

FORESTRY RESEARCH DIVISION

FOREST MENSURATION BRANCH

Publication No. 88

*VOLUME TABLES  
FOR  
TREE SPECIES ON FARMLANDS IN THE PUNJAB*

By

MUHAMMAD AFZAL CHEEMA  
ABDUL KHALIQ BALOCH  
MIAN MUQARRAB SHAH



PUNJAB FORESTRY RESEARCH INSTITUTE  
FAISALABAD  
1998

FORESTRY RESEARCH DIVISION

FOREST MENSURATION BRANCH

*Hafeez*  
4.7.95

Publication No. 88

Donated to PFRI Faisalabad  
by  
(SAHIBZADA MUHAMMAD HAFEEZ) & Id.  
Chief Conservator of Forests (P&D),  
Punjab, Pakistan

**VOLUME TABLES  
FOR  
TREE SPECIES ON FARMLANDS IN THE PUNJAB**

By

MUHAMMAD AFZAL CHEEMA  
Forest Mensuration Officer  
PFI, Peshawar

ABDUL KHALIQ BALOCH  
MIAN MUQARRAB SHAH  
Forest Rangers, PFI, Peshawar



**PUNJAB FORESTRY RESEARCH INSTITUTE  
FAISALABAD  
1998**

## TABLE OF CONTENTS

ACKNOWLEDGEMENTS . . . . .	1
INTRODUCTION . . . . .	1
2. BASIC DATA . . . . .	1
3. METHOD AND PROCEDURE . . . . .	4
3.1 Models for height estimation . . . . .	5
3.2 Models for total volume (o.b), Smallwood volume (o.b) And timber volume (o.b) Estimation . . . . .	5
3.3 Regression equations . . . . .	5
3.4 Height, total volume (o.b.) small wood (o.b.) and timber volume (o.b.) estimation . . . . .	6
4. CLARIFICATION AND USE OF THE VOLUME TABLES . . . . .	6
4.1 Conversion to british units . . . . .	7
LITERATURE CITED . . . . .	8

## LIST OF TABLES

TABLE-1.	VOLUME TABLE OF BAKAIN ( <i>Melia azedarach</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	9
TABLE-2	VOLUME TABLE OF BER ( <i>Zizyphus jujuba</i> ) ON FARMLANDS IN IRRIGATTED AND NON-IRRIGATTED AREAS OF PUNJAB	10
TABLE-3	VOLUME TABLE OF <i>Eucalyptus camaldulensis</i> ON FARMLANDS IN IRRIGATED AREAS OF PUNJAB AND NWFP	11
TABLE-4	VOLUME TABLE OF <i>Eucalyptus camaldulensis</i> ON FARMLANDS IN NON- IRRIGATED AREAS OF PUNJAB AND NWFP . . . . .	12
TABLE-5	VOLUME TABLE OF FRASH ( <i>Tamarix species</i> ) ON FARMLANDS IN IRRIGATED AND NON-IRRIGATED AREAS OF PUNJAB . . . . .	13
TABLE-6	VOLUME TABLE OF JAND ( <i>Prosopis ceneraria</i> ) ON FARMLANDS IN IRRIGATTED AND NON-IRRIGATTED AREAS OF PUNJAB . . . . .	14
TABLE-7	VOLUME TABLE OF KIKAR ( <i>Acacia nilotica</i> ) ON FARMLANDS IN IRRIGATTED AND NON-IRRIGATTED AREAS OF PUNJAB . . . . .	15
TABLE-8	VOLUME TABLE OF MULBERRY ( <i>Morus alba</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	16
TABLE-9	VOLUME TABLE OF PHULAH I ( <i>Acacia modesta</i> ) ON FARMLANDS IN NON-IRRIGATTED AREAS OF PUNJAB . . . . .	17
TABLE-10	VOLUME TABLE OF POPLAR ( <i>Hybrid poplar</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	18
TABLE-11	VOLUME TABLE OF SHISHAM ( <i>Dalbergia sissoo</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	19
TABLE-12	VOLUME TABLE OF SIMAL ( <i>Bombax ceiba</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	20
TABLE- 13	VOLUME TABLE OF SIRIS ( <i>Albizzia labbek</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	21
TABLE-14	VOLUME TABLE OF WILLOW ( <i>Salix species</i> ) ON FARMLANDS IN IRRIGATTED AREAS OF PUNJAB . . . . .	22

## APPENDICES

APPENDIX-I	SPECIES-WISE HEIGHT AND VOLUME EQUATIONS WITH PRECISION MEASURES . . . . .	23
1.	BAKAIN ( <i>Melia azedarach</i> ) on farmlands in Punjab irrigated areas. . . . .	23
2.	BER on farmlands in Punjab (irrigated and non-irrigated) areas . . . . .	24
3.	EUCALYPTUS ( <i>Eucalyptus camaldulensis</i> ) irrigated areas of Punjab including NWFP plain areas. . . . .	25
4.	EUCALYPTUS ( <i>Eucalyptus camaldulensis</i> ) Non-irrigated areas. . . . .	26
5.	FRASH on farmlands in Punjab irrigated & Non-irrigated areas combined. . . . .	27
6.	JAND on farmland in Punjab (irrigated and non irrigated) areas combined data. . . . .	28
7.	KIKAR ( <i>Acacia nilotica</i> ) irrigated & non-irrigated areas combined. . . . .	29
8.	MULBERRY ( <i>Morus alba</i> ) on farmlands in the Punjab irrigated areas. . . . .	30
9.	PHULAH ( <i>Acacia modesta</i> ) on farmlands of Punjab .	31
10.	POPLAR on farmlands in the Punjab irrigated areas. . . . .	32
11.	SHISHAM ( <i>Delbergia sissoo</i> ) in Punjab farmlands irrigated areas. . . . .	33
12.	SIMAL ( <i>Bombax ceiba</i> ) irrigated area . . . . .	34
13.	SIRIS on farmlands of Punjab irrigated areas. . .	35
14.	WILLOW in Punjab on farmlands irrigated areas. .	36

APPENDIX-II . . . . .	37
1. T-TEST on BER data of Punjab irrigated vs Non-irrigated areas . . . . .	37
2. T-TEST on FRASH data of Punjab irrigated vs Non-irrigated areas . . . . .	38
3.(a) T-TEST on EUCALYPTUS ( <i>Eucalyptus camaldulensis</i> ) data Punjab vs NWFP irrigated areas . . . . .	39
3.(b) . . . . .	39
4. T-TEST for JAND data on farmlands of Punjab irrigated vs Non-irrigated areas . . . . .	40
5. T-TEST on KIKAR data of Punjab irrigated vs Non-irrigated areas . . . . .	41

## FOREWORD

A correct assessment of available wood from the trees growing on the farmlands could not be carried out in the past, because volume tables of the tree species were not available. This is inspite of the fact that about 50 percent of timber and 90 percent fuelwood requirements are met from the farmland trees. Keeping in view the need of these volume tables, Forest Mensuration branch of Pakistan Forest Institute had already prepared revised volume tables of 15 important tree species growing in plains and submountainous parts of the NWFP in 1993. The present volume tables of 13 tree species growing on farmlands of the Punjab have been prepared in the second attempt of Forest Mensuration Branch.

The information presented in the volume tables can be used by field officers, farmers and industrialists for estimating available wood volume of trees on farmlands. The efforts of Forest Mensuration officer and his staff in collection of data and producing these volume tables are highly commended.

K.M.SIDDIQUI,  
Director General.  
Pakistan Forest Institute,  
Peshawar.  
1995.

1-7-16  
257 MA 1-7-15

## ACKNOWLEDGEMENTS

The authors are grateful to Dr. K. M. Siddiqui, Director General, Pakistan Forest Institute, Peshawar for taking keen interest and providing guidance in the work of preparation of these volume tables. We are thankful to M/S. Taj Mahmood Abbasi, Forest Ranger, Fatehullah, Forester, Wisal Muhammad, Khalid Javed and Amjad Ali Field Assistants of Forest Mensuration Branch for the collection and computation of volume tables data. The cooperation in data collection of the staff of Forest Economics branch is also appreciated.

We are also grateful to M/S. Abdul Karim Abbasi, Stenotypist Computer Section, Khushhal Khan, L.D.C. of Forest Mensuration Branch of Pakistan Forest Institute, Peshawar and Faisal Imran Computer Technician for neat typing and composing of the draft/tables of this publication.

## INTRODUCTION

About 50 percent of timber and 98 percent of fuelwood requirements of Pakistan are reported to be met from trees growing on the farmlands. However, accurate estimate of growing stock of trees on farmlands is not possible without volume tables. Volume tables of tree species growing on farmlands of N.W.F.P. were prepared in 1992 and revised them again in 1993 by collecting additional data from leftover localities of the province. It was also necessary to prepare volume tables of tree species growing on farmlands of the Punjab province.

It was massive work to prepare the volume tables of all tree species on farmland covering all sites of the province. To reduce the work, it was decided to take up only major tree species growing on the farmlands in different climatic zones of this province. Keeping this into consideration 13 major tree species growing in abundance in the northern, central and southern parts of the Punjab were selected for the preparation of their volume tables. However, an effort was also made to include all localities representative of the various climatic zones. Further, data of Kikar, Frash, Ber, Jand and *Eucalyptus* growing in irrigated as well as non-irrigated areas were collected to study the variation in height growth and volume contents of trees of these species and the volume tables of these species growing were prepared separately for irrigated and non-irrigated areas on the basis of their significant variations in heights and total volume growth.

### 2. BASIC DATA

Data of 13 major tree species growing on farmlands were collected from different localities of Punjab including irrigated and non-irrigated areas for the preparation of their volume tables. The number of trees of each species measured in irrigated and non-irrigated areas in different localities of three zones against various dbh classes are given in the following tables:

Table - I Species-wise number of trees measured in irrigated areas of different dbh classes.

DBH (cm)	Species												
	Ber	Bakain	Euc.	Jard	Kikar	Mulberry	Poplar	Phulahi	Shisham	Simal	Siris	Frash	Willow
4	.	1	.	.	9	2	.	.	9	.	1	1	.
6	2	15	.	2	25	2	5	.	21	3	3	9	3
8	3	12	.	2	28	9	5	.	24	3	4	5	3
10	3	19	.	2	30	15	7	.	31	3	6	6	3
12	4	19	.	2	32	14	7	.	32	3	6	6	3
14	5	10	.	3	28	14	7	.	32	3	6	6	3
16	7	10	.	3	27	14	7	.	32	3	6	6	3
18	5	16	.	3	19	16	7	.	31	4	6	7	3
20	6	10	.	3	28	14	6	.	32	3	6	6	3
22	4	13	.	3	29	17	5	.	33	4	7	7	3
24	.	13	.	3	29	14	5	.	32	4	5	6	3
26	4	12	1	2	30	16	5	.	33	3	6	9	3
28	.	16	.	2	28	13	5	.	35	3	6	8	4
30	4	15	2	3	32	15	12	.	34	3	7	7	2
32	4	15	1	3	22	16	17	.	31	3	7	7	3
34	4	14	1	3	29	14	13	.	34	3	6	7	2
36	4	14	1	3	28	16	16	.	33	3	6	6	2
38	3	14	2	3	26	16	13	.	31	4	8	5	2
40	1	16	1	3	29	16	12	.	30	3	6	7	3
42	2	11	1	3	31	13	11	.	30	3	7	7	3
44	3	7	1	3	27	11	12	.	30	3	5	7	2
46	2	6	2	2	27	18	8	.	31	3	3	5	.
48	4	7	4	1	25	12	7	.	29	3	4	9	.
50	3	4	3	2	21	10	5	.	27	3	3	7	1
52	7	4	3	.	24	11	5	.	27	3	2	8	1
54	5	4	2	2	18	12	6	.	26	3	2	8	1
56	6	2	2	2	19	12	6	.	26	3	3	7	.
58	3	2	2	.	19	10	3	.	26	3	3	3	.
60	2	1	2	.	13	9	3	.	16	3	.	6	1
62	.	.	.	.	4	2	.	.	2	.	.	.	.
Total	100	302	31	63	736	373	220	.	840	88	140	188	60

Table - II

Species-wise number of trees measured in non-irrigated areas of different dbh classes.

