FINAL REPORT

TIMBER AND FUELWOOD VOLUME TABLES FOR *Acacia auriculiformis, A. mangium, Eucalyptus camaldulensis and Dalbergia sissoo* IN PLANTATIONS IN BANGLADESH

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ABBREVIATIONS

Vt – Total volume overbark in cubic metre
V30 – Underbark volume up to top end girth of 30 cm in cubic metre
VT- Timber volume (over bark volume up to 30.0 cm top end girth)
V-Volume in cubic metre
G, GBH- Girth at breast height in centimetre
H, Ht - Total height in metre
BG, B. Girth – Basal girth in centimetre
SG- Stump girth in centimetre
H30 – Height (Length) up to 30 cm top end girth in metre
H45 - Height (Length) up to 45 cm top end girth in metre
L & T – Leaves and twigs
M, m – Metre
Cm, cm – Centimetre
Cum., cum. – Cubic metre
Kg – Kilogram
F30 – Conversion factor to estimate underbark volume up to 30.0cm top end girth from overbark timber volume

TABLE OF CONTENTS

LIST OF TABLES

TIMBER AND FUELWOOD VOLUME TABLES FOR *Acacia auriculiformis, A. mangium, Eucalyptus camaldulensis and Dalbergia sissoo* IN PLANTATIONS IN BANGLADESH

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INTRODUCITON

Eucalyptus camaldulensis (eucalyptus) and *Acacia auricaliformis* (akashmoni) are the two major species planted in woodlot, agroforestry and strip plantations in Bangladesh. *A. mangium* (mangium) is planted in woodlot and agroforestry plantations while *Dalbergia sissoo* (sissoo) is planted mainly in the strip plantations. Volume, biomass (fuelwood), growth and yield tables for these species in young plantations have been prepared and published (Davidson *et al.* 1985, Latif 1988, Latif *et al.*1993a, Latif and Habib 1993, Latif *et al.* 1993b, Latif and Habib 1994a, Latif and Habib 1994b, Latif *et al.* 1995a, Latif *et al.* 1995b, Latif *et al.* 1995c, Latif *et al.* 1995d, Latif *et al.* 1999a, and Latif *et al.* 1999b). At the time of preparation of the above-mentioned tables, the trees of these species were young and small in size. Since then, considerable time has passed and the trees have grown larger in size. Therefore, it is required to update these tables and prepare new volume and fuelwood production tables for the trees growing in the woodlot, agroforestry and strip plantations. Forest Department also feels that conversion factors should be derived to estimate the relationship between stake wood volume and the solid volume for fuelwood. The trees of these species from woodlot, agroforestry and strip plantations are being felled at present. Therefore, it is a great chance to update and prepare new volume, fuelwood production and conversion factor tables for the important tree species planted in woodlot, agroforestry and strip plantations of these four important species.

MATERIALS AND METHODS

Data Collection: *Eucalyptus camaldulensis* (eucalyptus), *Acacia auricaliformis* (akashmoni), *A. mangium* (mangium) and *Dalbergia sissoo* (sissoo) are the major species in woodlot, agroforestry and strip plantations in Bangladesh. We selected representative trees for each species and girth at breast height (GBH) classes at random for preparation of volume tables. First, we measured the GBH at 1.3m, basal girth at about 15.0cm, and girth at 1.0m above ground level and total heights of the standing trees. Then we felled the trees and measured the girths of the tree at one-metre intervals from a point of about 1.0 m above ground level. We removed a small sample of bark from each point of girth measurements and measured the bark thickness to estimate the underbark girth. We cut the small wood into pieces of 1.0 to 1.5 m long billets. Then, we took the weight of the billets by spring balance to estimate the weight of the green fuelwood. We collected data from 968 trees for estimation of volume, fuelwood production and stake wood conversion factors for the four important species (Table 1). We collected data from different plantations under seven Forest Divisions as given in Table 2.

