENT SURVEY OF
FOREST RESOURCES

NORTHERN ZONE

DATE:

Total No. of Sections	Plot No.	Grid Zone	Block Centre Grid Ref.	Inv. Design.
67-68	69-70	71-78		79-80

Section	Height above the base	No. of Rings on the Section.	D.O.B. MM	D.U.B. MM	Radius No.	Century Code	GROWTH OF DECADES (10 YEARS)										Width of incomplete Decade
							1	2	3	4	5	6	7	8	9	10	
13-14	15-18	19-21	22-25	26-29	30	31	32-34	35-37	38-40	41-43	44-46	47-49	50-52	53-55	56-58	59-61	62-64

TREE VOLUME STUDY FORM (FELLED TREES)

JOB NO.	Card Design	No. of the tree	Species Code
1-3	4-5	6-7	8-10

PREINVESTMENT SURVEY OF FOREST RESOURCES
NORTHERN ZONE

DATE:-

PLOT NO.	GRID ZONE	BLOCK CENTRE GRID REFERENCE	INVENTORY DESIGN
69	70	71-78	79-80

TREE PORTION	SL. NO. OF SECTION	HEIGHT ABOVE THE BASE/BRANCH SECTION (cm.)	D. O. B. TOWARD P.C.	D. O. B. IR. TO P.C.	D. U. B. TOWARD P.C.	D. U. B. IR. P.C.	NO. OF RINGS AT THE STATION	CULL PRESENTED	MEASUREMENT OF DEFECT: TYPE OF DEFECT	SIZE OF RECTANGLE L MM.	SIZE OF RECTANGLE B MM.	TYPE OF DEFECT	SIZE OF RECTANGLE L MM.	SIZE OF RECTANGLE B MM.	TYPE OF DEFECT	SIZE OF RECTANGLE L MM.	SIZE OF RECTANGLE B MM.	STRAIGHTNESS	SHAPE OF SE.	A. OUT TURN		TOTAL NO. OF SECTIONS
1-2	13-14	15-16	19-22	23-26	27-30	31-34	35-37	38	39-40	41-43	44-46	47-48	49-51	52-54	55-56	57-59	60-62	63	64	65	66	67-68

2. MAIN TABLES

In the following tables 8 forest types recognised in photointerpretation have been grouped into 5 stratum as given below :

Stratum	Forest types in stratum
Fir	Fir, Fir-Bluepine
Bluepine	Bluepine, Bluepine-Fir
Deodar	Deodar
Chirpine	Chirpine
Broadleaved	Broadleaved

All area related informations have been obtained from maps prepared from aerial photo-interpretation.

In stand and stock tables information has been provided by 10 cm. diameter classes. All conifers have been listed by species but broadleaved species by groups only e.g. oaks and other broadleaved with exception of *Juglans regia* (walnut) which is presented separately keeping in view its importance.

Stand tables start from 10 cm. onwards but stock tables from 20 cm. This was done because volume has been calculated upto 20 cm. top diameter only. Here volume is defined as gross content of a tree underbark upto 20 cm. overbark top diameter.

All tables have been compiled using metric system of measurement.

Contents

Table 1: Broad Land Use

(Source: Photointerpretation)

Land Use	Area in ha.	Percentage of total land area
Forest	374674	38
Scrub	85011	9
Others	525869	53
Total	985554	100

Contents

Table 2: Area, Volume/ha. and total volume by stratum in Forest Land.

Stratum	Area in ha.	Vol./ha. in cu.m.	Total vol. in 1000 cu.m.	% age area distri-bution	% age volume distri-bution
Fir	175581	297	52172	47	58
Blue pine	88059	184	16166	23	18
Deodar	44473	319	14195	12	16
Chir pine	13618	110	1502	4	2
Broadleaved species	52843	110	5843	14	6
Total	374674	240	89878	100	100

Contents

Table 3: Stratum area by Forest Division

(Source: Photointerpretation)

Forest Division	Stratum area in ha.					
	Fir	Bluepine	Deodar	Chir	Broad leaved	Total
Bhaderwah	38868	12923	19922	2018	5077	78808
Doda	48842	28295	11619	1241	9813	99810
Kishtwar	75018	23882	10581	28	35572	145081
Ramban	12953	22959	2351	10331	2381	50975
Total	175681	88059	44473	13618	52843	374674

Contents

Table 4: **Area by Forest Type and Crown Density Classes Division-wise**

(Source: Photointerpretation)

Forest Type/ Land Use Class	Forest Division	Area in hectares by Crown Density Class					Total Area in hectares
		5-19%	20-39%	40-59%	60-79%	80% +	
1	2	3	4	5	6	7	8
Fir	Bhadarwah	4033	4879	13807	14487	241	37447
	Doda	8775	9665	9017	8504	5032	40993
	Kishtwar	16111	14283	18607	10245	3872	61118
	Ramban	2818	2743	3545	1122	108	10336
	Total	31737	31570	42976	34358	9253	149894
Fir-Bluepine	Bhadarwah	612	96	149	564	-	1421
	Doda	273	2243	3811	950	572	7849
	Kishtwar	1436	3579	4253	3228	1404	13900
	Ramban	122	1454	990	51	-	2617
	Total	2443	7372	9203	4793	1976	25787
Blue-Pine	Bhadarwah	830	1206	2360	2996	2061	9453
	Doda	3427	5315	5448	5185	1445	20820
	Kishtwar	5192	2969	2623	3559	866	15209
	Ramban	2253	6463	7006	3453	56	19231
	Total	11702	15953	16037	15193	4428	65313
Bluepine-Fir	Bhadarwah	108	323	1208	1710	121	3470
	Doda	299	2185	2559	1687	745	7475
	Kishtwar	1646	1298	2399	2190	840	8673
	Ramban	105	1372	817	834	-	3128
	Total	2158	5178	7383	6321	1706	22746
Deodar	Bhadarwah	1093	1691	7196	7629	2313	19922
	Doda	1205	2239	3536	3363	1274	11619
	Kishtwar	1947	2271	2904	1967	492	10581
	Ramban	338	980	726	196	112	2351
	Total	5583	7190	14364	13145	4191	44473

Contd.....

Contents

Table 4 - Contd...