DBH (cm)	Species												
	Ber	Bakain	Euc.	Jand	Kikar	Mulberry	Poplar	Phulahi	Shisham	Simal	Siris	Frash	Willow
4	5	-	-	-	7	-	-	-	-	-	-	2	-
6	10	-	3	3	17	-	-	-	-	-	-	4	-
8	13	-	3	2	15	-	-	5	-	-	-	7	-
10	18	-	3	2	21	-	-	8	-	-	-	6	-
12	17	-	3	2	19	-	-	8	-	-	-	7	-
14	18	-	3	2	22	-	-	8	-	-	-	7	-
16	18	-	3	2	19	-	-	8	-	-	-	7	-
18	19	-	3	2	31	-	-	9	-	-	-	6	-
20	18	-	3	2	21	-	-	8	-	-	-	6	-
22	17	-	3	2	22	-	-	8	-	-	-	6	-
24	18	-	3	2	21	-	-	8	-	-	-	6	-
26	18	-	2	2	20	-	-	8	-	-	-	6	-
28	19	-	3	2	21	-	-	8	-	-	-	6	-
30	18	-	1	2	20	-	-	8	-	-	-	6	-
32	17	-	3	2	23	-	-	8	-	-	-	6	-
34	13	-	2	2	19	-	-	8	-	-	-	6	-
36	13	-	3	2	22	-	-	8	-	-	-	7	-
38	12	-	2	2	21	-	-	8	-	-	-	7	-
40	11	-	4	2	17	-	-	7	-	-	-	7	-
42	7	-	2	2	15	-	-	6	-	-	-	6	-
44	7	-	2	2	17	-	-	6	-	-	-	6	-
46	7	-	-	2	17	-	-	6	-	-	-	5	-
48	8	-	-	2	17	-	-	6	-	-	-	6	-
50	9	-	-	1	19	-	-	6	-	-	-	5	-
52	5	-	-	-	10	-	-	6	-	-	-	4	-
54	3	-	2	-	14	-	-	6	-	-	-	4	-
56	3	-	-	-	13	-	-	6	-	-	-	4	-
58	-	-	-	-	11	-	-	6	-	-	-	5	-
60	-	-	-	-	6	-	-	3	-	-	-	3	-
62	-	-	-	-	3	-	-	-	-	-	-	-	-
Total	341	-	56	46	520	-	-	190	-	-	-	163	-

### 3. METHOD AND PROCEDURE

Volume upto 5 cm over bark diameter at thin end of the stem including branches was taken as total volume of the tree, whereas volume upto 20 cm diameter over bark at thin end of the stem and branches was taken as timber volume of the tree. The volume from 20 cm down to 5 cm diameter over bark of the stem and branches was considered as smallwood of the tree. Trees were measured over bark by dividing the stem and branches into 2 m logs with end log of variable length separately for timber and smallwood parts. Mid diameter of each log was measured over bark and Huber formula (4) was used to calculate the volume of each log of the stem and branches. Total volume of a tree was determined by adding volumes of all logs upto 5 cm and timber volume upto 20 cm over bark diameter of the stem and branches.

T-test for unpaired replicates for Kikar, Frash, Ber, Jand and Eucalypts data of irrigated VS non-irrigated in groups of 4-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55 and 56-60 centimetres dbh ranges were applied (Appendix -II). This test for Kikar, Frash, Ber and Jand showed generally non-significance differences of heights and total volume growth in these dbh ranges. Therefore, the volume tables of these species were prepared using the combined data of both irrigated and non-irrigated areas for each species. Data of Eucalyptus trees from irrigated area of the Punjab were inadequate to prepare its volume table and therefore data of N.W.F.P. irrigated areas were combined with it after studying the non-significant variations of heights and volume growths of the species [Appendix -II (a)] in these provinces. The differences of height growth of irrigated (Punjab and N.W.F.P.) areas versus non-irrigated area of the Punjab were highly significant as indicated by t-test for Eucalyptus [Appendix -II (b)]. Therefore volume tables for irrigated (Punjab combined with N.W.F.P.) and non-irrigated areas of the Punjab were prepared separately.

The estimates of heights, timber volume (o.b) smallwood volume (o.b) and total volume (o.b), for different species were determined using the following mathematical models and regression analysis technique.

### 3.1 Models for height estimation

$$H = a + b \ln D$$

$$H = a + bD + cD^2$$

$$\ln H = a + b \ln D + c(\ln D)^2$$

$$\ln(H - 1.37) = a + b/D$$

### 3.2 Models for total volume (o.b), Smallwood volume (o.b) And timber volume (o.b) Estimation

$$TV = a + bD + cD^2 + dD^3 + eD^2H$$

$$\ln TV = a + b \ln D + c \ln H + dD^2H$$

$$SW = a + bD + cD^2 + dD^3 + cD^2H$$

$$\ln SW = a + b \ln D + c \ln H + dD^2H$$

$$TM = a + bD + cD^2 + dD^3 + cD^2H$$

$$\ln TM = a + b \ln D + c \ln H + dD^2H$$

where

H: Total height in meters.

D: Breast height diameter (o.b) in centimeters.

TV: Total volume over bark (o.b) in cubic meters.

SW: Total smallwood over bark (o.b) in cubic meters.

TM: Timber volume over bark (o.b) in cubic meters.

$\ln$ : Natural logarithm of variable.

### 3.3 Regression equations

Regression equations were developed on above mathematical models for each species separately by the method of stepwise regression analysis technique in SPSS. All the regression equations developed separately for all species with their measures of precision are given in Appendix-I.

### 3.4 Height, Total volume (o.b), Smallwood (o.b) And timber volume (o.b) Estimation

For a particular tree species that regression equation was selected which gave higher measures of precision (high correlation coefficient, low standard error, high F-value and with significant regression coefficients) as compared to others. In some cases a combination of equations were used to get estimates nearer to actual average values of heights against different dbh classes. The selected equation for the estimation of heights, Total volume (o.b) Smallwood (o.b) and Timber Volume (o.b) of individual species are shown in the respective volume table of each species.

#### 4. CLARIFICATION AND USE OF THE VOLUME TABLES

The volume tables given in tables 1 through 14 were prepared for 2 cm dbh class intervals in metric units. The volume shown are over bark and total volume includes stem and branches volumes upto 5 cm top diameter. The timber volume also includes stem and branch volumes of diameters above 20 cm diameter. In these tables diameter classes are mid values for the range of diameters. For example 20 cm dbh class include trees with dbh 19.1 to 21.0 centimeters. The heights given in volume tables are in meters (m) and volumes in cubic meters ( $m^3$ )

To consult the volume table of a tree species following instructions must be followed:

- Measure the dbh in centimeters of the tree.
- Convert it to the nearest dbh class of 2 cm interval.
- Consult the respective volume table of the tree species against this dbh class and obtain timber (o.b), smallwood (o.b) or total volume (o.b) under the respective columns of the required volumes.

#### 4.1 Conversion to British units

To convert metric units into the British units use the following conversions.

$$D_b = 0.3937 D_m$$

$$H_b = 3.28084 H_m$$

$$TV_b = 35.3147 TV_m$$

$$SW_b = 35.3147 SW_m$$

$$TM_b = 35.3147 TM_m$$

where subscripts 'b' and 'm' refer to British and Metric system of measurements respectively.

## LITERATURE CITED

1. Cheema, M. A. and T.M. Abbasi 1993 Revised volume tables of tree species growing on the farmlands in N.W.F.P. Publication No.85 Forestry Research Division, Forest Mensuration Branch, P.F.I., Peshawar.
2. Cheema, M.A. and M.A.H. Fatimi 1991 Local and standard volume tables of Ash (*Fraxinus exelisor*) for Azad Kashmir publication No. 77 Forestry Research Division, Forest Mensuration Branch PFI, Pesahwar.
3. Griffith, A.L. and Jagdamba Parasad 1949 'The Silvicultural Research Code' Vol.3 Forest Research Institute Dera Dun, India.
4. Jerram, M. R. K. 1958 Elementary Forest Mensuration Text book publications, Thomas Marey and company, 40 Museum street W.C.L. London.
5. Muhammad Amjad and Nadir Khan 1990 The state of Forestry in Pakistan of Forestry Economics Branch P.F.I. Peshawar.
6. Muhammad Amjad 1991 Survey report on tree growth on the farmlands of the N.W.F.P. Forest Economics Branch P.F.I. Peshawar.

TABLE - 1  
 VOLUME TABLE OF BAKAIN (*Melia azedarach*) ON  
 FARMLANDS IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	Volume (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	2.69	0.0000	0.0033	0.0033
6	4.24	0.0000	0.0099	0.0099
8	5.61	0.0000	0.0196	0.0196
10	6.73	0.0000	0.0310	0.0310
12	7.63	0.0000	0.0469	0.0469
14	8.37	0.0000	0.0677	0.0677
16	8.98	0.0000	0.0925	0.0925
18	9.49	0.0275*	0.0941*	0.1216
20	9.92	0.0592	0.0957	0.1550
22	10.29	0.0841	0.1085	0.1926
24	10.61	0.1137	0.1209	0.2346
26	10.89	0.1480	0.1329	0.2809
28	11.14	0.1872	0.1444	0.3316
30	11.36	0.2312	0.1555	0.3867
32	11.56	0.2802	0.1659	0.4462
34	11.90	0.3388	0.1762	0.5149
36	12.24	0.4042	0.1857	0.5899
38	12.57	0.4765	0.1946	0.6711
40	12.89	0.5559	0.2027	0.7586
42	13.20	0.6424	0.2102	0.8526
44	13.51	0.7364	0.2169	0.9533
46	13.81	0.8379	0.2229	1.0608
48	14.10	0.9471	0.2282	1.1753
50	14.38	1.0642	0.2328	1.2970
52	14.66	1.1892	0.2368	1.4260
54	14.94	1.3224	0.2402	1.5625
56	15.21	1.4638	0.2429	1.7067
58	15.47	1.6136	0.2451	1.8587
60	15.73	1.7719	0.2467	2.0187

\* Adjusted figures

$$l_n(H-1.37) = 2.61350 - 9.35249/D \quad (\text{DBH } 4 - 32)$$

$$l_n H = 0.74143 + 0.49198 l_n D \quad (\text{DBH } 34 - 60)$$

$$l_n SW = -9.02162 - 0.10798 H - 0.02256 D + 1.66967 l_n D + 1.39286 l_n H$$

$$(\text{DBH } 4-10 \text{ \& } 20-60) \quad (\text{DBH } 12-60)$$

$$l_n TV = -8.97921 + 2.04035 l_n D + 0.03243 H + 0.29666 l_n H$$

$$TM = TV - SW$$

TABLE - 2  
 VOLUME TABLE OF BER (*Zizyphus jayuba*) ON FARMLANDS  
 IN IRRIGATED AND NON-IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	2.21	0.0000	0.0030	0.0030
6	3.49	0.0000	0.0086	0.0086
8	4.65	0.0000	0.0175	0.0175
10	5.67	0.0000	0.0302	0.0302
12	6.58	0.0000	0.0468	0.0468
14	7.38	0.0000	0.0676	0.0676
16	8.10	0.0000	0.0925	0.0925
18	8.73	0.0279*	0.0940*	0.1219
20	9.30	0.0691*	0.0968*	0.1559
22	9.81	0.0949	0.0996	0.1945
24	10.27	0.1296	0.1084	0.2380
26	10.69	0.1705	0.1159	0.2864
28	10.99	0.2167	0.1219	0.3385
30	11.27	0.2682	0.1275	0.3957
32	11.52	0.3246	0.1335	0.4581
34	11.75	0.3851	0.1407	0.5258
36	11.96	0.4489	0.1501	0.5989
38	12.15	0.5151	0.1627	0.6778
40	12.32	0.5830	0.1797	0.7627
42	12.48	0.6515	0.2021	0.8536
44	12.62	0.7199	0.2310	0.9509
46	12.76	0.7874	0.2675	1.0549
48	12.88	0.8531	0.3126	1.1656
50	13.00	0.9163	0.3672	1.2835
52	13.10	0.9765	0.4322	1.4087
54	13.21	1.0330	0.5085	1.5415
56	13.30	1.0855	0.5968	1.6823
58	13.39	1.1335	0.6977	1.8312
60	13.47	1.1767	0.8119	1.9887

