VOLUME TABLES FOR HORSE CHEST-NUT (*AESCULUS INDICA*) OF AZAD KASHMIR

Mohammad Afzal Cheema*
Mohammad Aliul Hassnain Fatime
Raja Walayat Hussain

Introduction

Hourse chestnut (*Aesculus indica*) is a useful broad-leaved tree which grows naturally as an individual or as an associate of other broad leaved species in high hill coniferous forests of N.W.F.P., Punjab and Azad Kashmir. Its wood is pale pink, soft and used for light constructional work, packing cases water troughs and furniture. The tree grows to a large size specially under favourable conditions. It is a moderate light demander and has good coppicing power.

Data for the species were available from Galies forests of N.W.F.P. and Azad Kashmir. However, initial scrutiny of data showed significant difference between volume contents for both the regions especially timber volume. This necessitated construction of separate volume tables of the species for both the regions.

Basic Data

Data on 243 trees ranging from 8 inches (20 cms) to 60 inches (152 cms) dbh classes from Jhelum Valley Muzaffarabad, Keran and Sharda Forest Divisions of Azad Kashmir were collected by the field staff of Forest Research Division of Azad Kashmir.

A graph was drawn between timber volume and $\frac{D^2 H}{100}$ for initial scrutiny of data. 20 trees were rejected showing abnormal volume. Consequently data from 223 trees were used for preparation of these volume tables.

Method and Procedure

Data were collected by felling the trees. Each felled tree was divided into logs of suitable lengths upto minimum 8 inches (20 cms) dbh at thin end both for stem and branches. Diameters at both the ends of different logs of a tree were measured. Timber volumes of these logs were calculated using Samlian formula and were summed to get timber volume (o.b.) for each tree. The estimates of heights and volume (timber) against dbh classes were obtained using regression technique.

* The authors are Forest Mensuration Officer, P.F.I., Divisional Forest Officer (Research), Azad Kashmir and Director, Forestry Research Division, P.F.I., respectively.

Following mathematical models were used for these estimations:—

(i) Models for total height:—

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

$$H = a+b\,D+ cD^2$$

(ii) Models for timber (o.b.) volume:—

$$V = a+b \frac{D^2 H}{100}$$

$$V = a+b \log \frac{D^2 H}{100}$$

where,
H stands for total height in feet.
D stands for diameter at breast height in inches.
V stands for total timber (o.b.) volume in cft.
log stands for common logarithms to the base 10.

The regression equations developed from the above models are given in Appendix I alongwith their measures of precision.

Height Estimation

Regression equations for height estimations are presented in Appendix I at serial No. 1 and 2. The measures of precision for both equations are not so strong due to much variation in heights of trees of same size. Estimates of heights were obtained using both equations 1 and 2 to compare them with actual average volues against different dbh classes. It was found that the estimates from equation 2 were more nearer to actual values upto 19 inch dbh class than the estimates of equation 1 and after 19 dbh class, estimates from height equation 1 were better as compared to equation 2. Therefore estimates of heights were obtained upto 19 inch dbh class using equation 2 and thereafter equation 1 of Appendix I. i.e.

(i) $H = 24.3875 + 3.6280\,D—0.0451\,D^2$ (upto 19 inch dbh class).

(ii) $H = —0.4759 +60.4674 \log D$ (greater than 19 inch dbh class).

Smallwood Estimation

Variation of smallwood volume due to locality is not usually much against same dbh and height classes. Since smallwood volume data were not collected from the field, the standard volume table of the species for N.W.F.P. (5) was used for estimation of smallwood volumes for different dbh classes. These estimates are given in Appendix II.

Total Volume Estimation

Timber volume and small wood volume against different dbh classes were added to get the total volume for the same dbh classes.

Conversion to Metric Units

Equations used in the preparation of volume tables in the British units were converted to metric units. Volume tables in metric units were prepared using diameter breast height in centimeters and height in meters. The converted equations in metric units are:—

(i) $H = 7.433311 + 0.435357\ D - 0.002129\ D^2$

(ii) $H = -7.606334 + 18.430455 \log D$

(iii) $V = -0.027412 + 0.003593\ D^2 H$

Where H is height in metres, D is dbh in centimetres and V is volume in cubic metres. For height estimation equation (i) was used upto 48 cm dbh class and thereafter equation (ii).