1	2	3	4	5	6	7	8
Chirpine	Bhadarwah	541	939	538	-	-	2018
	Doda	588	554	99	-	-	1241
	Kishtwar	28	-	-	-	-	28
	Ramban	3137	5872	1322	-	-	10331
	Total	4294	7365	1959	-	-	13618
Broad leaved species (Hardwood)	Bhadarwah	2015	1453	1317	250	42	5077
	Doda	5377	2563	1257	616	-	9813
	Kishtwar	27036	6676	1205	469	186	35572
	Ramban	1055	404	922	-	-	2381
	Total	35483	11096	4701	1335	228	52843
Scrub	Bhadarwah	-	-	-	-	-	2084
	Doda	-	-	-	-	-	14342
	Kishtwar	-	-	-	-	-	52285
	Ramban	-	-	-	-	-	16200
	Total	-	-	-	-	-	85011
Other non-forested land	Bhadarwah	-	-	-	-	-	64301
	Doda	-	-	-	-	-	70955
	Kishtwar	-	-	-	-	-	345571
	Ramban	-	-	-	-	-	46942
	Total	-	-	-	-	-	525869
	GRAND TOTAL	93400	85724	98623	75145	21782	985554

NOTE:- Area under 'Scrub' and 'Other non-forested lands' not classified by crown density classes.

Table 5.1. Distribution of total No. of stems/ha.

Stratum : Fir (Area 175681 ha.)

Species	Diameter class in centimetre. 10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Abies pindrow	76.59	27.94	16.38	10.19	7.50	5.50	5.53	4.16	5.80	159.59
Picea morinda	20.25	5.77	3.32	1.92	2.10	1.56	1.32	1.12	0.86	38.22
Pinus excelsa	10.74	4.29	0.88	1.24	0.49	0.85	0.32	0.30	0.19	19.30
Cedrus deodara	1.28	1.21	0.00	0.19	0.40	0.30	0.26	0.13	0.46	4.23
Juglans regia	2.73	0.48	0.26	0.27	0.21	0.08	0.02	0.02	0.03	4.10
Quercus species	10.37	2.15	0.78	0.46	0.11	0.28	0.32	0.04	0.00	14.51
Other broadleaved	13.10	4.02	6.96	3.29	1.43	0.68	0.55	0.27	0.34	30.64
Total	135.06	45.86	28.58	17.56	12.24	9.25	8.32	6.04	7.68	270.59

Table 5.2. Distribution of total No. of stems/ha.

Stratum : Blue pine (Area 88059 ha.)

Species	Diameter class in centimetre.									
	10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Pinus excelsa	24.49	35.03	25.70	20.49	14.52	5.27	2.61	1.15	1.12	130.38
Cedrus deodara	10.12	4.57	3.54	1.11	0.96	0.45	0.37	0.21	0.19	21.52
Abies pindrow	0.00	1.39	2.42	0.36	0.08	0.07	0.17	0.21	0.01	4.71
Picea morinda	2.33	0.64	0.87	0.27	0.11	0.07	0.00	0.03	0.00	4.32
Juglans regia	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.11
Quercus species	4.15	1.04	0.21	0.14	0.10	0.07	0.10	0.08	0.02	5.91
Other broadleaved	3.99	1.50	1.94	0.43	0.20	0.06	0.33	0.00	0.09	8.54
Total	45.08	44.17	34.68	22.80	16.08	5.99	3.58	1.68	1.43	175.49

Table 5.3. Distribution of total No. of stems per ha.

Stratum : Deodar (Area 44473 ha.)

Species	Diameter class in centimetre. 10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Cedrus deodara	211.40	68.33	38.50	27.69	16.26	9.11	4.60	2.56	2.57	381.02
Pinus excelsa	10.88	4.74	5.20	3.07	2.19	1.43	0.77	0.05	0.32	28.65
Picea morinda	2.22	2.81	1.01	0.81	0.66	0.52	0.11	0.05	0.25	8.44
Abies pindrow	1.50	2.03	0.35	0.48	0.21	0.29	0.06	0.04	0.12	5.08
Juglans regia	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.18
Quercus species	7.32	3.70	0.82	0.32	0.12	0.14	0.06	0.00	0.03	12.51
Other broadleaved	6.99	1.72	1.57	0.68	0.45	0.39	0.19	0.04	0.06	12.09
Total	240.31	83.33	47.45	33.23	19.89	11.88	5.79	2.74	3.35	447.97

Table 5.4. Distribution of total No. of stems/ha.

Stratum : Chir pine (Area 13618 ha.)

Species	Diameter class in centimetre.									
	10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Pinus roxburghii	25.32	28.32	26.71	13.06	14.06	4.11	2.47	0.54	0.58	115.17
Quercus species	3.71	0.00	0.00	0.75	0.47	0.00	0.00	0.00	0.00	4.93
Other broadleaved	11.19	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	11.41
Total	40.22	28.32	26.71	13.81	14.53	4.11	2.69	0.54	0.58	131.51

Table 5.5. Distribution of total No. of stems/ha.

Stratum : Broadleaved (Area 52843 ha.)

Species	Diameter class in centimetre. 10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Pinus excelsa	10.40	1.78	0.85	1.07	0.30	0.13	0.10	0.15	0.11	14.89
Abies pindrow	7.52	0.64	0.77	1.23	0.57	0.38	0.41	0.08	0.45	12.05
Juglans regia	4.66	0.81	1.13	0.55	0.40	0.45	0.10	0.00	0.09	8.19
Cedrus deodara	0.71	0.39	0.20	0.00	0.00	0.06	0.13	0.00	0.06	1.55
Picea morinda	0.71	0.00	0.29	0.00	0.18	0.00	0.00	0.04	0.06	1.28
Pinus roxburghii	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20
Quercus species	128.31	31.08	11.10	4.23	3.26	1.19	0.65	0.28	0.13	180.23
Other broadleaved	96.71	23.17	14.02	6.61	3.38	1.87	0.90	0.55	0.72	147.93
Total	249.02	57.87	28.56	13.69	8.09	4.08	2.29	1.10	1.62	366.32

Table 6.1. Gross volume/ha. in cubic metre underbark.

Stratum : Fir (Area 175'81 ha.)