\* Adjusted figures

$$l_n H = -1.25071 + 1.74457 l_n D - 0.19446 (l_n D)^2 \quad (\text{DBH } 4-26)$$

$$l_n (H-1.37) = 2.69390 - 12.03077/D \quad (\text{DBH } 28-60)$$

$$l_n TV = -8.78248 + 0.009947 D + 1.71616 l_n D + 0.71005 l_n H \quad (\text{DBH } 4-60)$$

$$l_n TM = -16.90177 - 0.06239 D + 4.66439 l_n D + 0.65765 l_n H \quad (\text{DBH } 22-60)$$

$$SW = TV - TM$$

TABLE - 3  
 VOLUME TABLE OF *Eucalyptus camaldulensis* ON FARMLANDS  
 IN IRRIGATED AREAS OF PUNJAB AND HWP

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	6.93	0.0000	0.0025	0.0025
6	8.93	0.0000	0.0083	0.0083
8	10.52	0.0000	0.0190	0.0190
10	11.83	0.0000	0.0356	0.0356
12	12.93	0.0000	0.0590	0.0590
14	13.89	0.0000	0.0898	0.0898
16	14.73	0.0000	0.1285	0.1285
18	15.47	0.0454*	0.1298*	0.1752
20	16.13	0.0989	0.1311	0.2300
22	16.73	0.1455	0.1475	0.2930
24	17.27	0.2018	0.1621	0.3639
26	17.77	0.2675	0.1749	0.4424
28	18.22	0.3419	0.1860	0.5279
30	18.63	0.4244	0.1956	0.6200
32	19.02	0.5138	0.2040	0.7178
34	19.37	0.6092	0.2115	0.8207
36	19.70	0.7092	0.2186	0.9278
38	20.01	0.8127	0.2254	1.0381
40	20.29	0.9184	0.2324	1.1508
42	20.56	1.0248	0.2399	1.2647
44	20.81	1.1306	0.2483	1.3790
46	21.05	1.2345	0.2580	1.4925
48	21.27	1.3349	0.2694	1.6043
50	21.48	1.4305	0.2829	1.7133
52	21.67	1.5196	0.2992	1.8188
54	21.86	1.6007	0.3189	1.9196
56	22.03	1.6722	0.3429	2.0151
58	22.20	1.7322	0.3723	2.1045
60	22.35	1.7787	0.4084	2.1871

\* Adjusted figures

$$l_n H = 0.85754 + 0.89457 l_n D - 0.08430 (l_n D)^2 \quad (\text{DBH } 4-60)$$

$$l_n TV = -11.30825 - 0.00000782746 D^2 H + 2.23706 l_n D + 1.14625 l_n H \quad (\text{DBH } 4-60)$$

$$l_n SW = -10.23894 - 0.12327 D + 0.0000105 D^2 + 3.53455 l_n D \quad (\text{DBH } 20-60)$$

$$TM = TV - SW$$

TABLE - 4  
 VOLUME TABLE OF *Eucalyptus camaldulensis* ON FARMLANDS  
 IN NON- IRRIGATED AREAS OF PUNJAB AND NWFP

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	5.14	0.0000	0.0033	0.0033
6	6.39	0.0000	0.0089	0.0089
8	7.45	0.0000	0.0183	0.0183
10	8.40	0.0000	0.0319	0.0319
12	9.27	0.0000	0.0502	0.0502
14	10.07	0.0000	0.0737	0.0737
16	10.82	0.0000	0.1028	0.1028
18	11.52	0.0342*	0.1037*	0.1379
20	12.19	0.0747*	0.1046*	0.1793
22	12.84	0.1218*	0.1055*	0.2273
24	13.45	0.1760*	0.1064*	0.2824
26	14.04	0.2374*	0.1073*	0.3447
28	14.61	0.3063*	0.1082*	0.4145
30	15.16	0.3831*	0.1092*	0.4923
32	15.70	0.4680	0.1102	0.5781
34	16.22	0.5543	0.1181	0.6724
36	16.72	0.6463	0.1290	0.7753
38	17.22	0.7442	0.1429	0.8871
40	17.70	0.8483	0.1597	1.0080
42	18.17	0.9588	0.1794	1.1383
44	18.63	1.0762	0.2020	1.2781

\* Adjusted figures

$$l_n H = 0.89135 + 0.53731 l_n D \quad (\text{DBH } 4-44)$$

$$l_n TV = -9.90534 + 2.05510 l_n D + 0.81168 l_n H \quad (\text{DBH } 4-44)$$

$$TM = -0.91339 + 0.27798 l_n D + 0.000026 D^2 H \quad (\text{DBH } 32-44)$$

$$SW = TV - TM$$

TABLE - 5  
 VOLUME TABLE OF FRASH (*Tamarix species*) ON FARMLANDS  
 IN IRRIGATED AND NON-IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALL WOOD	TOTAL
4	2.80	0.0000	0.0027	0.0027
6	3.93	0.0000	0.0076	0.0076
8	4.92	0.0000	0.0158	0.0158
10	5.81	0.0000	0.0278	0.0278
12	6.63	0.0000	0.0439	0.0439
14	7.39	0.0000	0.0645	0.0645
16	8.10	0.0000	0.0897	0.0897
18	8.76	0.0290*	0.0910*	0.1200
20	9.38	0.0630*	0.0924*	0.1554
22	9.97	0.1023	0.0939	0.1962
24	10.52	0.1380	0.1046	0.2425
26	11.05	0.1804	0.1142	0.2946
28	11.56	0.2298	0.1228	0.3526
30	12.04	0.2861	0.1304	0.4165
32	12.51	0.3493	0.1373	0.4867
34	12.95	0.4193	0.1438	0.5630
36	13.38	0.4956	0.1502	0.6458
38	13.80	0.5780	0.1571	0.7351
40	14.19	0.6659	0.1651	0.8309
42	14.58	0.7588	0.1747	0.9335
44	14.95	0.8562	0.1866	1.0428
46	15.31	0.9574	0.2016	1.1590
48	15.66	1.0618	0.2204	1.2822
50	16.00	1.1686	0.2437	1.4124
52	16.33	1.2774	0.2723	1.5497
54	16.65	1.3872	0.3069	1.6941
56	16.97	1.4976	0.3482	1.8459
58	17.27	1.6079	0.3970	2.0049
60	17.56	1.7174	0.4539	2.1713

\* Adjusted figures

$$l_n H = -0.28335 + 1.03972 l_n D - 0.06608 (l_n D)^2 \quad (\text{DBH } 4-60)$$

$$l_n TV = -9.41521 + 2.00801 l_n D + 0.68707 l_n H \quad (\text{DBH } 4-60)$$

$$l_n TM = -15.09242 - 0.03859 D + 3.80834 l_n D + 0.82208 l_n H \quad (\text{DBH } 22-60)$$

$$SW = TV - TM$$

TABLE - 6  
 VOLUME TABLE OF JAND (*Prosopis ceneraria*) ON FARMLANDS  
 IN IRRIGATED AND NON-IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HIEGHT (m)	VOLUME (cu.m)		
		TIMBER	SMLL WOOD	TOTAL
4	2.82	0.0000	0.0023	0.0023
6	3.50	0.0000	0.0062	0.0062
8	4.17	0.0000	0.0128	0.0128
10	4.81	0.0000	0.0227	0.0227
12	5.44	0.0000	0.0364	0.0364
14	6.05	0.0000	0.0544	0.0544
16	6.64	0.0000	0.0773	0.0773
18	7.22	0.0231*	0.0822*	0.1053
20	7.77	0.0519	0.0871	0.1390
22	8.31	0.0762	0.1023	0.1785
24	8.83	0.1065	0.1177	0.2243
26	9.33	0.1433	0.1332	0.2765
28	9.81	0.1867	0.1486	0.3353
30	10.27	0.2373	0.1637	0.4010
32	10.72	0.2951	0.1786	0.4737
34	11.15	0.3605	0.1930	0.5535
36	11.56	0.4333	0.2071	0.6404
38	11.95	0.5139	0.2206	0.7345
40	12.33	0.6020	0.2337	0.8357
42	12.68	0.6977	0.2463	0.9440
44	13.02	0.8008	0.2585	1.0593
46	13.34	0.9113	0.2702	1.1815
48	13.64	1.0290	0.2815	1.3105
50	13.92	1.1536	0.2925	1.4460
52	14.19	1.2848	0.3030	1.5878
54	14.44	1.4224	0.3133	1.7357
56	14.66	1.5660	0.3234	1.8894
58	14.88	1.7153	0.3331	2.0485
60	15.07	1.8699	0.3427	2.2127

\* Adjusted figures

$$H = 1.40251 + 0.36372 D - 0.002266 D^2$$

(DBH 4-60)

$$l_n TV = -9.78932 + 1.85728 l_n D + 1.09828 l_n H$$

(DBH 4-60)

$$l_n SW = -9.02968 - 0.18235 H + 0.88079 l_n D + 2.61755 l_n H$$

(DBH 20-60)

$$TM = TV - SW$$

TABLE - 7  
 VOLUME TABLE OF KIKAR (*Acacia nilotica*) ON FARMLANDS  
 IN IRRIGATED AND NON-IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	3.29	0.0000	0.0036	0.0036
6	4.25	0.0000	0.0095	0.0095
8	5.10	0.0000	0.0189	0.0189
10	5.88	0.0000	0.0322	0.0322
12	6.60	0.0000	0.0497	0.0497
14	7.28	0.0000	0.0718	0.0718
16	7.93	0.0000	0.0987	0.0987
18	8.54	0.0296*	0.1010*	0.1306
20	9.13	0.0631	0.1047	0.1678
22	9.70	0.0915	0.1191	0.2106
24	10.26	0.1261	0.1330	0.2590
26	10.79	0.1672	0.1462	0.3134
28	11.31	0.2150	0.1589	0.3739
30	11.82	0.2698	0.1708	0.4406
32	12.31	0.3316	0.1822	0.5138
34	12.79	0.4006	0.1930	0.5936
36	13.27	0.4768	0.2034	0.6802
38	13.73	0.5602	0.2134	0.7736
40	14.19	0.6510	0.2231	0.8741
42	14.63	0.7492	0.2326	0.9818
44	15.07	0.8547	0.2420	1.0967
46	15.50	0.9676	0.2516	1.2192
48	15.93	1.0879	0.2613	1.3492
50	16.35	1.2156	0.2713	1.4869
52	16.76	1.3507	0.2817	1.6324
54	17.17	1.4931	0.2928	1.7859
56	17.57	1.6429	0.3046	1.9475
58	17.96	1.7999	0.3173	2.1171
60	18.35	1.9641	0.3310	2.2951

\* Adjusted figures

$$l_n H = 0.30911 + 0.63520 l_n D \quad (\text{DBH } 4-60)$$

$$l_n TV = -9.17527 + 1.85096 l_n D + 0.83427 l_n H$$

$$l_n SW = -9.06051 - 0.05572 D + 2.00190 H$$

$$l_n H + 0.000014856 D^2 H \quad (\text{DBH } 20-60)$$

$$TM = TV - SW$$

$$l_n D - 0.05291$$

$$H + 1.06234$$

TABLE - 8  
VOLUME TABLE OF MULBERRY (*Morus alba*) ON FARMLANDS  
IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	2.38	0.0000	0.0039	0.0039
6	3.74	0.0000	0.0103	0.0103
8	5.01	0.0000	0.0203	0.0203
10	6.07	0.0000	0.0338	0.0338
12	6.95	0.0000	0.0508	0.0508
14	7.67	0.0000	0.0715	0.0715
16	8.28	0.0183*	0.0775*	0.0958
18	8.79	0.0404*	0.0836*	0.1240
20	9.22	0.0664*	0.0898*	0.1562
22	9.60	0.0965	0.0960	0.1925
24	9.93	0.1282	0.1049	0.2331
26	10.21	0.1651	0.1130	0.2781
28	10.47	0.2071	0.1206	0.3277
30	10.69	0.2541	0.1279	0.3821
32	10.89	0.3058	0.1354	0.4412
34	11.07	0.3619	0.1435	0.5054
36	11.24	0.4219	0.1528	0.5747
38	11.42	0.4863	0.1640	0.6503
40	11.69	0.5564	0.1783	0.7347
42	11.95	0.6302	0.1950	0.8252
44	12.20	0.7075	0.2143	0.9218
46	12.45	0.7878	0.2366	1.0244
48	12.69	0.8710	0.2620	1.1330
50	12.93	0.9567	0.2907	1.2474
52	13.16	1.0446	0.3227	1.3674
54	13.38	1.1346	0.3580	1.4926
56	13.60	1.2264	0.3964	1.6228
58	13.82	1.3198	0.4377	1.7575
60	14.03	1.4147	0.4816	1.8963