Local Volume Tables

Volume tables were prepared by one inch diamter class in the British units and two centimeter class intervals in metric units. These are produced in Appendices II and III respectively. In these tables diameter classes are middle values between two ranges. For example 20 inch dbh class includes trees ranging from 19.6 to 20.5 inches in the British units. In metric units 50 centimeter dbh class includes trees with dbh 49.1 to 51.0 centimetres.

Standard Volume Tables

Volume tables given in Appendices IV and V were prepared by one inch/2 centimetre classes (as for local volume tables) and 5 feet/1.5 metres height classes in the British and metric units respectively. As an example, 60 feet height class includes trees having total height ranging from 58 to 62 feet in the British units. In metric units 21 metres height class includes trees with total height from 20.26 to 21.75 metres and 22.5 metre height class includes trees with total height 21.76 to 23.25 metres. Figures in brackets are adjusted figveres calculated proportionately on the basis of estimates given in local volume tables.

Acknowledgement

The assistance rendered by the field staff of Forest Research Division of Azad Kashmir specially of Mr. Musaddiq Forester in collection of data and M/s Fatehullah, H.S. Askari Foresters and T.M. Abbasi (F,A.) of Forest Mensuration Branch in computation of data is appreciated. Neat typing of tables by Mr. Khushal Khan is commended.

BIBLIOGRAPHY

1. Abbas, H.S. and M.A. Cheema. 1981. Revised local and standard volume tables of walnut in N W.F.P. Publication No. 55 Mensuration Branch of P.F.I. Peshawar.

2. Cheema, M.A. and R.W. Hussain. 1978. Local metric volume tables for forest tree species in Hazara. Pub. No. 43 Mensuration Branch P.F.I. Peshawar.

3. Cheema, M.A. and R.W. Hussain. 1981. Local and standard volume tables of kandi in Sind. Pub. No. 56 Forest Mensuration Branch P.F.I. Peshawar.

4. Cheema, M.A. and M.A.H. Fatime. 1985. Local and standard volume tables for maple (*Acer caesium*) of Azad Kashmir and NWFP. Pak. Jour. For. Vol. 35 (4): 187–215.

5. Cheema, M.A. and R.W. Hussain. 1986. Volume tables for Horse chestnut (*Aesculus indica*) of N.W.F.P. Pak. Jour. For. Vol 37 (1) Pages 37–58.

6. Demarschalk, J.P. 1972. Conversion of taper and volume equations from English to Metric systems. Canadian Journal of Forest Research Volume 2 No. 3.

7. Griffith, A.L. and Jagdamba Parasad. 1949. The Silvicultural Research Code Vol. 3 Forest Research Institute, Dehra Dun, India.

8. Qazi, I.A. and R.W. Hussain. 1974. Ready Recknoner for conversion of measurements with Accessory Tables. Pub. No. 27. Mensuration Branch P.F.I, Peshawar.

Appendix I

Regression equations for volume tables of Horse chestnut (*Aesculus indica*) in Azad Kashmir with measures of precision.

S.No.	No. of observation	Regression equation	Correlation coefficient (R)	Coefficient of determination (R^2)	Standard error of estimates (SEE)	SE% mean of volume
1.	223	$H = 0.4759 + 60.4674 \log D$	0.6608	0.4368	14.89	18.09
2.	223	$H = 24.3875 + 3.6280\ D - 0.0451D^2$	0.7237	0.5238	13.74	16.70
3.	223	$V = -604.7529 + 300.6018 \log \frac{D^2H}{100}$	0.8563	0.7332	93.96	49.84
4.	223	$V = -0.0968 + 0.2495 \frac{D^2H}{100}$	0.9857	0.9716	30.62	16.24

Appendix II

Local timber volume table of Horse chestnut (*Aesculus indica*) for Azad Kashmir (British units)

D.B.H. (inche)	Height (feet)	Timber o.b. (cft)	S/W o.b. (cft)	Total volume (cft)
8	50	7.89	4.94	12.74
9	53	10.6	5.07	16.67
10	56	13.9	5.16	19.06
11	59	17.7	5.40	23.10
12	61	21.8	5.50	27.3
13	64	26.9	5.70	32.6
14	66	32.2	6.00	38.2
15	69	38.6	6.20	44.8
16	71	45.2	6.40	51.6
17	73	52.5	6.80	59.3
18	75	60.5	7.10	67.6
19	77	69.3	7.40	76.7
20	78	78.7	7.80	86.5
21	79	86.8	8.10	94.9
22	81	97.7	8.50	106.2
23	82	108	9.20	117.2
24	83	119	10.0	129.0
25	84	131	10.0	141.0
26	85	143	10.0	153.0
27	86	156	11.0	167.0
28	87	170	11.0	181.0
29	88	185	13.0	198.0
30	89	200	13.0	213.0
31	90	216	13.0	229.0
32	90	232	14.0	246.0
33	91	247	14.0	261.0
34	92	265	15.0	280.0
35	93	284	16.0	300.0
36	94	304	17.0	321.0
37	94	321	18.0	339.0
38	95	342	18.0	360.0
39	96	364	19.0	383.0
40	96	383	20.0	403.0
41	97	407	20.0	427.0