Species	Diameter class in centimetre. 20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Abies pindrow	11.51	15.88	17.11	19.57	20.63	27.62	26.89	60.46	199.67
Picea morinda	2.97	2.85	2.71	4.92	5.44	6.41	7.44	10.86	43.60
Pinus excelsa	1.19	0.59	1.76	1.19	3.47	1.90	2.44	2.47	15.01
Cedrus deodara	0.38	0.00	0.28	1.15	1.23	1.47	0.95	6.25	11.71
Juglans regia	0.14	0.19	0.31	0.48	0.25	0.13	0.13	0.28	1.91
Quercus species	0.46	0.45	0.53	0.23	0.88	1.31	0.27 ~~2.07~~	0.00	4.13
Other broadleaved	1.06	4.31	3.97	2.68	2.00	2.22	1.49	2.99	20.72
Total	17.71	24.27	26.67	30.22	33.90	41.06	39.61	83.31	296.75

Table 6.2. Gross volume per ha. in cubic metre underbark.

Stratum: Blue pine (Area 88059 ha.)

Species	Diameter class in centimetre. 20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Pinus excelsa	10.49	16.90	28.84	36.08	20.50	14.98	9.30	13.94	151.03
Cedrus deodara	1.69	2.91	1.69	2.43	1.75	2.19	1.62	2.42	16.70
Abies pindrow	0.62	2.36	0.49	0.26	0.27	0.82	1.40	0.29	6.51
Picea morinda	0.29	0.62	0.44	0.22	0.25	0.00	0.29	0.00	2.11
Juglans regia	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.19
Quercus species	0.21	0.16	0.18	0.19	0.21	0.44	0.45	0.23	2.07
Other broadleaved	0.33	1.24	0.54	0.39	0.21	1.32	0.00	0.70	4.73
Total	13.63	24.19	32.18	39.76	23.19	19.75	13.06	17.58	183.34

Table 6.3. Gross volume/ha. in cubic metre underbark.

Stratum : Deodar (Area 44473 ha.)

Species	Diameter class in centimetre. 20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Cedrus deodara	23.11	32.59	44.60	44.48	37.60	26.31	19.59	35.77	264.05
Pinus excelsa	1.40	3.66	4.44	5.20	5.72	4.55	0.36	4.66	29.99
Picea morinda	1.40	0.91	1.20	1.55	1.97	0.60	0.30	2.67	10.60
Abies pindrow	0.91	0.24	0.82	0.57	1.19	0.30	0.30	1.25	5.58
Quercus species	0.87	0.50	0.39	0.21	0.46	0.23	0.00	0.25	2.91
Juglans regia	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.19
Other broadleaved	0.76	1.02	0.78	0.86	1.15	0.71	0.25	0.51	5.64
Total	28.05	38.92	52.42	52.87	48.09	32.70	20.80	45.11	318.96

Contents

Table 6.4. Gross Volume/ha. in cubic metre underbark.

Stratum : Chir pine (Area 13618 ha.)

Species	Diameter class in centimetre. 20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Pinus roxburghii	5.69	16.94	16.62	32.40	14.30	11.59	3.67	6.55	107.76
Quercus species	0.00	0.00	0.74	0.83	0.00	0.00	0.00	0.00	1.57
Other broadleaved	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00	0.96
Total	5.69	16.94	17.36	33.23	14.30	12.55	3.67	6.55	110.29

Table 6.5. Gross volume per ha. in cubic metre underbark.

Stratum : Broadleaved (Area 52843 ha.)

Species	Diameter class in centimetre. 20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Abies pindrow	0.17	0.63	2.09	1.45	1.50	2.03	0.51	5.62	14.00
Pinus excelsa	0.53	0.62	1.59	0.67	0.53	0.58	1.27	1.36	7.15
Juglans regia	0.21	0.71	0.66	0.71	1.36	0.40	0.00	0.89	4.94
Cedrus deodara	0.15	0.19	0.00	0.00	0.26	0.87	0.00	0.98	2.45
Picea morinda	0.00	0.19	0.00	0.43	0.00	0.00	0.25	0.88	1.75
Pinus roxburghii	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.16
Quercus species	6.75	6.62	4.96	6.38	3.49	2.63	1.46	1.09	33.38
Other broadleaved	5.49	8.68	8.00	6.34	5.43	3.55	2.93	5.94	46.46
Total	13.30	17.80	17.30	15.98	12.57	10.16	6.42	16.76	110.29

Table 7.1. Distribution of total number of stems.

Stratum: Fir (Area 175681 ha.)

Species	Diameter class in centimetre. 10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Juglans regia	480,320	85,818	46,130	48,675	38,325	14,894	5,194	4,282	5,676	729,314
Pinus excelsa	1887,100	755,070	155,940	218,980	87,828	149,350	57,402	54,356	34,375	3400,401
Cedrus deodara	225,120	213,470	0	34,605	70,527	52,795	47,376	23,646	81,183	748,722
Picea morinda	3557,600	1014,100	584,250	338,690	369,630	275,530	233,580	197,350	152,750	6723,450
Abies pindrow	13456,000	4910,000	2878,700	1791,900	1319,300	967,740	972,400	731,020	1020,400	28047,430
Quercus species	1822,600	378,130	137,270	81,083	19,721	50,600	56,940	8,375	0	2554,719
Other broadleaved	2301,800	706,410	1223,000	579,650	252,960	121,020	97,576	48,806	60,990	5392,212
Total	23730,540	8062,998	5025,290	3093,583	2158,291	1631,929	1470,468	1067,935	1355,374	47596,308

Table 7.2. Distribution of total No. of stems

Stratum : Blue pine (Area 88059 ha.)

Species	Diameter class in centimetre.									
	10<20	20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Juglans regia	0	0	0	0	10,113	0	0	0	0	10,113
Pinus excelsa	2156,900	3085,200	2263,200	1805,000	1279,400	464,650	230,650	101,790	98,712	11485,502
Cedrus deodara	891,310	403,160	311,960	97,756	84,601	40,295	33,101	19,337	17,337	1898,857
Picea morinda	205,940	56,500	77,223	24,313	10,513	6,472	0	3,376	0	384,337
Abies pindrow	0	122,810	213,360	31,770	7,855	6,676	15,268	18,985	892	417,616
Quercus species	365,520	92,147	18,937	12,379	9,378	6,277	9,596	7,500	2,577	524,311
Other broadleaved	351,710	132,600	171,570	38,568	17,760	5,743	29,065	0	8,789	755,805
Total	3971,380	3892,417	3056,250	2009,786	1419,620	530,113	317,680	150,988	128,307	15476,541

Table 7.3. Distribution of total No. of stems.