\* Adjusted figures

$$l_n(H-1.37) = 2.57459 - 10.29991/D \quad (\text{DBH } 4-36)$$

$$l_n H = 0.79578 + 0.45077 l_n D \quad (\text{DBH } 38-60)$$

$$l_n TV = -8.28600 + 0.02399 D - 0.000008134 D^2 H + 1.47981 l_n H \quad (\text{DBH } 4-60)$$

$$l_n TM = -15.30876 + 0.05484 D + 0.000006875 D^2 H + 4.29281 l_n D + 0.38713 l_n H$$

$$SW = TV - TM$$

TABLE - 9  
 VOLUME TABLE OF PHULAH (Acacia modesta) ON FARMLANDS  
 IN NON-IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	3.76	0.0000	0.0037 *	0.0037 *
6	4.81	0.0000	0.0095	0.0095
8	5.72	0.0000	0.0187	0.0187
10	6.55	0.0000	0.0314	0.0314
12	7.31	0.0000	0.0480	0.0480
14	8.02	0.0000	0.0688	0.0688
16	8.70	0.0000	0.0939	0.0939
18	9.34	0.0413	0.0823	0.1236
20	9.95	0.0623	0.0958	0.1580
22	10.54	0.0893	0.1081	0.1974
24	11.11	0.1228	0.1189	0.2417
26	11.67	0.1633	0.1280	0.2913
28	12.20	0.2108	0.1355	0.3463
30	12.72	0.2653	0.1414	0.4067
32	13.23	0.3265	0.1462	0.4727
34	13.72	0.3942	0.1503	0.5445
36	14.20	0.4678	0.1543	0.6221
38	14.67	0.5468	0.1589	0.7057
40	15.14	0.6303	0.1651	0.7953
42	15.59	0.7176	0.1736	0.8911
44	16.04	0.8078	0.1854	0.9932
46	16.47	0.9001	0.2016	1.1017
48	16.90	0.9936	0.2230	1.2166
50	17.32	1.0874	0.2507	1.3381
52	17.74	1.1806	0.2856	1.4662
54	18.15	1.2725	0.3286	1.6010
56	18.55	1.3621	0.3805	1.7427
58	18.95	1.4490	0.4423	1.8912
60	19.34	1.5322	0.5145	2.0468

\* Adjusted figures

$$l_n H = 0.48656 + 0.60468 l_n D \quad (\text{DBH 4-60})$$

$$l_n TV = -9.16055 + 1.91907 l_n D + 0.68172 l_n H \quad (\text{DBH 6-60})$$

$$l_n TM = -16.80296 - 0.05611 D + 4.59337 l_n D + 0.60407 l_n H \quad (\text{DBH 18-60})$$

$$SW = TV - TM$$

TABLE - 10  
 VOLUME TABLE OF POPLAR (Hybrid poplar) ON FARMLANDS  
 IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu. m)		
		TIMBER	SMALLWOOD	TOTAL
4	2.99	0.0000	0.0038	0.0038
6	4.43	0.0000	0.0091	0.0091
8	5.71	0.0000	0.0174	0.0174
10	6.86	0.0000	0.0292	0.0292
12	7.90	0.0000	0.0448	0.0448
14	8.84	0.0000	0.0647	0.0647
16	9.71	0.0000	0.0894	0.0894
18	10.50	0.0267*	0.0924*	0.1191
20	11.23	0.0587	0.0955	0.1542
22	11.91	0.0882	0.1069	0.1951
24	12.54	0.1262	0.1159	0.2420
26	13.13	0.1732	0.1221	0.2954
28	13.68	0.2296	0.1256	0.3553
30	14.20	0.2955	0.1266	0.4221
32	14.69	0.3704	0.1255	0.4959
34	15.14	0.4540	0.1232	0.5771
36	15.57	0.5452	0.1206	0.6659
38	15.98	0.6433	0.1190	0.7623
40	16.37	0.7469	0.1196	0.8665
42	16.73	0.8549	0.1239	0.9788
44	17.08	0.9658	0.1335	1.0992
46	17.41	1.0782	0.1497	1.2280
48	17.72	1.1909	0.1742	1.3651
50	18.02	1.3023	0.2083	1.5107
52	18.30	1.4113	0.2536	1.6649
54	18.58	1.5167	0.3111	1.8278
56	18.83	1.6173	0.3821	1.9995
58	19.08	1.7123	0.4677	2.1799
60	19.32	1.8007	0.5686	2.3693

\* Adjusted figures

$$l_n H = -0.55106 + 1.35576 l_n D - 0.12162 (l_n D)^2 \quad (\text{DBH } 4-60)$$

$$l_n TV = -8.44860 + 1.89418 l_n D + 0.08053 H \quad (\text{DBH } 4-60)$$

$$l_n TM = -19.15791 - 0.06491 D + 1.28009 l_n H \quad (\text{DBH } 20-60)$$

$$SW = TV - TM$$

TABLE - 11  
 VOLUME TABLE OF SHISHAM (*Dalbergia sissoo*) ON FARMLANDS  
 IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	3.48	0.0000	0.0035	0.0035
6	4.54	0.0000	0.0089	0.0089
8	5.49	0.0000	0.0175	0.0175
10	6.35	0.0000	0.0297	0.0297
12	7.16	0.0000	0.0459	0.0459
14	7.92	0.0000	0.0665	0.0665
16	8.65	0.0000	0.0918	0.0918
18	9.34	0.0285*	0.0937*	0.1222
20	10.01	0.0614*	0.0967*	0.1581
22	10.66	0.1001	0.0997	0.1998
24	11.28	0.1373	0.1103	0.2476
26	11.89	0.1824	0.1196	0.3020
28	12.48	0.2358	0.1274	0.3632
30	13.06	0.2979	0.1337	0.4316
32	13.63	0.3687	0.1390	0.5076
34	14.18	0.4482	0.1434	0.5916
36	14.72	0.5361	0.1477	0.6838
38	15.25	0.6323	0.1524	0.7847
40	15.77	0.7363	0.1583	0.8946
42	16.29	0.8475	0.1664	1.0139
44	16.79	0.9653	0.1776	1.1429
46	17.29	1.0890	0.1931	1.2821
48	17.78	1.2178	0.2139	1.4317
50	18.26	1.3509	0.2414	1.5923
52	18.74	1.4874	0.2767	1.7641
54	19.21	1.6265	0.3212	1.9477
56	19.67	1.7672	0.3760	2.1432
58	20.13	1.9087	0.4426	2.3513
60	20.58	2.0501	0.5221	2.5722

\* Adjusted figures

$$l_n H = 0.33837 + 0.65603 l_n D \quad (\text{DBH } 4-60)$$

$$l_n TV = -9.01744 + 2.02135 l_n D + 0.02945 H + 0.35709 l_n H \quad (\text{DBH } 4-60)$$

$$l_n TM = -15.42666 - 0.05173 D + 4.42448 l_n D + 0.05505 H \quad (\text{DBH } 22-60)$$

$$SW = TV - TM$$

TABLE - 12  
VOLUME TABLE OF SIMAL (*Bombax ceiba*) ON FARMLANDS  
IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	2.19	0.0000	0.0016	0.0016
6	3.08	0.0000	0.0049	0.0049
8	3.91	0.0000	0.0109	0.0109
10	4.71	0.0000	0.0200	0.0200
12	5.49	0.0000	0.0330	0.0330
14	6.24	0.0000	0.0503	0.0503
16	6.98	0.0000	0.0725	0.0725
18	7.70	0.0268*	0.0734*	0.1002
20	8.41	0.0595	0.0742	0.1337
22	9.10	0.0858	0.0878	0.1736
24	9.79	0.1184	0.1019	0.2203
26	10.46	0.1578	0.1165	0.2743
28	11.13	0.2046	0.1315	0.3361
30	11.79	0.2593	0.1466	0.4060
32	12.44	0.3225	0.1620	0.4845
34	13.09	0.3947	0.1774	0.5721
36	13.73	0.4763	0.1927	0.6690
38	14.36	0.5678	0.2080	0.7758
40	14.99	0.6698	0.2231	0.8929
42	15.61	0.7826	0.2380	1.0206
44	16.23	0.9067	0.2526	1.1593
46	16.84	1.0426	0.2669	1.3095
48	17.45	1.1907	0.2807	1.4714
50	18.06	1.3513	0.2942	1.6455
52	18.66	1.5249	0.3073	1.8322
54	19.25	1.7120	0.3198	2.0318
56	19.85	1.9128	0.3319	2.2446
58	20.44	2.1278	0.3434	2.4712
60	21.02	2.3573	0.3544	2.7117

\* Adjusted figures

$$l_n H = -0.37089 + 0.83446 l_n D \quad (\text{DBH } 4-60)$$

$$l_n TV = -9.86648 + 1.945520 l_n D + 0.95208 l_n H \quad (\text{DBH } 4-60)$$

$$l_n SW = -8.80702 - 0.02182 D + 2.2174 l_n D \quad (\text{DBH } 20-60)$$

$$TM = TV - SW$$

TABLE - 13  
 VOLUME TABLE OF SIRIS (*Albizzia labbek*) ON FARMLANDS  
 IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	VOLUME (cu.m)		
		TIMBER	SMALLWOOD	TOTAL
4	3.28	0.0000	0.0056	0.0056
6	4.14	0.0000	0.0124	0.0124
8	4.89	0.0000	0.0220	0.0220
10	5.56	0.0000	0.0346	0.0346
12	6.17	0.0000	0.0505	0.0505
14	6.74	0.0000	0.0700	0.0700
16	7.28	0.0000	0.0933	0.0933
18	7.79	0.0000	0.1209	0.1209
20	8.28	0.0399	0.1132	0.1531
22	8.75	0.0601	0.1301	0.1903
24	9.20	0.0857	0.1471	0.2329
26	9.63	0.1173	0.1640	0.2813
28	10.05	0.1554	0.1807	0.3361
30	10.46	0.2007	0.1972	0.3979
32	10.85	0.2538	0.2133	0.4671
34	11.24	0.3154	0.2289	0.5443
36	11.61	0.3861	0.2442	0.6303
38	11.98	0.4668	0.2589	0.7257
40	12.34	0.5581	0.2731	0.8312
42	12.69	0.6609	0.2867	0.9477
44	13.03	0.7761	0.2998	1.0759
46	13.37	0.9045	0.3123	1.2168
48	13.70	1.0472	0.3243	1.3714
50	14.03	1.2051	0.3356	1.5407
52	14.35	1.3793	0.3464	1.7257
54	14.66	1.5710	0.3566	1.9277
56	14.98	1.7815	0.3663	2.1478
58	15.28	2.0120	0.3754	2.3874
60	15.58	2.2640	0.3839	2.6478

$$\begin{aligned}
 l_n H &= 0.38972 + 0.57552 l_n D \quad (\text{DBH } 4-60) \\
 l_n TV &= -8.30799 + 0.02037 D + 1.15365 l_n D + 1.21485 l_n H \quad (\text{DBH } 4-60) \\
 l_n SW &= -8.90580 - 0.20095 H + 0.88179 l_n D + 2.71992 l_n H \quad (\text{DBH } 20-60) \\
 TM &= TV - SW
 \end{aligned}$$