D.B.H. (inche)	Height (feet)	Timber o.b. (cft)	S/W o.b. (cft)	Total volume (cft)
42	98	431	23.0	454.0
43	98	452	23.0	475.0
44	99	478	24.0	502.0
45	99	500	25.0	525.0
46	100	528	26.0	554.0
47	101	557	27.0	584.0
48	101	580	28.0	608.0
49	102	611	30.0	641.0
50	102	636	30.0	666.0
51	103	668	32.0	700.0
52	103	695	32.0	727.0
53	104	729	34.0	763.0
54	104	757	35.0	792.0
55	105	792	37.0	829.0
56	105	821	38.0	859.0
57	106	859	39.0	898.0
58	106	890	41.0	931.0
59	107	929	42.0	971.0
60	107	961	44.0	1005.0

Derived from:

$H = 24.3875 + 3.6280\ D - 0.0451\ D^2$ (upto 19 inch dbh class)

$H = -0.475946 + 60.467374 \log D$ (20 inch and over dbh classes)

$$V\ (tim) = -0.096804 + 0.249488 \frac{D^2 H}{100}$$

Smallwood volume is obtained from standard volume table of NWFP

Total volume. = Timber volume. + smallwood volume.

(o.b) (o.b) (o.b)

Appendix III

Local timber volume table of Horse chestnut (*Aesculus indica*) for Azad Kashmir (Metric units)

D.B.H. (cm)	Height (m)	Timber volume (o.b.) (m^3)	Smallwood (o.b.) (m^3)	Total volume (o.b.) (m^3)
20	15.29	0.192	0.140	0.332
22	15.98	0.250	0.142	0.392
24	16.65	0.317	0.145	0.462
26	17.31	0.393	0.149	0.542
28	17.95	0.478	0.152	0.630
30	18.58	0.573	0.154	0.727
32	19.18	0.678	0.160	0.838
34	19.77	0.794	0.164	0.958
36	20.35	0.920	0.168	1.09
38	20.90	1.06	0.173	1.23
40	21.44	1.21	0.176	1.39
42	21.96	1.36	0.180	1.54
44	22.47	1.54	0.190	1.73
46	22.95	1.72	0.200	1.92
48	23.42	1.91	0.210	2.12
50	23.71	2.10	0.220	2.32
52	24.02	2.31	0.220	2.53
54	24.32	2.52	0.240	2.76
56	24.61	2.77	0.240	3.01
58	24.89	2.98	0.250	3.23
60	25.17	3.23	0.260	3.49
62	25.43	3.48	0.270	3.75
64	25.68	3.75	0.280	4.03
66	25.93	4.03	0.290	4.32
68	26.17	4.32	0.300	4.62
70	26.40	4.62	0.320	4.94
72	26.63	4.93	0.330	5.26
74	26.84	5.25	0.350	5.60
76	27.06	5.59	0.360	5.95
78	27.27	5.93	0.370	6.30
80	27.47	6.29	0.380	6.67
82	27.67	6.66	0.400	7.06
84	27.86	7.03	0.420	7.45
86	28.05	7.43	0.440	7.87
88	28.23	7.83	0.450	8.28