Stratum: Deodar (Area 44473 ha.)

Species	Diameter class in centimetre.									
	10 < 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Juglans regia	0	0	0	8,166	0	0	0	0	0	8,166
Pinus excelsa	484,180	211,080	231,650	136,680	97,761	63,669	34,600	2,301	14,337	1276,308
Cedrus deodara	9402,000	3039,200	1712,500	1231,800	723,470	405,230	204,680	114,160	114,600	16947,640
Picea morinda	98,853	125,070	45,283	36,176	29,575	23,299	4,963	2,245	11,329	376,793
Abies pindrow	67,110	90,348	15,712	21,728	9,667	13,092	2,757	2,140	5,579	228,133
Quercus species	325,930	164,960	36,670	14,600	5,584	6,535	2,995	0	1,708	558,982
Other broadleaved	311,210	76,520	70,139	30,566	20,066	17,459	8,455	1,949	3,082	539,446
Total	10689,283	3707,176	2111,954	1479,716	886,123	529,304	258,450	122,795	150,665	19975,468

Table 7.4. Distribution of total No. of stems.

Stratum: Chir pine (Area 13618 ha.)

Species	Diameter class in centimetre.									
	10<20	20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Pinus roxburghii	344,870	385,700	363,840	177,910	191,570	56,015	33,728	7,474	7,952	1539,059
Quercus species	50,558	0	0	10,346	6,497	0	0	0	0	67,401
Other broadleaved	152,510	0	0	0	0	0	2,999	0	0	155,509
Total	547,938	385,700	363,840	188,256	198,067	56,015	36,727	7,474	7,952	1791,969

Table 7.5. Distribution of total No. of stems.

Stratum : Broadleaved (Area 52843 ha.)

Species	Diameter class in centimetre.									
	10< 20	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Juglans regia	246,580	43,106	59,758	29,429	21,157	24,170	5,525	0	4,897	434,622
Pinus roxburghii	0	0	11,044	0	0	0	0	0	0	11,044
Pinus excelsa	549,680	94,190	45,108	56,663	16,353	7,059	5,616	0,329	6,227	789,228
Cedrus deodara	37,798	20,740	11,044	0	0	3,691	7,332	0	3,362	83,967
Picea morinda	37,798	0	15,733	0	9,877	0	0	2,194	3,473	69,075
Abies pindrow	397,380	34,284	40,968	65,222	30,403	20,285	21,763	4,553	23,781	638,659
Quercus species	6780,500	1642,400	587,050	223,620	172,450	63,344	34,701	14,810	7,394	9526,269
Other broadleaved	5110,900	1224,800	741,320	349,490	178,640	99,157	48,042	29,259	38,060	7819,668
Total	13160,636	3059,520	1512,025	724,424	428,883	217,706	122,979	53,145	87,194	19372,511

Table 8.1. Distribution of total volume in cubic metre.

Stratum : Fir (Area 175681 ha.)

Species	Diameter class in centimetre. 20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Juglans regia	25.890	33.574	56.094	84.341	44.145	23.322	23.917	50.067	341.350
Pinus excelsa	210.380	104.270	310.840	209.850	611.220	334.180	430.150	434.260	2645.150
Cedrus deodara	67.027	0.0	50.026	202.830	216.390	259.240	168.480	1099.300	2063.283
Picea morinda	522.730	501.770	476.520	864.600	955.940	1126.600	1307.600	1907.900	7663.660
Abies pindrow	2023.800	2790.800	3006.000	3438.700	5624.900	4852.700	4724.100	10623.000	35084.000
Quercus species	80.975	79.224	93.497	41.941	155.330	230.260	47.968	0.0	729.195
Other broadleaved	186.260	758.900	698.060	471.650	352.330	390.990	262.000	525.650	3645.840
Total	3117.062	4368.538	4691.037	5313.902	5960.255	7217.292	6964.215	14640.177	52172.478

Table 8.2. Distribution of total volume in cubic metre.

Stratum : Blue pine (Area 88059 ha.)

Species	Diameter class in centimetre								
	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Juglans regia	0.0	0.0	0.0	16.965	0.0	0.0	0.0	0.0	16.965
Pinus excelsa	924.320	1488.900	2539.800	3177.600	1806.000	1319.200	819.300	1228.100	13303.220
Cedrus deodara	149.610	256.750	149.640	214.520	154.700	193.300	142.820	213.880	1475.220
Picea morinda	26.067	35.382	39.008	20.073	22.365	0.0	25.619	0.0	188.514
Abies pindrow	55.268	208.600	43.469	23.469	23.797	72.882	123.820	26.328	577.633
Quercus species	19.128	14.288	16.164	17.248	18.621	38.846	40.168	20.959	185.424
Other broadleaved	29.412	109.800	48.080	34.897	18.896	116.400	0.0	62.047	419.532
Total	1203.805	2133.720	2836.163	3504.772	2044.379	1740.628	1151.727	1551.314	16166.508

Table 8.3. Distribution of total volume in cubic metre.

Stratum: Deodar (Area 44473 ha.)

Species	Diameter class in centimetre. 20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Juglans regia	0.0	0.0	8.511	0.0	0.0	0.0	0.0	0.0	8.511
Pinus excelsa	62.474	133.140	197.670	231.300	254.820	222.630	16.280	207.280	1335.594
Cedrus deodara	1027.700	1449.700	1985.800	1978.400	1672.200	1170.100	871.530	1590.800	11744.230
Picea morinda	62.682	40.504	53.388	69.000	87.859	26.730	13.641	119.130	472.934
Abies pindrow	40.694	10.953	36.876	25.664	53.061	13.432	13.656	55.932	250.268
Quercus species	38.930	22.530	17.597	9.367	20.768	10.528	0.0	11.346	131.066
Other broadleaved	16.036	45.652	34.729	38.370	51.371	31.888	11.171	22.954	252.171
Total	1248.516	1732.479	2732.571	2352.101	2140.079	1455.308	926.278	2007.442	14194.774

Table 8.4. Distribution of total volume in cubic metre

Stratum: Chirpine (Area 13618 ha.)