TABLE - 14  
VOLUME TABLE OF WILLOW (*Salix species*) ON FARMLANDS  
IN IRRIGATED AREAS OF PUNJAB

D.B.H (cm)	HEIGHT (m)	TIMBER	VOLUME (cu.m)	
			SMALLWOOD	TOTAL
4	2.55	0.0000	0.0019	0.0019
6	3.88	0.0000	0.0063	0.0063
8	5.04	0.0000	0.0145	0.0145
10	5.98	0.0000	0.0269	0.0269
12	6.74	0.0000	0.0438	0.0438
14	7.35	0.0000	0.0653	0.0653
16	7.86	0.0000	0.0914	0.0914
18	8.28	0.0222*	0.1000*	0.1222
20	8.64	0.0487	0.1089	0.1576
22	8.95	0.0683	0.1293	0.1976
24	9.21	0.0917	0.1501	0.2419
26	9.44	0.1192	0.1710	0.2903
28	9.65	0.1508	0.1917	0.3425
30	9.83	0.1863	0.2120	0.3983
32	9.99	0.2256	0.2315	0.4571
34	10.14	0.2684	0.2502	0.5186
36	10.27	0.3144	0.2679	0.5822
38	10.39	0.3630	0.2844	0.6474
40	10.50	0.4139	0.2996	0.7135
42	10.60	0.4663	0.3136	0.7799
44	10.69	0.5196	0.3261	0.8458
46	10.77	0.5732	0.3373	0.9106
48	10.85	0.6263	0.3471	0.9734
50	10.92	0.6782	0.3554	1.0336
52	10.99	0.7281	0.3624	1.0905
54	11.05	0.7751	0.3681	1.1432
56	11.11	0.8188	0.3724	1.1911
58	11.16	0.8582	0.3755	1.2337
60	11.22	0.8928	0.3773	1.2702

\* Adjusted figures

$$l_n(H-1.37) = 2.43866 - 9.10025/D \quad (\text{DBH } 4-60)$$

$$l_n TV = -10.01681 - 0.00000223 D^3 + 2.11898 l_n D + 0.85295 l_n H \quad (\text{DBH } 4-60)$$

$$l_n SW = -9.48652 - 0.043560 + 2.71729 l_n D \quad (\text{DBH } 20-60)$$

$$TM = TV - SW$$

1. BAKAIN (*Melia azedarach*) on farmlands in Punjab irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<b>a. Height equations</b>							
1.	$H = -3.99525 + 4.63202$	0.70 21	0.49 30	2.7 9	291.6 9	302	Const=0.0000, $l_n D = 0.0000$
2.	$H = 2.96733 + 0.39720 D - 0.003450 D^2$	0.70 51	0.49 72	2.7 9	147.8 3	302	Const=0.0000, $D = 0.0000$ , $D^2 = 0.0001$
3.	$l_n H = 0.74143 + 0.49198 l_n D$	0.77 00	0.59 30	0.2 4	437.0 3	302	Const=0.0454, $l_n D = 0.0000$
4.	$l_n (H-1.37) = 2.61350 - 9.35249/D$	0.75 88	0.57 58	0.3 0	407.2 7	302	Const=0.0000, $1/D = 0.0000$
<b>b. Timber volume</b>							
5.	$TM = -0.05463 + 0.0000307 D^2 H$	0.93 76	0.87 90	0.1 3	1482. 36	206	Const=0.0008, $D^2 H = 0.0000$ ,
6.	$l_n TM = -12.64439 + 3.07164 l_n D - 0.0000034 D^2 + 0.07378 H$	0.95 49	0.91 19	0.2 8	697.1 1	206	Const=0.0000, $l_n D = 0.0000$ , $D^2 = 0.0016$ , $H = 0.0000$
<b>c. Small wood volume</b>							
7.	$SW = -0.04111 - 0.0000022 D^2 H + 0.007372 D$	0.81 96	0.67 17	0.0 5	305.8 5.	302	Const=0.0000, $D^2 H = 0.0000$ , $D = 0.0005$
8.	$l_n SW = -9.02162 - 0.10798 H + 0.02256 D + 1.66967 l_n D + 1.39286 l_n H$	0.92 11	0.84 85	0.3 5	415.8 6	302	Const=0.0000, $H = 0.0000$ , $D = 0.0002$ , $l_n D = 0.0000$ , $l_n H = 0.0000$
<b>d. Total volume</b>							
9.	$TV = 0.18969 - 0.14834 l_n D + 0.01551 D + 0.0000256 D^2 H$	0.96 62	0.93 35	0.1 1	1393. 53	302	Const=0.0454, $l_n D = 0.0048$ , $D = 0.0000$ , $D^2 H = 0.0000$
10.	$l_n TV = -8.97921 + 2.04035 l_n D + 0.03243 H + 0.29666 l_n H$	0.99 09	0.98 20	0.1 9	5403. 06	302	Const=0.0000, $l_n D = 0.0000$ , $H = 0.0106$ , $l_n H = 0.0421$

2. BER on farmlands in Punjab (irrigated and non-irrigated) areas

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
a. <u>Height equations</u>							
1.	$H = -5.33582 + 4.92761 l_n D$	0.79 41	0.63 06	2.1 9	749.3 2	441	Const=0.0000, $l_n D$
2.	$H = 0.29382 + 0.58973 D - 0.006580 D^2$	0.81 54	0.66 49	2.0 9	434.5 4	441	Const=0.4943, D=0.0000, $D^2=0.0000$
3.	$l_n H = -1.25071 + 1.74457 l_n D - 0.19446 (l_n D)^2$	0.86 27	0.74 32	0.2 0	636.5 2	441	Const=0.0000, $l_n D=0.0000$ , $(l_n D)^2=0.0000$
4.	$l_n (H-1.37) = 2.69390 - 12.03077/D$	0.86 10	0.74 13	0.2 5	1257. 70	441	Const=0.0000, $1/D=0.0000$
b. <u>Timber volume</u>							
5.	$TM = -0.009124 + 0.0000289 D^2 H$	0.78 45	0.61 54	0.2 7	484.9 0	305	Const=0.7380, $D^2 H=0.0000$
6.	$l_n TM = -16.90177 - 0.06239 D + 4.66439 l_n D + 0.65765 l_n H$	0.94 32	0.88 96	0.3 2	808.2 5	305	Const=0.0000, D=0.0000, $l_n D=0.0000$ , $l_n H=0.0000$
c. <u>Small wood volume</u>							
7.	$SW = -0.01940 + 0.005354D + 0.0000019 D^2 H$	0.81 69	0.66 73	0.0 7	439.1 5	441	Const=0.0879, D=0.0000, $D^2 H=0.0151$
8.	$l_n SW = -7.86050 + 1.11833 l_n D - 0.08604 H + 1.30634 l_n H$	0.89 12	0.79 43	0.4 3	562.5 1	441	Const=0.0000 $l_n D=0.0000$ , H=0.0005, $l_n H=0.0000$
d. <u>Total volume</u>							
9.	$TV = -0.08457 + 0.00810 l_n D + 0.0000284 D^2 H$	0.89 44	0.79 99	0.2 3	875.2 9	441	Const=0.0257, D=0.0005, $D^2 H=0.0000$
10.	$l_n TV = -8.78248 + 0.009947 D + 1.71616 l_n D + 0.71005 l_n H$	0.98 03	0.96 09	0.2 8	3582. 68	441	Const=0.0000, D=0.0047, $l_n D=0.0000$ , $l_n H=0.0000$

3. EUCLYPTUS (*Eucalyptus camaldulensis*) irrigated areas of Punjab including NWFP plain areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<u>a. Height equations</u>							
1.	$H = -1.44089 + 5.89760 \ln D$	0.86 84	0.75 42	2.2 1	174.8 6	59	Const=0.3473, $\ln D = 0.0000$
2.	$H = 7.09720 - 0.004601 D^2 + 0.52598 D$	0.86 25	0.74 40	2.2 8	81.35	59	Const=0.0000, $D^2 = 0.0002, D = 0.0000$
3.	$\ln H = 0.85754 + 0.89457 \ln D - 0.08430 (\ln D)^2$	0.89 42	0.79 64	0.1 3	109.5 0	59	Const=0.0113, $\ln D = 0.0001,$ $(\ln D)^2 = 0.0129$
4.	$\ln(H-1.3) = 3.09673 - 6.87132/D$	0.87 52	0.76 59	0.1 5	186.4 8	59	Const=0.0000, $1/D = 0.0000$
<u>b. Timber volume</u>							
5.	$TM = -0.86642 + 0.04502 D$	0.94 55	0.89 40	0.2 1	362.7 7	45	Const=0.0000, $D = 0.0000$
6.	$\ln TM = -22.60668 - 0.11649 D + 6.88886 \ln D + 0.61030 \ln H$	0.98 37	0.96 77	0.1 9	409.5 6	45	Const=0.0000, $D = 0.0000,$ $\ln D = 0.0000,$ $\ln H = 0.0146$
<u>c. Small wood volume</u>							
7.	$SW = -0.007429 + 0.00664 D$	0.84 45	0.71 31	0.0 7	141.6 8	59	Const=0.7252, $D = 0.0000$
8.	$\ln SW = -10.23894 - 0.12327 D + 0.0000105 D^2 + 3.53455 \ln D$	0.90 51	0.81 92	0.4 6	83.07	59	Const=0.0000, $D = 0.0009,$ $D^2 = 0.0143,$ $\ln D = 0.0000$
<u>d. Total volume.</u>							
9.	$TV = -0.14788 + 0.000991 D^2 - 0.000012 D + 0.000016 D^2 H$	0.96 99	0.94 08	0.2 0	291.2 3	59	Const=0.0143, $D^2 = 0.0000,$ $D^3 = 0.0000,$ $D^2 H = 0.0000$
10.	$\ln TV = -11.30825 - 0.00000782746 D^2 H + 2.23706 \ln D + 1.14625 \ln H$	0.99 25	0.98 5	0.2 0	1215. 34	59	Const=0.0000, $D^2 H = 0.0000,$ $\ln D = 0.0000,$ $\ln H = 0.0000$

4. EUCALYPTUS (*Eucalyptus camaldulensis*) Non-irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<u>a. Height equations</u>							
1.	$H = -6.61316 + 6.52994 l_n D$	0.82 18	0.67 53	2.6 0	108.1 6	54	Const=0.0013, $l_n D = 0.0000$
2.	$H = 5.51264 + 0.32135 D$	0.82 18	0.67 54	2.6 0	108.2 0	54	Const=0.0000, $D = 0.0000$
3.	$l_n H = 0.89135 + 0.53731 l_n D$	0.87 30	0.76 21	0.1 7	166.5 4	54	Const=0.0000, $l_n D = 0.0000$
4.	$l_n (H - 1.37) = 2.92265 - 9.20747/D$	0.85 70	0.73 44	0.2 1	143.7 6	54	Const=0.0000, $1/D = 0.0000$
<u>b. Timber volume</u>							
5.	$TM = -0.91339 + 0.27798 l_n D + 0.000026 D^2 H$	0.99 42	0.98 84	0.0 4	1240. 35	32	Const=0.0000, $l_n D = 0.0001$ , $D^2 H = 0.0000$ ,
6.	$l_n TM = -20.88262 - 0.001309 D + 5.51561 l_n D + 0.86472 l_n H$	0.99 18	0.98 37	0.1 1	563.4 1	32	Const=0.0000, $D^2 = 0.0000$ , $l_n D = 0.0000$ , $l_n H = 0.0000$
<u>c. Small wood volume</u>							
7.	$SW = -6.05579 + 1.17086 l_n D$	0.74 83	0.65 00	0.0 4	68.73	54	Const=0.0000, $l_n D = 0.0000$
8.	$l_n SW = -9.46719 - 0.09538 D + 3.04731 l_n D$					54	Const=0.0000, $D = 0.0001$ , $l_n D = 0.0000$ ,
<u>d. Total volume.</u>							
9.	$TV = -0.009444 + 0.000137 D^2 + 0.000028 D^2 H$	0.99 23	0.98 47	0.0 5	1636. 61	54	Const=0.1601, $D = 0.0001$ $D^2 H = 0.0000$
10.	$l_n TV = -9.90534 + 2.05510 l_n D + 0.81168 l_n H$	0.99 77	0.99 54	0.1 0	5725. 92	54	Const=0.0000, $l_n D = 0.0000$ , $l_n H = 0.0000$ ,