D.B.H. (cm)	Height (m)	Timber volume (o.b.) (m^3)	Smallwood (o.b.) (m^3)	Total volume (o.b.) (m^3)
90	28.41	8.24	0.470	8.71
92	28.59	8.67	0.490	9.16
94	28.76	9.10	0.510	9.61
96	28.93	9.55	0.510	10.1
98	29.09	10.0	0.510	10.5
100	29.25	10.5	0.510	11.0
102	29.41	11.0	0.580	11.6
104	29.57	11.5	0.600	12.1
106	29.72	12.0	0.620	12.6
108	29.87	12.5	0.640	13.1
110	30.02	13.0	0.660	13.7
112	30.16	13.6	0.680	14.3
114	30.30	14.1	0.690	14.8
116	30.44	14.7	0.720	15.4
118	30.58	15.3	0.750	16.0
120	30.71	15.9	0.780	16.7
122	30.85	16.5	0.790	17.3
124	30.98	17.1	0.820	17.9
126	31.10	17.7	0.840	18.5
128	31.23	18.4	0.880	19.3
130	31.35	19.0	0.900	19.9
132	31.48	19.7	0.920	20.6
134	31.60	20.4	0.960	21.4
136	31.72	21.1	0.980	22.1
138	31.83	21.8	1.01	22.8
140	31.95	22.5	1.04	23.5
142	32.06	23.2	1.07	24.3
144	32.17	23.9	1.09	25.0
146	32.28	24.7	1.13	25.8
148	32.39	25.5	1.15	26.6
150	32.50	26.3	1.19	27.5

Derived from:

$H = 7.433311 + 0.43537\ D - 0.002129D^2$ (upto 48 cm dbh class)

$H = -7.606334 + 18.430455 \log D$ (50 cm and over dbh class)

$V\ (tim) = -0.027412 + 0.00003593\ D^2H$

Smallwood volume is obtained from standard volume table of NWFP.

Total volume. = Timber volume. + smallwood volume.

Appendix IV

Standard volume table of Horse chestnut (*Aesculus indica*) for Azad Kashmir (British units)

Dia class	Height classes (feet)														
	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
(inches)	Timber volume (cft)														
8	3.89	4.69	5.49	6.29	7.09	7.89	8.69	9.48	10.28	11.08					
9	4.95	5.96	6.98	7.99	9.00	10.01	11.02	12.03	13.04	14.05	15.06	16.07			
10		7.39	8.63	9.88	11.13	12.38	13.62	14.87	16.12	17.37	18.61	19.86	21.11	22.36	
11		8.96	10.47	11.98	13.49	15.00	16.51	18.02	19.52	21.03	22.54	24.05	25.56	27.07	
12			12.48	14.27	16.07	17.87	19.66	21.46	23.25	25.05	26.85	28.64	30.44	32.24	
13			14.66	16.77	18.88	20.98	23.09	25.20	27.31	29.42	31.52	33.63	35.74	37.85	39.96

Dia classes	Height classes (feet)														
	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
(inches)															
14	19.46	21.91	24.35	26.80	29.24	31.69	34.13	36.58	39.02	41.47	43.91	46.36	48.80	51.25	
15		25.16	27.97	30.78	33.58	36.39	39.20	42.00	44.81	47.62	50.42	53.23	56.04	58.84	
16		28.64	31.84	35.03	38.22	41.42	44.61	47.80	51.00	54.19	57.38	60.58	63.77	66.97	70.16
17		32.35	35.95	39.56	43.16	46.77	50.37	53.98	57.58	61.19	64.79	68.40	72.00	75.61	79.21
18		36.28	40.32	44.36	48.40	52.44	56.49	60.53	64.57	68.61	72.65	76.70	80.74	84.78	88.82
19		40.43	44.94	49.44	53.94	58.44	62.95	67.45	71.96	76.46	80.96	85.46	89.97	94.47	98.97
21		44.81	49.80	54.79	59.78	64.77	69.76	74.75	79.74	84.73	89.72	94.71	99.70	104.69	109.68
21		49.41	54.91	60.42	65.92	71.42	76.92	82.42	87.92	93.42	98.92	104.42	109.93	115.43	120.93
22			60.28	66.32	72.35	78.39	84.43	90.47	96.50	102.54	108.58	114.62	120.65	126.69	132.73