Species	Diameter class in centimetre.								
	20 < 30	30 < 40	40 < 50	50 < 60	60 < 70	70 < 80	80 < 90	90+	Total
Pinus roxburghii	77.493	230.680	226.400	441.220	194.800	157.870	50.029	89.313	1467.805
Quercus species	0.0	0.0	10.149	11.419	0.0	0.0	0.0	0.0	21.568
Other broadleaved	0.0	0.0	0.0	0.0	0.0	13.084	0.0	0.0	13.084
Total	77.493	230.680	236.549	452.639	194.800	170.954	50.029	89.313	1502.457

Table 8.5. Distribution of total volume in cubic metre.

Stratum : Broadleaved (Area 52843 ha.)

Species	Diameter class in centimetre. 20<30	30<40	40<50	50<60	60<70	70<80	80<90	90+	Total
Juglans regia	11.610	37.815	35.119	37.987	72.147	21.350	0.0	47.154	263.182
Pinus roxburghii	0.0	8.455	0.0	0.0	0.0	0.0	0.0	0.0	8.455
Pinus excelsa	28.210	32.947	84.133	35.582	28.357	30.695	67.117	72.342	379.383
Cedrus deodara	8.309	10.301	0.0	0.0	14.265	46.327	0.0	52.082	131.484
Picea morinda	0.0	10.343	0.0	23.029	0.0	0.0	13.725	46.517	93.614
Abies pindrow	9.122	33.789	110.840	76.749	79.508	107.720	27.246	296.980	741.954
Quercus species	357.080	350.280	262.610	337.630	184.940	139.500	77.525	57.722	1767.287
Other broadleaved	280.560	459.080	422.760	335.080	287.400	193.170	155.310	314.090	2457.450
Total	704.891	943.210	915.462	846.057	666.617	538.762	340.923	886.887	5842.809

Table 2. Diameter volume relation for important species by 5 cm. dia. class

Diameter class in cm.	Mid.dia. in M. D	D^2 Sq.M.	Volume in cu.m. of species				
			Fir	Bluepine	Deodar	Chirpine	Broad-leaved
20-25	.225	.0506	0.32	0.24	0.25	-	0.16
25-30	.275	.0756	0.52	0.33	0.42	0.18	0.29
30-35	.325	.1056	0.78	0.51	0.67	0.48	0.49
35-40	.375	.1406	1.09	0.78	1.00	0.83	0.73
40-45	.425	.1806	1.44	1.15	1.37	1.23	1.01
45-50	.475	.2256	1.85	1.60	1.84	1.68	1.34
50-55	.525	.2756	2.31	2.16	2.37	2.17	1.72
55-60	.575	.3306	2.82	2.80	2.97	2.72	2.14
60-65	.625	.3906	3.39	3.54	3.65	3.32	2.61
65-70	.675	.4556	4.00	4.37	4.39	3.97	3.13
70-75	.725	.5256	4.66	5.29	5.21	4.67	3.69
75-80	.775	.6006	5.38	6.31	6.10	5.42	4.30
80-85	.825	.6806	6.14	7.42	7.06	6.22	4.96
85-90	.875	.7656	6.96	8.62	8.10	7.07	5.56
90-95	.925	.8556	7.82	9.91	9.20	7.96	6.41
95-100	.975	.9506	8.74	11.30	10.38	8.91	7.20

Note:- These are the values derived from local volume equations given on page 51. They have been used for calculation of volume given in tables 5-8.

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Table 10. (a) Percentage relationship between gross and net volume.
(Derived from a small sample of 20 trees of Chenab valley)

Diameter in cm. (1)	20 cm. top gross vol. cu.m. (2)	20 cm. top net volume cu.m. (3)	Net/Gross (4)
35	.90	.80	.89
45	1.85	1.70	.92
55	3.15	2.85	.90
65	4.85	4.30	.89
75	6.75	6.25	.93

Table 10. (b) Percentage relationship between 20 cm. top and 5 cm. top volume.

Diameter in cm. (1)	20 cm. top gross vol. cu.m. (2)	5 cm. top volume cu.m. (3)	Difference 3 - 2 (4)	% difference $(V_5-V_{20})/V_{20}$ (5)
35	.90	.93	.03	3
45	1.85	1.93	.08	3
55	3.15	3.25	.10	3
65	4.85	4.90	.05	1
75	6.75	6.80	.05	1

Table 10. (c) Percentage relationship between No. of rings by diameter class for Fir.
(Based on a sample of 60 trees)

Diameter	No. of rings at breast height
20 - 30	65
30 - 40	110
40 - 50	170

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3.1. GENERAL VOLUME EQUATIONS

Volume equations used: (taken from FAO/GOI Report of Northern Zone).

1.	Abies pindrow	$V = -.065 + 0.256\ D^2H$
2.	Picea morinda	$V = .151 + 0.232\ D^2H$
3.	Cedrus deodara	$V = -.087 + 0.289\ D^2H$
4.	Pinus excelsa	$V = -.166 + 0.304\ D^2H$
5.	Pinus roxburghii	$V = -.116 + 0.297\ D^2H$
6.	Broadleaved species	$V = .013 + 0.296\ D^2H$

3.1. LOCAL VOLUME EQUATIONS

(Based on diameter and height measurement from trees of Chenab valley)

1.	Abies pindrow	$.023802 - .984622\ D + 10.182621\ D^2$
2.	Picea morinda	$.941931 - 5.280366\ D + 14.072706\ D^2$
3.	Cedrus deodara	$.343140 - 3.646670\ D + 14.295253\ D^2$
4.	Pinus excelsa	$1.009923 - 7.586554\ D + 18.608842\ D^2$
5.	Pinus roxburghii	$-575406\quad 9.981027\ D$
6.	Broadleaved spa.	$.091511 - 1.798541\ D + 9.324297\ D^2$