5. FRASH on farmlands in Punjab irrigated & Non-irrigated areas combined.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<u>a. Height equations</u>							
1.	$H = -8.67351 + 6.28863 l_n D$	0.83 26	0.69 33	2.6 1	788.8 5	351	Const=0.0000, $l_n D = 0.0000$
2.	$H = 1.59114 + 0.45895 D - 0.003284 D^2$	0.83 92	0.70 43	2.5 7	414.3 5	351	Const=0.0058, $D = 0.0000, D^2 = 0.0000$
3.	$l_n H = -0.28335 + 1.03972 l_n D - 0.06608 (l_n D)^2$	0.89 42	0.79 96	0.2 0	694.2 4	351	Const=0.2221, $l_n D = 0.0000,$ $(l_n D)^2 = 0.0099$
4.	$l_n (H - 1.37) = 2.83633 - 12.6825/D$	0.87 29	0.76 20	0.2 6	1117. 32	351	Const=0.0000, $1/D = 0.0000$
<u>b. Timber volume</u>							
5.	$TM = -0.06341 + 0.000130 D^2 + 0.000023 D^2 H$	0.94 20	0.88 73	0.1 9	1035. 11	266	Const=0.0147, D =0.0005, $D^2 H = 0.0000$
6.	$l_n TM = -15.09242 - 0.03859 D + 3.80834 l_n D + 0.82208 l_n H$	0.96 97	0.94 03	0.2 4	1375. 69	266	Const=0.0000, $D = 0.0005,$ $l_n D = 0.0000,$ $l_n H = 0.0000$
<u>c. Small wood volume</u>							
7.	$SW = 0.05275 + 0.0034886 D + 0.01387 H - 0.07588 l_n H + 2.59551 l_n D$	0.78 27	0.61 28	0.0 7	183.0 2	351	Const=0.2164, $D = 0.0000, H = 0.0000,$ $l_n H = 0.0137$
8.	$l_n SW = -8.89777 - 0.07167 D + 2.56142 l_n D + 0.000019915 D^2 H$	0.89 30	0.79 75	0.4 4	455.5 6	351	Const=0.0000, $D = 0.0000,$ $l_n D = 0.0000,$ $D^2 H = 0.0000$
<u>d. Total volume.</u>							
9.	$TV = -0.06779 + 0.006764 D + 0.000028369 D^2 H$	0.96 31	0.92 75	0.1 8	2225. 54	351	Const=0.0270, $D = 0.0000,$ $D^2 H = 0.0000$
10.	$l_n TV = -9.41521 + 2.00801 l_n D + 0.68707 l_n H$	0.98 66	0.67 35	0.2 5	6382. 62	351	Const=0.0000, $l_n D = 0.0000,$ $l_n H = 0.0000$

6. JAND on farmland in Punjab (irrigated and non irrigated) areas combined data.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<u>a. Height equations</u>							
1.	$H = -7.4607 + 5.30143 l_n D$	0.86 89	0.75 50	1.7 9	329.6 7	109	const=0.0000, $l_n D = 0.000$
2.	$H = 1.40251 + 0.36372 D - 0.002266 D^2$	0.88 50	0.78 32	1.6 9	191.4 9	109	const=0.0511, $D = 0.0000$ , $D^2 = 0.0134$
3.	$l_n H = 0.05406 + 0.66067 l_n D$	0.91 31	0.83 37	0.1 7	536.4 0	109	const=0.5630, $l_n D = 0.0000$
4.	$l_n (H - 1.37) = 2.60352 - 12.66684/D$	0.86 92	0.75 55	0.2 7	330.6 4	109	const=0.0000, $1/D = 0.0000$
<u>b. Timber volume</u>							
5.	$TM = -0.04970 + 0.000034 D^2 H$	0.96 35	0.92 84	0.1 1	984.9 6	78	const=0.260, $D^2 H = 0.0000$
6.	$l_n TM = -12.58175 + 2.61423 l_n D + 0.95587 l_n H$	0.92 23	.850 64	0.4 1	213.5 3	78	const=0.0000, $l_n D = 0.0000$ , $l_n H = 0.0007$
<u>c. Small wood volume</u>							
7.	$SW = 0.06119 + 0.00546 D + 0.0060933 H$	.885 4	0.78 40	0.0 5	192.3 5	109	const=0.0000, $D = 0.0000$ , $H = 0.0311$
8.	$l_n SW = -9.02968 - 0.18235 H + 0.88079 l_n D + 2.61755 l_n H$	0.94 90	0.90 06	0.3 4	317.0 6	109	const=0.0000, $H = 0.0000$ , $l_n D = 0.0000$ , $l_n H = 0.0000$
<u>d. Total volume.</u>							
9.	$TV = -0.007033 + 0.00014365 D^2 + 0.000031675 D^2 H$	0.98 00	0.96 04	0.1 0	1286. 54	109	const=0.6897, $D^2 = 0.0052$ , $D^2 H = 0.0000$
10.	$l_n TV = -9.78932 + 1.85728 l_n D + 1.09828 l_n H$	0.98 63	0.97 27	0.2 6	1888. 48	109	const=0.0000, $l_n D = 0.0000$ , $l_n H = 0.0000$

7. KIKAR (*Acasia nilotica*) irrigated & non-irrigated areas combined.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<b>a. Height equations</b>							
1.	$H = -9.23742 + 6.45892 l_n D$	0.83 25	0.69 30	2.6 7	2830. 63	1256	Const=0.0000, $l_n D = 0.0000$
2.	$H = 2.43296 + 0.36900 D - 0.001655 D^2$	0.84 97	0.72 20	2.5 5	1626. 98	1256	Const=0.0000, $D = 0.0000$ , $D^2 = 0.0000$
3.	$l_n H = 0.30911 + 0.63520 l_n D$	0.90 62	0.82 11	0.1 8	5756. 04	1256	Const=0.0000, $l_n$ $D = 0.0000$ ,
4.	$l_n (H - 1.37) = 2.80255 - 11.98626/D$	0.86 38	0.74 62	0.2 6	3686. 72	1256	Const=0.0000, $1/D = 0.0000$
<b>b. Timber volume</b>							
5.	$TM = -0.07353 + 0.0001123 D^2 + 0.0000246 D^2 H$	0.95 33	0.90 87	0.1 9	4613. 08	930	Const=0.0000, $D^2 = 0.0000$ , $D^2 H = 0.0000$
6.	$l_n TM = -14.38483 - 0.02732 D + 3.44723 l_n D + 0.87656 l_n H$	0.96 02	0.92 20	0.2 9	3648. 94	930	Const=0.0000, $D = 0.0000$ , $l_n H = 0.0000$ , $l_n D = 0.0000$
<b>c. Small wood volume</b>							
7.	$SW = -0.06390 + 0.003308 D + 0.01175 H$	0.83 55	0.69 80	0.0 7	1448. 18	1256	Const=0.0000, $D = 0.0000$ , $H = 0.0000$
8.	$l_n SW = -9.06051 - 0.05572 D + 2.00190 l_n D + 0.05291 H + 1.06234 l_n H + 0.000014856 D^2 H$	0.91 73	0.84 14	0.3 8	1326. 29	1256	Const=0.0000, $D = 0.0000$ , $l_n D = 0.0000$ , $H = 0.0028$ , $l_n H = 0.0000$ , $D^2 H = 0.0000$
<b>d. Total volume</b>							
9.	$l_n TV = -9.17527 + 1.85096 l_n D + 0.83427 l_n H$	0.96 76	0.93 62	0.1 8	9185. 86	1256	Const=0.0000, $D = 0.0000$ , $D^2 H = 0.0000$
10.	$TV = -0.06351 + 0.0070816 D + 0.00002964 D^2 H$	0.98 80	0.97 61	0.2 3	25550 .4	1256	Const=0.0000, $l_n D = 0.0000$ , $l_n H = 0.0000$

8. MULBERRY (*Morus alba*) on farmlands in the Punjab irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
a. <u>Height equations</u>							
1.	$H = -4.24265 + 4.47854 D$	0.60 14	0.36 17	3.2 8	210.2 1	373	Const=0.0001, $l_n D = 0.0000$
2.	$H = 1.93294 + 0.43645 D - 0.004187 D^2$	0.61 04	0.37 26	3.2 5	109.8 5	373	Const=0.0182, $D = 0.0000, D^2 = 0.0000$
3.	$l_n H = 0.79578 + 0.45077 l_n D$	0.66 16	0.43 77	0.2 8	288.7 9	373	Const=0.0000, $l_n D = 0.0000$
4.	$l_n (H - 1.37) = 2.57459 - 10.29991/D$	0.65 86	0.43 37	0.3 3	284.1 6	373	Const=0.0000 $1/D = 0.0000$
b. <u>Timber volume</u>							
5.	$TM = -0.06795 + 0.0001699 D^2 + 0.0000187 D^2 H$	0.94 66	0.89 60	0.1 5	1249. 72	293	Const=0.0001, $D^2 = 0.0000,$ $D^2 H = 0.0000$
6.	$l TM = -15.30876 + 0.05484 D + 0.000006875 D^2 H + 4.29281 l_n D + 0.38713 l_n H$	0.96 89	0.93 88	0.2 3	1105. 00	293	Const=0.0000, $D = 0.0000,$ $D^2 H = 0.0030,$ $l_n D = 0.0000,$ $l_n H = 0.0000$
c. <u>Small wood volume</u>							
7.	$SW = -0.01329 + 0.005330 D$	0.75 42	0.56 89	0.0 7	489.4 8	373	Const=0.1297, $D = 0.0000$
8.	$l_n SW = -5.97401 + 1.16465 l_n D$	0.85 71	0.73 46	0.3 9	1026. 75	373	Const=0.0000, $l_n D = 0.0000$
d. <u>Total volume.</u>							
9.	$TV = 0.03221 + 0.0003849 D^2 - 0.0000031 D^3 + 0.00002266 D^2 H - 0.0009893 H$	0.96 52	0.93 15	0.1 5	1251. 87	373	Const=0.3695, $D^2 = 0.0000,$ $D^3 = 0.0027,$ $D^2 H = 0.0000,$ $H = 0.0448$
10.	$l TV = -8.28600 + 0.02399 D - 0.000008134 D^2 H + 1.47981 l_n H$	0.98 20	0.96 42	0.2 4	2481. 20	373	Const=0.0000, $D = 0.0001,$ $D^2 H = 0.0030,$ $l_n D = 0.0000,$ $l_n H = 0.0000$

9. PHULAH I (*Acacia modesta*) on farmlands of Punjab

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
a. <u>Height equations</u>							
1.	$H = -10.71439 + 7.12168 \ln D$	0.83 79	0.70 21	2.4 4	443.1 3	190	Const=0.0000, $\ln D=0.0000$
2.	$H = 2.39793 + 0.44539 D - 0.002879 D^2$	0.84 37	0.71 19	2.4 0	231.0 0	190	Const=0.0085, $D=0.0000$ $D_n=0.0010$
3.	$\ln H = 0.48656 + 0.60468 \ln D$	0.85 93	0.73 83	0.1 9	530.4 4	190	Const=0.0000, $\ln D=0.0000$
4.	$\ln(H-1.37) = 2.98642 - 14.81929/D$	0.83 64	0.69 95	0.2 3	437.5 8	190	Const=0.0000, $1/D=0.0000$
b. <u>Timber volume</u>							
5.	$TM = 0.009076 + 0.000015 D^2 H + 0.0000032 D^3$	0.96 34	0.92 81	0.1 4	949.0 9	150	Const=0.6266, $D^2 H=0.0000$ , $D^3=0.0000$
6.	$\ln TM = -16.80296 - 0.05611 D + 4.59337 \ln D + 0.60407 \ln H$	0.97 30	0.94 67	0.2 4	863.5 4	150	Const=0.0000, $D=0.0000$ , $\ln D=0.0000$ , $\ln H=0.0000$
c. <u>Small wood volume</u>							
7.	$SW = -0.003166 + 0.005224 D$	0.67 64	0.45 75	0.0 8	158.5 5	190	Const=0.8311, $D=0.0000$
8.	$\ln SW = -6.11219 + 0.85161 \ln D + 0.48662 \ln H$	0.83 74	0.70 12	0.4 0	219.4 2	190	Const=0.0000, $\ln D=0.0000$ , $\ln H=0.0018$
d. <u>Total volume.</u>							
9.	$TV = 0.009215 + 0.0002336 D^2 + 0.00001714 D^2 H$	0.96 63	0.93 37	0.1 5	1317. 33	190	Const=0.6466, $D^2=0.0000$ , $D^2 H=0.0000$ ,
10.	$\ln TV = -9.16055 + 1.91907 \ln D + 0.68172 \ln H$	0.98 26	0.96 55	0.2 3	2613. 83	190	Const=0.0000, $\ln D=0.0000$ , $\ln H=0.0000$