Dia class	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
(inches)	Timber volume (cft)														
23	65.89	72.49	79.09	85.68	92.29	98.89	105.49	112.08	118.68	125.28	131.88	138.48	145.08	151.68	
24	71.76	78.94	86.13	93.31	100.50	107.68	114.87	122.05	129.24	136.42	143.61	150.79	157.98	165.16	172.35
25	77.87	85.66	93.46	101.26	109.05	116.85	124.65	132.44	140.24	148.04	155.83	163.63	171.43	179.22	187.02
26		92.66	101.09	109.53	117.96	126.39	134.83	143.26	151.69	160.12	168.56	176.99	185.42	193.86	202.29
27			109.03	118.12	127.22	136.31	145.40	154.50	163.59	172.69	181.87	190.87	199.97	209.06	218.16
28			117.26	127.04	136.82	146.60	156.38	166.16	175.94	185.72	195.50	205.28	215.06	224.84	234.40
29				136.29	146.78	157.27	167.76	178.25	188.74	199.23	209.72	220.21	230.70	241.20	251.69
30				145.85	157.08	168.31	179.53	190.76	201.99	213.22	224.44	235.67	246.90	258.12	269.35
31				155.75	167.73	179.72	191.71	203.70	215.68	227.67	239.66	251.65	263.64	275.62	278.61
32				165.96	178.74	191.51	204.28	217.06	229.83	242.61	255.38	268.15	280.93	293.70	306.47
33					190.09	203.67	217.26	230.84	244.43	258.01	271.60	285.18	298.76	312.35	325.93
34					201.79	216.21	230.63	245.05	259.47	273.89	288.31	302.73	317.15	331.57	345.99
35					213.84	229.12	244.40	259.68	274.96	290.24	305.53	320.81	336.09	351.37	366.65
36					226.24	242.41	258.57	274.74	290.91	307.07	323.24	339.41	355.57	371.74	387.91
37					238.99	256.06	273.14	290.22	307.30	324.37	341.45	358.53	375.61	392.68	409.76

HEIGHT CLASSES (FEET)

Dia. class (Inches)	70	75	80	85	90	95	100	105	110	115	120	125	130	135
						TIMBER VOLUME (CFT)								
38	252.08	270.10	288.11	306.12	324.14	342.15	360.16	378.18	396.19	414.20	432.22	450.23		
39	265.53	284.51	303.48	322.45	341.43	360.40	379.37	398.35	417.32	436.30	455.27	474.25		
40	279.33	299.29	319.25	339.21	359.17	379.12	399.08	419.04	439.00	458.96	478.92	498.88		
41	293.48	314.44	335.41	356.38	377.35	398.32	419.29	440.26	461.23	482.20	503.17	524.14		
42	307.97	329.98	351.98	373.99	395.99	417.99	440.00	462.00	484.01	506.01	528.02	550.02		
43		345.88	368.95	392.01	415.08	438.14	461.21	484.27	507.34	530.40	553.47	576.53		
44		362.16	386.31	410.46	434.61	458.76	482.91	507.06	531.21	555.36	579.51	603.66		
45		378.81	404.07	429.33	454.60	479.86	505.12	530.38	555.64	580.90	606.16	631.42		
46		395.84	422.24	448.63	475.03	501.42	527.82	554.22	580.61	607.01	633.40	659.80		
47		413.24	440.80	468.35	495.91	523.47	551.02	578.58	606.13	633.69	661.25	688.80		
48			459.76	488.50	517.24	545.98	574.72	603.46	632.21	660.95	689.69	718.43	747.17	
49			479.12	509.07	539.02	568.97	598.92	628.87	658.83	688.78	718.73	748.68	778.63	
50			519.04	551.48	583.93	616.38	648.82	681.27	713.71	746.16	778.61	811.05	843.50	
51			539.60	573.33	607.06	640.79	674.52	708.25	741.98	775.71	809.44	843.17	876.90	910.63
52			581.91	618.28	654.66	691.03	727.41	763.79	800.16	836.54	872.91	909.29	945.66	982.04
53			718.43	763.34	808.24	853.15	898.06	942.97	987.88	1032.78	1077.69	1122.60	1167.51	1212.41

APPENDIX – V

Standard timber volume table of Horse chest nut (*Aesculus indica*) Azad Kashmir in metric units

HEIGHTS IN METRES

Dia. class (cm)	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30.0
	(TIMBER VOLUME IN CUBIC METRES)															
20	0.0804	.1019	.1235	.1450	.1666	.1882	.2097	.2313	.2528	.2744						
22	.103	.129	.155	.181	.207	.233	.260	.286	.312	.336	.364	.390				
24		.150	.190	.221	.252	.283	.314	.345	.376	.407	.438	.469	.500	.531		
26		.191	.228	.264	.300	.337	.373	.409	.446	.483	.519	.556	.592	.656		
28		.226	.268	.311	.353	.395	.437	.480	.522	.564	.606	.649	.691	.761		
30		.264	.312	.361	.409	.458	.506	.555	.603	.652	.700	.749	.797	.846		
32			.359	.414	.459	.524	.580	.635	.690	.745	.800	.856	.911	.966	1.02	
34			.408	.471	.533	.596	.658	.720	.782	.845	.907	.969	1.03	1.12	1.16	
36				.531	.601	.671	.741	.811	.881	.950	1.02	1.09	1.16	1.23	1.30	1.37
38					.673	.751	.828	.910	.984	1.06	1.14	1.22	1.30	1.37	1.45	1.53