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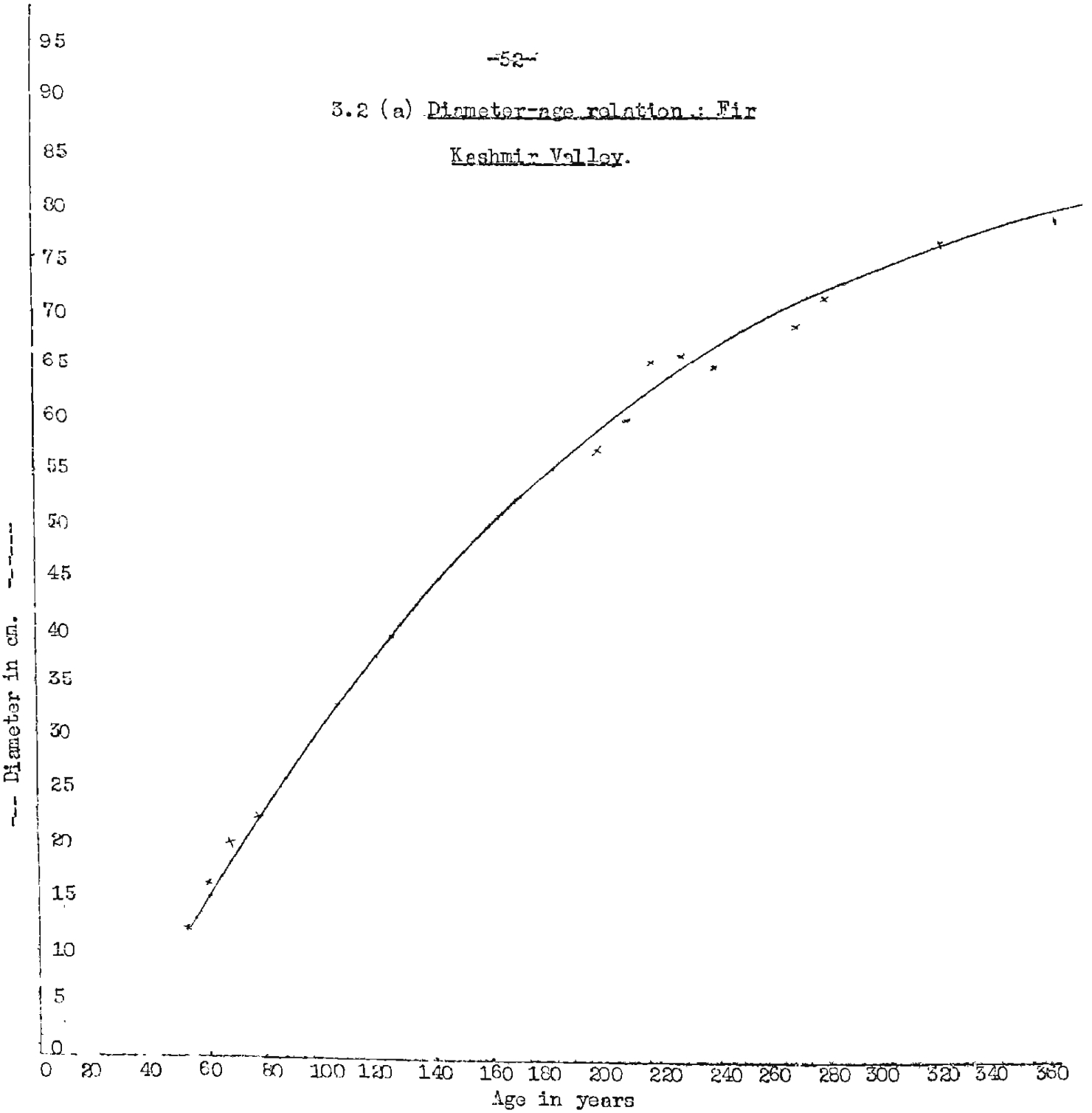
3.2 (a) Diameter-age relation : Fir

Kashmir Valley.



Age	Dia.
60	15.25
70	19.50
80	23.50
90	27.50
100	31.50
110	35.00
120	38.25
130	41.25
140	44.25
150	47.25
160	50.00
170	52.75
180	55.25
190	57.75
200	60.00
210	62.25
220	64.25
230	66.00
240	67.50
250	68.75
260	70.00
270	71.25
280	72.25
290	73.25
300	74.50
310	75.50
320	76.25
330	77.50
340	78.00

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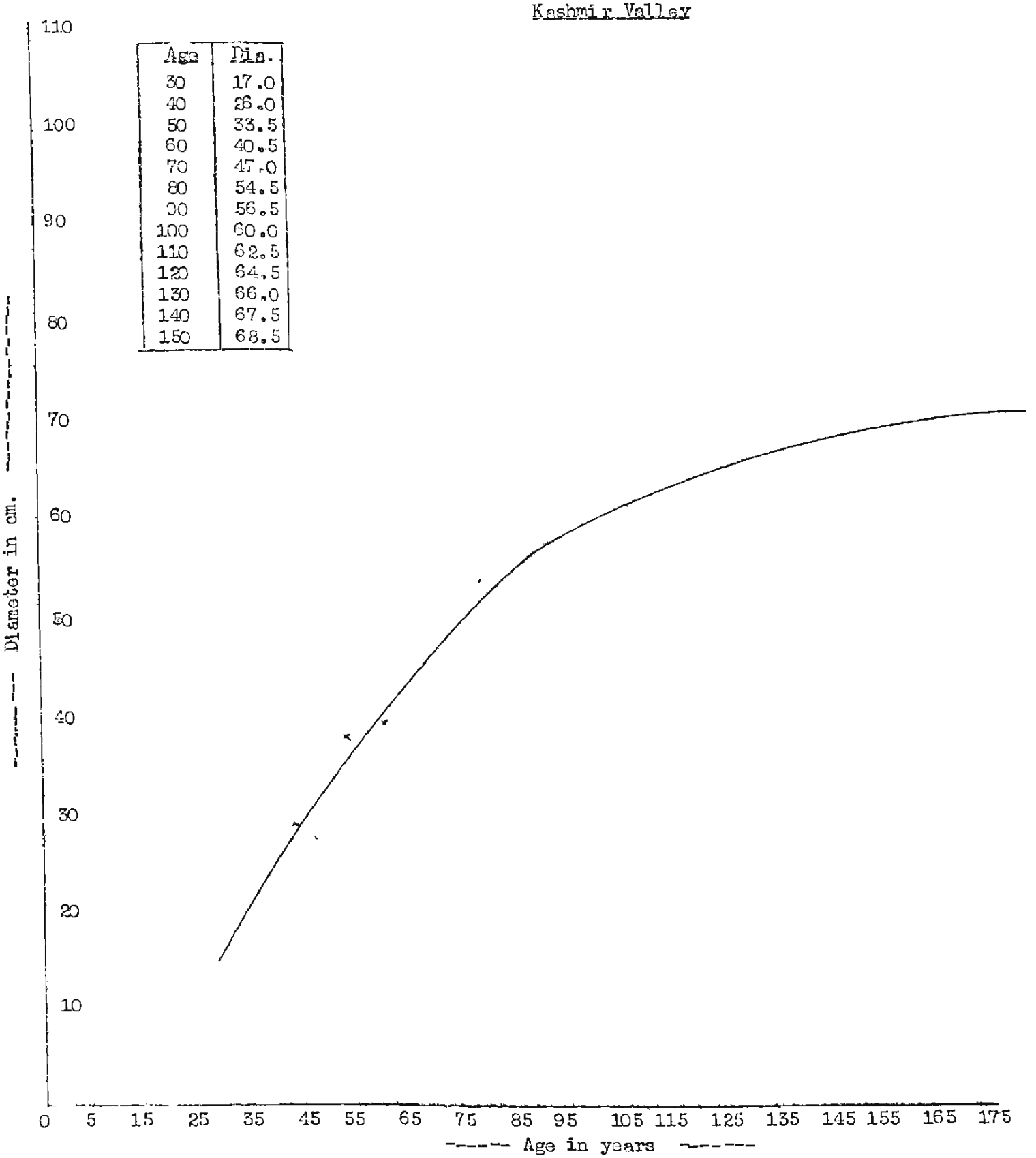
3.2(b) Diameter-Age relation : Bluepine