10. POPLAR on farmlands in the Punjab irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<u>a. Height equations</u>							
1.	$H = -8.75157 + 6.82346 l_n D$	0.88 66	.786 1	1.8 9	800.9 1	220	const=0.0000, $l_n D=0.0000$
2.	$H = 1.90261 + 0.55593 D - 0.004662 D^2$	.888 8	.7900	1.8 8	408.1 4	220	const=0.0026, $D=0.0000$ , $D^2=0.0000$
3.	$l_n H = -0.55106 + 1.35576 l_n D - 0.12162 (l_n D)^2$	0.91 99	0.84 63	0.1 4	597.2 2	220	const=0.0353, $l_n D=0.0000$ , $(l_n D)^2=0.0000$
4.	$l_n (H-1.37) = 3.00397 - 12.68281/D$	0.90 86	.825 5	0.1 7	1031. 20	220	const=0.0000, $1/D=0.0000$
<u>b. Timber volume</u>							
5.	$TM = -0.06462 + 0.0000303 D^2 H$	0.95 43	0.91 07	0.1 5	1804. 02	179	const=0.0034, $D^2 H=0.0000$
6.	$l_n TM = -19.15791 - 0.064910 + 1.28009 l_n H$	.972 2	.945 1	0.2 2	1003. 94	179	const=0.0000, $D=0.0000$ , $l_n H=0.0000$
<u>c. Small wood volume</u>							
7.	$SW = -0.01571 + 0.000937 D + 0.00000049 D^3 + 0.006947 H$	0.72 36	0.52 36	0.0 6	79.14	220	const=0.3644, $D=0.4187$ , $D^3=0.0255$
8.	$l_n SW = -8.59836 + 0.000003163 D^3 - 0.16642 H + 3.31359 l_n H$	0.86 07	0.74 08	0.3 7	205.8 2	220	const=0.0000, $D^3=0.0000$ , $H=0.0000$ , $l_n H=0.0000$
<u>d. Total volume.</u>							
9.	$TV = -0.003840 - 0.00000214 D^3 + 0.000040 D^2 H$	0.97 07	.942 3	0.1 4	1770. 15	220	const=.8263, $l^2 H=.0000$ , $D^3=.0305$
10.	$l_n TV = -8.44860 + 1.89418 l_n D + 0.08053 H$	.992 0	.984 0	0.1 7	6683. 57	220	const=.0000, $l_n D=.0000$ , $H=.0000$

11. SHISHAM (*Delbergia sissoo*) in Punjab farmlands irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<b>a. Height equations</b>							
1.	$H = -11.2053 + 7.42187 \ln D$	.821	0.7781	2.37	2938.31	840	Const=0.0000, $\ln D=0.0000$
2.	$H = 2.13998 + 0.44514 D - 0.002377 D^2$	0.8972	0.8050	2.22	1727.72	840	Const=0.0000, $D=0.0000$ , $D^2=0.0000$
3.	$\ln H = 0.33837 + 0.65603 \ln D$	0.9289	0.8629	0.16	5275.53	840	Const=0.0000, $\ln D=0.0000$
4.	$\ln(H-1.37) = 2.95004 - 12.69482/D$	0.8815	0.7770	0.23	2919.88	840	Const=0.0000, $1/D=0.0000$
<b>b. Timber volume</b>							
5.	$TM = -0.04569 + 0.00003056 D^2 H$	0.9685	0.9380	0.17	9710.88	644	Const=0.0000, $D^2 H=0.0000$
6.	$\ln TM = -15.42666 - 0.05173 D + 4.42448 \ln D + 0.05505 H$	0.9831	0.9664	0.19	6143.83	644	Const=0.0000, $D=0.0000$ , $\ln D=0.0000$ , $H=0.0000$
<b>c. Small wood volume</b>							
7.	$SW = -0.0027103 + 0.004226 D + 0.000001195 D^2 H$	0.7814	0.6106	0.07	656.15	840	Const=0.7532, $D=0.0000$ , $D^2 H=0.0001$
8.	$\ln SW = -9.66440 - 0.06294 D + 1.99612 \ln D + 0.000028253 D^2 H - 0.14483 H + 1.69390 \ln H$	0.8779	0.7706	0.43	557.67	840	Const=0.7532, $D=0.0000$ , $\ln D=0.0000$ , $D^2 H=0.0000$ , $H=0.0000$ , $\ln H=0.0000$
<b>d. Total volume.</b>							
9.	$TV = -0.03714 + 0.0037885 D + 0.00003196 D^2 H$	0.9778	0.9560	0.16	9092.30	840	Const=0.0548, $D=0.0001$ , $D^2 H=0.0000$
10.	$\ln TV = -9.01744 + 2.02135 \ln D + 0.02945 H + 0.35709 \ln H$	0.9923	0.9847	0.18	17880.49	840	Const=0.0000, $\ln D=0.0000$ , $H=0.0000$ , $\ln H=0.0001$

## 12. SIMAL (*Bombax ceiba*) irrigated areas

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients
<b>a. Height equations</b>							
1.	$H = -14.59286 + 8.16638 l_n D$	0.89 92	0.80 85	2.4 5	363.07	88	Const=0.0000, $l_n D=0.0000$
2.	$H = -2.37556 - 0.005792 D^2 + .69266 D$	0.91 95	0.84 54	2.2 1	232.43	88	Const=0.0223, $D^2=0.0000, D=0.0000$
3.	$l_n H = -0.37089 + 0.83446 l_n D$	0.94 12	0.88 59	0.1 8	668.00	88	Const=0.0011, $l_n D=0.0000$
4.	$l_n (H-1.37) = 3.00370 - 17.1259048/D$	0.90 49	0.81 89	0.2 8	388.81	88	Const=0.0000, $1/D=0.0000$
<b>b. Timber volume</b>							
5.	$TM = -0.03667 + 0.000031 D^2 H$	0.94 35	0.89 82	0.2 2	519.03	66	Const=0.4339, $D^2 H=0.0000$
6.	$l_n TM = -19.56654 - 0.07716 D + 5.63545 l_n D + 0.58551 l_n H$	0.98 11	0.96 26	0.2 2	531.56	66	Const=0.0000, $D=0.0000, l_n D=0.0000, l_n H=0.0008$
<b>c. Small wood volume</b>							
7.	$SW = -0.05824 + 0.0073517 D$	0.81 98	0.67 21	0.0 8	176.30	88	Const=0.0048, $D=0.0000$
8.	$l_n SW = -8.80702 - 0.02182 D + 2.2174 l_n D$	0.94 41	0.89 13	0.3 6	348.40	88	Const=0.0000, $D=0.0114, l_n D=0.0000$
<b>d. Total volume equations</b>							
9.	$TV = -0.01323 + 0.0001864 D^2 + 0.00002663 D^2 H$	0.96 64	0.93 39	0.2 0	600.33	88	Const=0.7240, $D^2 H=0.0000, D=0.0339$
10.	$l_n TV = -9.86648 + 1.945520 l_n D + 0.95208 l_n H$	0.99 42	0.98 83	0.1 9	3599.5	88	Const=0.000, $l_n D=0.0000, l_n H=0.0000$

13. SIRIS on farmlands of Punjab irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<b>a. Height equations</b>							
1.	$H = -6.06573 + 5.01160 l_n D$	0.82 46	0.68 00	1.9 5	293.2 7	140	Const=0.0000, $l_n D = 0.0000$
2.	$H = 1.75317 + 0.40651 D - 0.003337 D^2$	0.83 37	0.69 50	1.9 1	156.1 0	140	Const=0.0172, $D = 0.0000, D^2 = 0.0001$
3.	$l_n H = 0.38972 + 0.57552 l_n D$	0.86 80	0.75 34	0.1 9	421.6 3	140	Const=0.0000, $l_n D = 0.0000$
4.	$l_n (H - 1.37) = 2.63106 - 11.63827/D$	0.84 43	0.71 28	0.2 5	342.5 1	140	Const=0.0000, $1/D = 0.0000,$
<b>b. Timber volume</b>							
5.	$TM = -0.06873 - 0.00000227 D^3 + 0.0000412 D^2 H$	0.95 53	0.91 26	0.1 2	516.9 0	102	Const=0.0047, $D^3 = 0.0227,$ $D^2 H = 0.0000$
6.	$l_n TM = -16.65245 - 0.04561 D + 3.98875 l_n D + 1.28992 l_n H$	0.97 46	0.94 99	0.2 3	619.5 3	102	Const=0.0000, $D = 0.0002,$ $l_n D = 0.0000,$ $l_n H = 0.0000$
<b>c. Small wood volume</b>							
7.	$SW = -0.07031 + 0.01002 D - 0.00000075 D^3$	0.83 56	0.69 82	0.0 7	158.4 6	140	Const=0.0015, $D = 0.0000, D^3 = 0.0169$
8.	$l_n SW = -8.90580 - 0.20095 H + 0.88179 l_n D + 2.71992 l_n H$	0.89 68	0.80 43	0.4 2	186.3 2	140	Const=0.0000, $H = 0.0000,$ $l_n D = 0.0000,$ $l_n H = 0.0000$
<b>d. Total volume.</b>							
9.	$TV = -0.03487 + 0.000286 D^2 - 0.0000059 D^3 + 0.000042475 D^2 H$	0.97 05	0.94 18	0.1 3	733.8 8	140	Const=0.1825, $D^3 = 0.0000,$ $D^2 = 0.0000,$ $D^2 H = 0.0000$
10.	$l_n TV = -8.30799 + 0.02037 D + 1.15365 l_n D + 1.21485 l_n H$	0.96 02	0.92 19	0.3 9	534.9 9	140	Const=0.0000, $l_n D = 0.0000,$ $D = 0.0165,$ $l_n H = 0.0000,$