Dia. class (cm)	HEIGHTS IN METRES																
	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30.0	31.5	33.0	34.5	36.0	37.5
	(TIMBER VOLUMES IN CUBIC METRES)																
40	.749	.835	.921	1.01	1.09	1.18	1.27	1.35	1.44	1.52	1.61	1.70	1.78	1.87			
42	.828	.923	1.02	1.11	1.21	1.30	1.40	1.49	1.59	1.68	1.78	1.87	1.97	2.06			
44	.912	1.02	1.12	1.22	1.33	1.43	1.54	1.64	1.75	1.85	1.95	2.06	2.16	2.27			
46	.999	1.11	1.23	1.34	1.45	1.57	1.68	1.80	1.91	2.03	2.14	2.25	2.37	2.48			
48	1.09	1.21	1.33	1.46	1.59	1.71	1.84	1.96	2.08	2.21	2.33	2.46	2.58	2.70			
50	1.18	1.32	1.45	1.59	1.72	1.86	1.99	2.13	2.26	2.40	2.53	2.67	2.80	2.94			
52	1.28	1.43	1.58	1.72	1.87	2.01	2.16	2.30	2.45	2.60	2.74	2.89	3.03	3.18			
54	1.39	1.54	1.70	1.86	2.02	2.17	2.33	2.49	2.64	2.80	2.96	3.12	3.27	3.43			
56		1.66	1.83	2.00	2.17	2.34	2.51	2.68	2.84	3.01	3.18	3.35	3.52	3.69	3.86		
58		1.79	1.97	2.15	2.33	2.51	2.69	2.87	3.05	3.24	3.42	3.60	3.78	3.96	4.14		
60		1.91	2.11	2.30	2.49	2.69	2.88	3.08	3.27	3.46	3.66	3.85	4.05	4.24	4.44	4.63	
62		2.04	2.25	2.46	2.67	2.87	3.08	3.29	3.49	3.70	3.91	4.12	4.32	4.53	4.74	4.94	
64			2.40	2.62	2.84	3.06	3.28	3.50	3.73	3.95	4.17	4.39	4.61	4.83	5.05	5.27	
66			2.56	2.79	3.02	3.26	3.49	3.73	3.96	3.20	4.43	4.67	4.90	5.14	5.37	5.61	
68				2.96	3.21	3.46	3.71	3.96	4.21	4.46	4.71	4.96	5.21	5.46	5.70	5.95	
70				3.14	3.40	3.67	3.93	4.20	4.46	4.73	4.99	5.25	5.52	5.78	6.05	6.31	
72				3.32	3.60	3.88	4.16	4.44	4.72	5.00	5.28	5.56	5.84	6.12	6.40	6.68	
74					3.81	4.10	4.40	4.69	5.00	5.28	5.58	5.88	6.17	6.47	6.76	7.06	7.35
76					4.02	4.33	4.64	4.95	5.26	5.58	5.89	6.20	6.51	6.82	7.13	7.44	7.75
78					4.23	4.56	4.89	5.22	5.55	5.87	6.20	6.53	6.86	7.19	7.51	7.84	8.17
80					4.46	4.80	5.15	5.49	5.84	6.18	6.53	6.87	7.22	7.56	7.91	8.25	8.60
82					4.68	5.05	5.41	5.77	6.13	6.50	6.86	7.20	7.58	7.95	8.31	8.67	9.03
84						5.30	5.68	6.06	6.44	6.82	7.20	7.80	7.96	8.34	8.72	9.10	9.48
86						5.55	5.95	6.35	6.75	7.15	7.55	7.94	8.34	8.74	9.14	9.54	9.94
88						5.82	6.23	6.65	7.07	7.48	7.90	8.32	8.74	9.15	9.57	9.99	10.41