Kashmir Valley

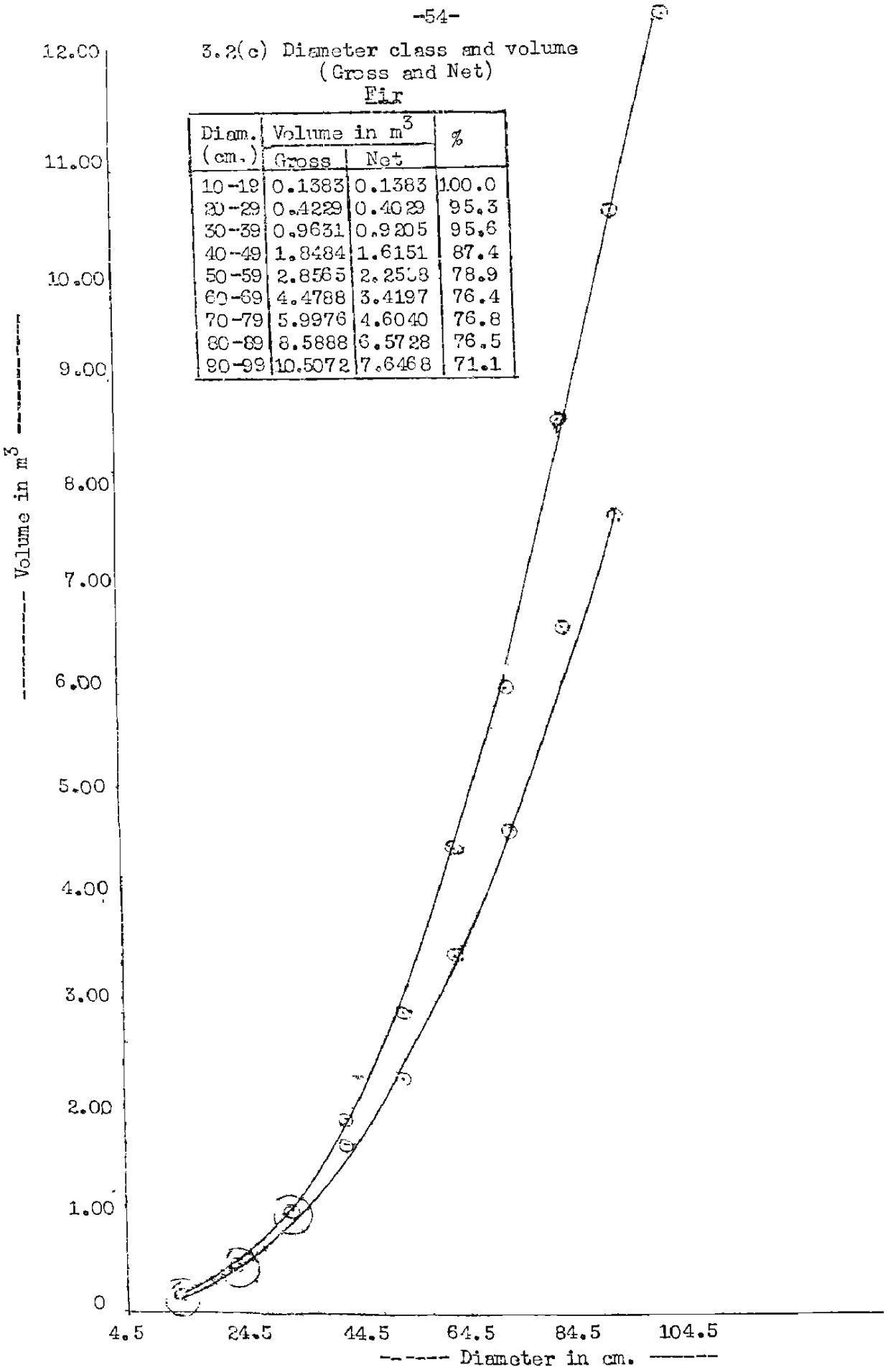
Age	Dia.
30	17.0
40	26.0
50	33.5
60	40.5
70	47.0
80	54.5
90	56.5
100	60.0
110	62.5
120	64.5
130	66.0
140	67.5
150	68.5



Contents

3.2(c) Diameter class and volume
(Gross and Net)
Fir

Diam. (cm.)	Volume in m^3 Gross	Volume in m^3 Net	%
10-19	0.1383	0.1383	100.0
20-29	0.4229	0.4029	95.3
30-39	0.9631	0.9205	95.6
40-49	1.8484	1.6151	87.4
50-59	2.8565	2.2508	78.9
60-69	4.4788	3.4197	76.4
70-79	5.9976	4.6040	76.8
80-89	8.5888	6.5728	76.5
90-99	10.5072	7.6468	71.1