14. WILLOW in Punjab on farmlands irrigated areas.

S. No.	Equations	R	R <sup>2</sup>	SE	F-VALUE	N	Significance of coefficients.
<b>a. Height equations</b>							
1.	$H = -1.67392 + 3.37339 l_n D$	0.86 28	0.74 44	1.1 9	168.9 4	60	const = 0.464, $l_n D = 0.00007$
2.	$H = 3.83832 - 0.002645 D^2 + 0.29267 D$	0.83 51	0.69 75	1.3 1	65.70	60	const = 0.0000, $D^2 = 0.0029$ , $D = 0.0000$
3.	$l_n H = -0.68584 - 0.17440 (l_n D)^2 + 1.46953 l_n D$	0.90 77	0.82 39	0.1 3	133.3 7	60	const = 0.0718, $(l_n D)^2 = 0.0000$ , $l_n D = 0.0000$
4.	$l_n (H - 1.37) = 2.43866 - 9.10025/D$	0.91 16	0.83 10	0.1 6	285.1 6	60	const = 0.0000, $1/D = 0.0000$
<b>b. Timber volume</b>							
5.	$TM = -0.07221 - 0.00000493 D + 0.00004666 D^2 H$	0.97 00	.940 9	0.0 7	302.2 7	41	const = 0.0006, $D^3 = 0.0000$ , $D^2 H = 0.0000$
6.	$l_n TM = -21.01304 - 0.08997 D + 5.27903 l_n D + 1.81023 l_n H$	0.96 43	.929 9	0.2 3	163.5 3	41	const = 0.0000, $D = 0.0007$ , $l_n D = 0.0000$ , $l_n H = 0.0000$
<b>Small wood volume</b>							
7.	$SW = -0.03644 - 0.000014236 D^2 H$	0.92 64	0.85 82	0.0 5	112.9 8	60	const = 0.1999, $D^2 H = 0.0000$ , $D^2 = 0.0011$ , $D = 0.0268$
8.	$l_n SW = -9.48652 - 0.043560 + 2.71729 l_n D$	0.97 19	0.94 45	0.2 7	484.9 8	60	const = 0.0000, $D = 0.0136$ , $l_n D = 0.0000$
<b>d. Total volume.</b>							
9.	$TV = -0.03562 + 0.000369 D^2 - 0.0000594 D^3$	0.98 91	.978 4	0.0 5	844.8 7	60	const = 0.0227, $D^2 = 0.0000$ , $D^3 = 0.0000$ , $D^2 H = 0.0000$
10.	$l_n TV = -10.01681 - 0.00000223 D^3 + 2.11898 l_n D + 0.85295 l_n H$	.996 9	.993 9	0.1 2	3033. 42	60	const = 0.0000, $D^3 = 0.0001$ , $l_n D = 0.0000$

APPENDIX-II

1. T-TEST on BER data of punjab irrigated vs Non-irrigated areas

DBH Range	Variable	No. of Observations		Means		Calculated T-Value
		Irrigated	Non-irrigated	Irrigated	Non-irrigated	
> 4 ≤ 10	H	7	37	4.3000	4.7568	-0.89 NS
	TV	7	37	0.0177	0.0208	-0.69 NS
> 10 ≤ 15	H	10	44	6.5800	6.8636	-0.52 NS
	TV	10	44	0.0494	0.0528	-0.51 NS
> 15 ≤ 20	H	14	46	8.2786	8.5435	-0.60 NS
	TV	14	46	8.2786	8.5435	-0.89 NS
> 20 ≤ 25	H	8	44	8.1750	10.29	-2.95 **
	TV	8	44	0.1707	0.2200	-2.30 *
> 25 ≤ 30	H	7	46	10.4193	12.0652	-1.75 NS
	TV	7	46	0.3710	0.4009	-0.29 NS
> 30 ≤ 35	H	9	39	10.5667	13.6667	-3.89 **
	TV	9	39	0.5379	0.6810	-0.66 NS
> 35 ≤ 40	H	7	31	10.8429	13.2903	-2.44 *
	TV	7	31	0.6691	0.7410	-1.05 NS
> 40 ≤ 45	H	6	19	11.6667	14.2632	-2.13 **
	TV	6	19	1.0838	0.9300	1.92 NS
> 45 ≤ 50	H	8	21	10.5750	14.4286	-3.97 **
	TV	8	21	1.0579	1.2067	-1.39 NS

> 50 ≤ 55	H	10	3	13.20 00	14.0000	-0.52 NS
	TV	10	3	1.516 2	1.7102	-0.72 NS
> 55 ≤ 60	H	13	11	12.15 54	12.9091	-0.88 NS
	TV	13	11	1.355 2	1.3838	-0.26 NS

Note: NS = Non-Significant at 0.05 level  
 \* = Significant at 0.05 level  
 \*\* = Significant at 0.01 level

---

2. T-TEST on FRASH data of Punjab irrigated vs Non-irrigated areas

DBH Range	Variable	No. of Observation		Means		Calculated T-Value
		Irrigated	Non-irrigated	Irrigated	Non-irrigated	
> 4 ≤ 10	H	16	16	4.5969	4.7500	-0.37 NS
	TV	16	16	0.0273	0.0158	0.69 NS
> 10 ≤ 15	H	17	17	6.6853	7.0000	-0.65 NS
	TV	17	17	0.0519	0.0540	-0.31 NS
> 15 ≤ 20	H	15	16	8.2967	9.5313	-2.07 *
	TV	15	16	0.1076	0.1202	-0.87 NS
> 20 ≤ 25	H	17	15	9.6265	12.0667	-3.12 **
	TV	17	15	0.2255	0.2605	-1.25 NS
> 25 ≤ 30	H	21	15	10.3043	12.9333	-3.73 **
	TV	21	15	0.3144	0.3698	-1.60 NS
> 30 ≤ 35	H	17	15	12.5353	14.0000	-1.98 NS
	TV	17	15	0.5632	0.6067	1.39 NS
> 35 ≤ 40	H	17	18	13.8294	14.8333	-1.06 NS
	TV	17	18	0.7956	0.7784	0.30 NS
> 40 ≤ 45	H	15	15	14.1933	15.9333	-1.66 NS
	TV	15	15	1.0333	1.0279	0.07 NS
> 45 ≤ 50	H	18	14	14.3194	18.2143	-3.52 **
	TV	18	14	1.2163	1.5339	-2.09 *

> 50 ≤ 55	H	19	10	15.86 32	17.8000	-1.56 NS
	TV	19	10	1.522 2	1.6826	-1.01 NS
> 55	H	16	12	16.10 38	19.0000	-2.17 *
	TV	16	12	2.027 8	1.9018	0.62 NS
>4.0 All data	H	188	163	11.54 04	12.8804	-2.68 **
	TV	188	163	0.719 3	0.6791	0.56 NS

Note: NS = Non-Significant at 0.05 level  
 \* = Significant at 0.05 level  
 \*\* = Significant at 0.01 level

3. (a) T-TEST on EUCALYPTUS (*Eucalyptus camaldulensis*) data Punjab vs NWFP irrigated areas

DBH Range	Variable	No. of Observation		Means		Calculated T-Value
		Punjab	N.W.F.P.	Irrigated	Non-irrigated	
25-36.5	H	6	8	18.47	20.06	1.25 NS
	TV	6	8	0.656 6	0.7446	1.12 NS

3. (b)

DBH Range	Variable	No. of observations		Means		Calculated T-Value
		irrigated	Non-irrigated	irrigated	Non-irrigated	
> 4 ≤ 10	H	6	9	10.07 50	7.3889	2.86 **
	TV	6	9	0.023 7	0.0204	0.43 NS
> 10 ≤ 15	H	5	6	14.62 80	10.3333	7.23 **
	TV	5	6	0.099 4	0.0710	1.74 NS
> 15 ≤ 20	H	5	8	14.86 00	11.1250	3.24 **
	TV	5	8	0.171 2	0.1272	1.83 NS
> 20 ≤ 25	H	5	7	16.28 00	13.3571	2.67 **
	TV	5	7	0.270 1	0.2476	0.42 NS
> 25 ≤ 30	H	4	6	18.65 75	14.6667	3.11
	TV	4	6	0.568 0	0.4241	2.15 NS
> 30 ≤ 35	H	8	5	19.90 00	17.8000	1.24 NS
	TV	8	5	0.748 2	0.7277	0.27 NS
> 35 ≤ 40	H	3	8	19.00 00	16.2500	1.07 NS
	TV	3	8	0.915 4	0.8039	1.03 NS
> 40 ≤ 45	H	3	5	20.50 00	19.5000	0.38 NS
	TV	3	5	1.164 5	1.2359	-0.66 NS
> 50 ≤ 55	H	6	2	21.63 00	17.000	2.52 *

	TV	6	2	1.933 0	1.8659	0.58 NS	
> 4	≤ 55	H	52	56	17.81 13	13.3839	5.17 **
	TV	52	56	0.790 5	0.4624	2.86 **	
	≤ 45	H	39	54	16.45 18	13.25	3.52 **
	TV	39	54	0.444 7	0.4103	0.42 NS	

Note: NS = Non-Significant at 0.05 level  
 \* = Significant at 0.05 level  
 \*\* = Significant at 0.01 level

---

4. T-TEST for JAND data on farmlands of Punjab irrigated vs Non-irrigated areas

DBH Range	Variable	No. of Observation		Means		Calculated T-Value
		Irrigated	Non-irrigated	Irrigated	Non-irrigated	
> 4 ≤ 10	H	5	6	3.760 0	4.3333	-0.98 NS
	TV	5	6	0.008 6	0.0159	-1.41 NS
> 10 ≤ 15	H	6	5	4.791 7	6.6000	-4.31 **
	TV	6	5	0.030 6	0.0622	-5.06 **
> 15 ≤ 20	H	8	5	6.531 3	7.6000	-1.85 NS
	TV	8	5	0.075 6	0.1328	-2.66 *
> 20 ≤ 25	H	7	5	7.314 3	10.4000	-4.02 **
	TV	7	5	0.179 3	0.2792	-3.05 **
> 25 ≤ 30	H	6	5	9.800 0	11.6000	-2.24 *
	TV	6	5	0.329 8	0.4046	-1.27 NS
> 30 ≤ 35	H	7	5	9.400 0	11.2000	-1.87 NS
	TV	7	5	0.489 4	0.4952	-0.06 NS
> 35 ≤ 40	H	8	5	11.85 00	12.2000	-1.87 NS
	TV	8	5	0.745 8	0.7060	0.31 NS
> 40 ≤ 45	H	7	5	11.98 57	12.8000	-0.40 NS
	TV	7	5	1.018 5	0.9116	0.98 NS
> 45 ≤ 50	H	4	5	12.72 50	16.2000	-1.71 NS
	TV	4	5	1.226 4	1.4964	-1.38 NS

> 40 All data	H	63	46	9.106 3	10.1957	-1.57 NS
	TV	63	46	0.537 9	0.4899	0.49 NS

Note: NS = Non-Significant at 0.05 level  
 \* = Significant at 0.05 level  
 \*\* = Significant at 0.01 level

---

5. T-TEST on KIKAR data of Punjab irrigated vs Non-irrigated areas

DBH Range	Variable	No. of Observation		Means		Calculated T-Value
		Irrigated	Non-irrigated	Irrigated	Non-irrigated	
> 4 ≤ 10	H	80	45	5.0925	4.9778	0.54 NS
	TV	80	45	0.0180	0.0199	-1.09 NS
> 10 ≤ 15	H	83	45	6.5319	6.9111	-1.68 NS
	TV	83	45	0.0536	0.0589	-1.30 NS
> 15 ≤ 20	H	77	47	8.6149	8.5106	0.38 NS
	TV	77	47	0.1341	0.1223	1.28 NS
> 20 ≤ 25	H	75	47	10.4347	10.6383	-0.64 NS
	TV	75	47	0.2512	0.2697	-0.92 NS
> 25 ≤ 30	H	79	44	11.8854	11.6364	0.57 NS
	TV	79	44	0.3849	0.3948	-0.56 NS
> 30 ≤ 35	H	72	48	12.8228	12.7083	0.27 NS
	TV	72	48	0.5888	0.5554	0.79 NS
> 35 ≤ 40	H	75	49	13.8353	13.8367	0.00 NS
	TV	75	49	0.9460	0.7817	1.06 NS
> 40 ≤ 45	H	74	36	15.1703	14.2222	1.59 NS
	TV	74	36	1.1225	1.2298	-0.63 NS
> 45 ≤ 50	H	69	40	16.1928	15.1000	1.78 NS

	TV	69	40	1.473 6	1.2436	3.02 **
> 50 ≤ 55	H	55	28	17.44 36	18.1786	-0.73 NS
	TV	55	28	1.887 6	1.7208	1.30 NS
> 55 ≤ 60	H	53	26	19.02 26	18.2692	0.75 NS
	TV	53	26	2.309 8	2.1137	1.33 NS
> 60	H	6	2	17.26 67	22.500	-1.32 NS
	TV	6	2	2.062 4	2.5252	-0.79 NS

**Note:** NS = Non-Significant at 0.05 level  
 \* = Significant at 0.05 level  
 \*\* = Significant at 0.01 level

Donated to PFRI Faisalabad  
 by  
 (SAHIBZADA MUHAMMAD HAFEEZ)Rtd.  
 Chief Conservator of Forests (P&D),  
 Punjab, Pakistan