Dia. class (cm)	HEIGHT IN METRES													
	21.0	22.5	24.0	25.5	27.0	28.5	30.0	31.5	33.0	34.5	36.0	37.5	39.0	40.5
	(TIMBER VOLUME IN CUBIC METRES)													
90	6.08	6.52	6.96	7.39	7.83	8.27	8.70	9.14	9.58	10.01	10.45	10.89		
92	6.36	6.81	7.27	7.73	8.18	8.64	9.10	9.55	10.01	10.46	10.92	11.38		
94	6.64	7.12	7.59	8.07	8.54	9.02	9.50	9.97	10.45	10.93	11.40	11.88		
96	6.93	7.42	7.92	8.42	8.91	9.41	9.91	10.40	10.90	11.40	11.89	12.39	12.89	
98	7.22	7.74	8.25	8.77	9.28	9.81	10.32	10.84	11.36	11.88	12.40	12.91	13.43	
100	7.52	8.06	8.60	9.13	9.67	10.21	10.75	11.29	11.83	12.37	12.91	13.45	13.99	
102	7.82	8.38	8.94	9.50	10.07	10.63	11.19	11.75	12.31	12.87	13.43	13.99	14.55	
104	8.13	8.72	9.30	9.88	10.47	11.05	11.63	12.21	12.80	13.38	13.96	14.55	15.13	
106	8.45	9.06	9.66	10.27	10.87	11.48	12.08	12.69	13.30	13.90	14.51	15.11	15.72	
108		9.40	10.03	10.66	11.29	11.92	12.55	13.17	13.80	14.43	15.06	15.69	16.32	
110		9.75	10.39	11.06	11.71	12.36	13.02	13.67	14.32	14.97	15.62	16.28	16.93	
112		10.11	10.79	11.46	12.14	12.82	13.49	14.17	14.85	15.52	16.20	16.87	17.55	
114		10.48	11.18	11.88	12.58	13.31	13.98	14.68	15.38	16.08	16.78	17.48	18.18	
116		10.85	11.58	12.30	13.03	13.75	14.48	15.20	15.93	16.65	17.38	18.10	18.83	
118		11.23	11.98	12.73	13.48	14.23	14.98	15.73	16.48	17.23	17.98	18.77	19.48	
120		11.61	12.39	13.17	13.94	14.72	15.49	16.27	17.05	17.82	18.60	19.37	20.15	
122			12.81	13.61	14.41	15.21	16.02	16.82	17.62	18.42	19.22	20.03	20.83	21.63
124			13.23	14.06	14.89	15.72	16.55	17.38	18.20	19.03	19.86	20.69	21.52	22.35
126			13.66	14.52	15.37	16.23	17.09	17.94	18.80	19.65	20.51	21.36	22.22	23.07
128			14.10	14.98	15.87	16.75	17.63	18.52	19.40	20.28	21.65	22.05	22.93	23.81
130			14.54	15.46	16.37	17.28	18.19	19.10	20.01	20.92	21.83	22.74	23.65	24.56

HEIGHT IN METRES

Dia. class (cm	24.0	25.5	27.0	28.5	30.0	31.5	33.0	34.5	36.0	37.5	39.0	40.5	42.00
	(TIMBER VOLUME IN CUBIC METRES)												
132	15.00	15.94	16.88	17.81	18.75	19.69	20.63	21.57	22.51	23.45	24.39	25.33	26.27
134	15.46	16.42	17.39	18.36	19.33	20.30	21.26	22.23	23.20	24.17	25.13	26.10	27.07
136	15.92	16.92	17.92	18.91	19.91	20.91	21.90	22.90	23.90	24.89	25.89	26.89	27.88
138	16.39	17.42	18.45	19.47	20.50	21.53	22.55	23.58	24.61	25.63	26.66	27.68	28.71
140	16.87	17.93	18.99	20.04	21.10	22.16	23.21	24.27	25.32	26.38	27.44	28.49	29.55
142	17.36	18.45	19.53	20.62	21.71	22.79	23.88	24.97	26.05	27.14	28.23	29.31	30.40
144	17.85	18.97	20.09	21.21	22.32	23.44	24.56	25.68	26.79	27.91	29.03	30.15	31.26
146	18.35	19.50	20.65	21.80	22.95	24.10	25.25	26.40	27.54	28.69	29.84	30.99	32.14
148	18.86	20.04	21.22	22.40	23.58	24.76	25.95	27.12	28.30	29.49	30.67	31.85	33.04
150	19.37	20.59	21.80	23.01	24.23	25.44	26.65	27.86	29.08	30.29	31.50	32.71	33.93