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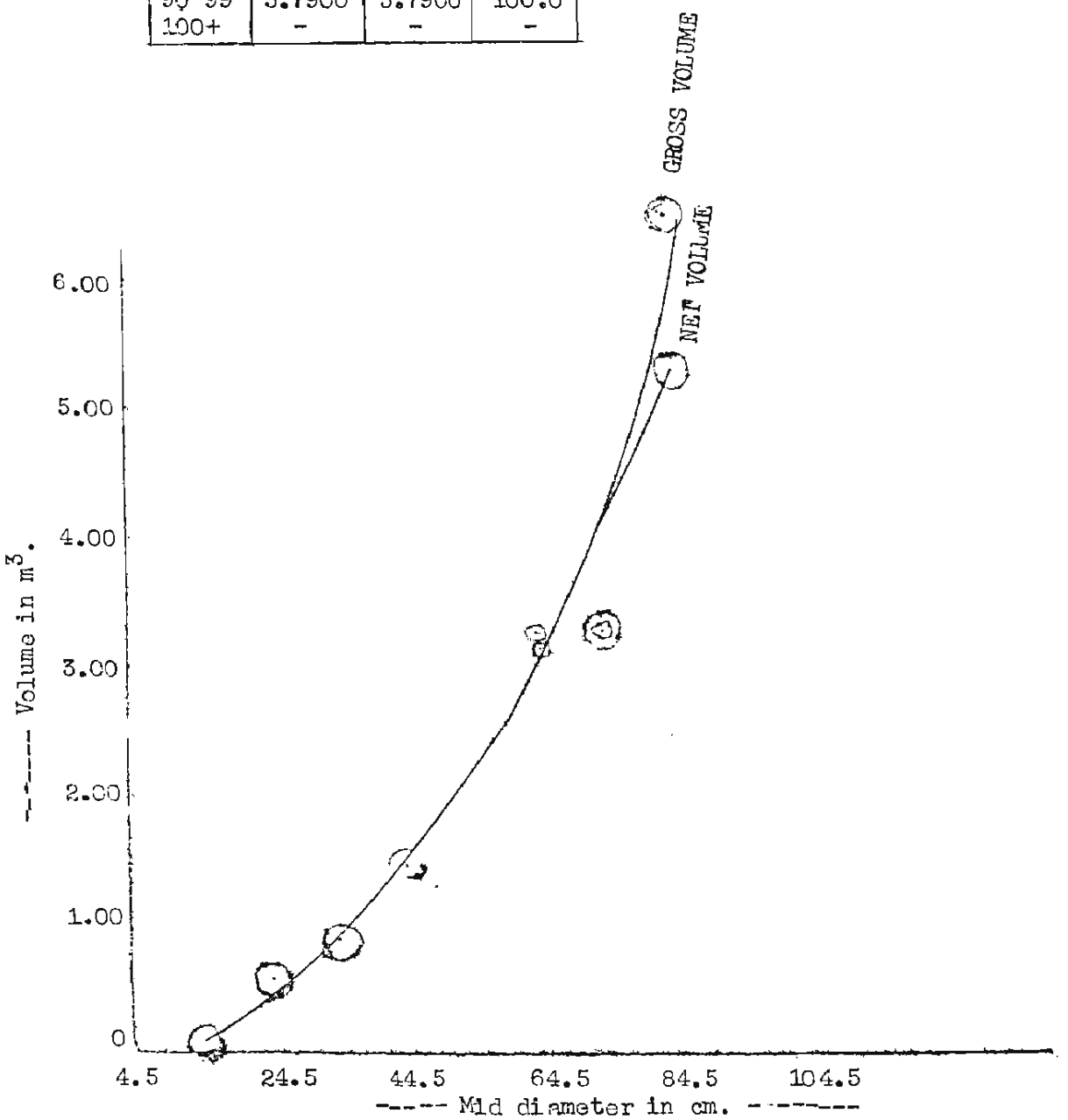
3.2(d) Diameter-Volume (Gross and Net)
Eucpina
Kashmir valley

Diam. (cm.)	Volume in m^3		%
	Gross	Net	
10-19	0.0550	0.0550	100.0
20-29	0.5540	0.5520	99.6
30-39	0.8890	0.8856	99.6
40-49	1.4145	1.4116	99.8
50-59	2.5079	2.5063	99.9
60-69	3.2555	3.1505	96.8
70-79	3.2750	3.2750	100.0
80-89	6.5375	5.3750	82.2
90-99	3.7900	3.7900	100.0
100+	-	-	-



4. GLOSSARY OF TERMS AND BOTANICAL NAMES

1. Species name:

Botanical name	Local name
Abies pindrow	Fir (Silver fir)
Picea griffithii	Spruce sometimes grouped with Fir as Fir.
Cedrus deodara	Deodar
Pinus excelsa	Kail, Blue pine
Pinus roxburghii	Chir pine.
Juglans regia	Walnut.
Quercus incana Quercus dilatata Quercus semicarpifolia	All grouped as Oaks in the present report.

2. Volume definitions:

Standard timber:- Volume of a tree underbark upto 20 cm. Overbark top diameter limit. Therefore volume has been calculated only for trees more than 20 cm. d.b.h. This includes stump volume also.

3. Standard diameter classes (in cm.)

10 < 20

20 < 30

30 < 40

40 < 50

50 < 60

60 < 70

70 < 80

80 < 90

90 +

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4 Stratum formation

Stratum	Forest types they represent on photo
Fir	Fir and Fir-Bluepine (fir contributing more than 50% of crown closure)
Bluepine	Bluepine, Bluepine-Fir (Bluepine contributing more than 50% of crown)
Deodar	All predominantly Deodar Forests
Chirpine	All predominantly Chirpine forests
Broadleaved	All predominantly broadleaved forest included

5. Units·

Diameter - in centimetre

Area - in hectares.

Volume - in cubic metre

B A F - in Sq.m /ha

6 Stump Volume

The volume defined in para 2 above includes stump volume also Base of stump is ground level in case of flat terrain but ground level on uphill side in case of sloping terrain

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