Table 1. GBH class distribution of the sample trees measured for estimation of volume and fuelwood for eucalyptus, akashmoni, mangium and sissoo in plantations in Bangladesh

Species	Plantation type		Height in metre					
Akashmoni		GBH (cm)	<10	10-15	15.1-20	20.1-25	>25	Total
	Agroforestry	<30	15	10				25
		30.1-45	1	14	18	1		34
		45.1-60		3	34	4		41
		60.1-75		2	18	9		29
		75.1-90			2	8		10
		Total	16	29	72	22		139
	Strip	<30	3					3
		30.1-45	4	12				16
		45.1-60		12	3			15
		60.1-75	1	3	13			17
		75.1-90		5	7			12
		90.1-105			1	2		3
		>105			2	3		5
		Total	8	32	26	5		71
	Woodlot	<30	14	20				34
		30.1-45	2	14	23			39
		45.1-60		1	31	1		33
		60.1-75			19	7		26
		75.1-90			12	13		25
		90.1-105			6	5		11
		>105			1	2	4	7
		Total	16	35	92	28	4	175
Eucalyptus	Agroforestry	<30	4	11				15
		30.1-45		10	9			19
		45.1-60		1	8	7		16
		60.1-75			1	8	5	14
		75.1-90				3	5	8
		90.1-105					3	3
		Total	4	22	18	18	13	75
	Strip	<60		1	3			4
		60.1-75		2	19	2		23
		75.1-90		1	17	14		32
		90.1-105			5	11		16
		105.1-120			2	2	6	10
		>120					9	9
		Total	0	4	46	29	15	94
	Woodlot	<30	1	13				14
		30.1-45		15	16			31
		45.1-60		2	14	16		32
		60.1-75			7	15	2	24
		75.1-90		1		9	7	17
		90.1-105				5	4	9
		105.1-120				1	3	4
		Total	1	31	37	46	16	131

Table 1. (Continued)

Mangium	Agroforestry	<30	5	2				7
		30.1-45		1	5			6
		45.1-60		2	3	1		6
		60.1-75			4	5	1	10
		75.1-90			2	7	1	10
		90.1-105				5		5
		Total	5	5	14	18	2	44
	Woodlot	<30	5	21				26
		30.1-45	4	11	15			30
		45.1-60		3	14	8		25
		60.1-75		1	9	16		26
		75.1-90			3	24	1	28
		90.1-105			2	9	3	14
		105.1-120			2	4		6
		>120				2	2	4
		Total	9	36	45	63	6	159
Sissoo	Strip	<30	8					8
		30.1-45	16	2				18
		45.1-60	9	9				18
		60.1-75	1	11	1			13
		75.1-90		3	4	1		8
		90.1-105			8	1		9
		105.1-120			5			5
		>120			1			1
		Total	34	25	19	2	[illegible]	80

Table 2. Locations of data collection for estimation of volume and fuelwood for eucalyptus, akashmoni, mangium and sissoo in plantations in Bangladesh

Forest Division	Range	Beat/Location
Dinajpur	Dinajpur Sadar	Dinajpur-Fulbari road and Dinajpur-Sayedpur road
	Madhyapara	Madhyapara and Kushdaho
	Charkai	Haripur
Mymensingh	Balijuri	Dumurtali
	Rangtia	Rangtia
	Valuka	Uthura, Angarghara and kadigar
Tangail	Baheratali	Baheratali and M. M. Chala
Dhaka	Kachighata	Jathila
	Kaliakoir	Chandra and Mauchalk
	Rajendrapur	Rajendrapur
Bogra	Sadar	Roadside
Camilla	Sadar	Roadside
Jessore	Sadar	Roadside

Estimation of Pole and Timber Heights: Different portions of the trees are being used as pole, timber and fuelwood based on straightness and size. The smaller sized trees with GBH < 30.0cm and portion of larger trees with girth approximately < 30.0cm are used as fuelwood only. Trees with GBH in between 30.0 — 45.0cm are used as pole and fuelwood. Trees with GBH>45.0cm may be used as timber, pole and fuelwood. Therefore, we have also recorded the height of approximately 30.0cm and 45.0cm top end girth limits for estimation of the length of the bottom portion of a tree.

Estimation of Fuelwood: We observed in the field that local buyers of the fuelwood take billets of up to approximately 10.0 cm thin end girth and sale by weights. Smaller than about 10.0 cm thick end girth twigs are sometimes sold as lump sum and sometimes given to the local people or the laborers free of cost. Therefore, we considered billets up to approximately 10.0cm thin end girth for fuelwood. We also took the weight of the smaller girth portion of the tree including leaves (leaves and twigs, L & T) for estimation purposes.

We took the weights of the whole trees as fuelwood (excluding leaves and twigs), which does not produce a pole. The local people informed that a piece of wood with minimum length of about 2.0m with approximately 30.0 cm thin end girth might produce posts. We observed from the data that a tree with approximately minimum GBH of about 32.0cm may produce a 2.0m long post. We divided the larger trees into three parts. The first part was the portion of the trees, which is suitable for post, pole or timber or both. The minimum thin end girth for this was approximately 30.0cm. We took all necessary measurements for estimation of volume for this portion. The second part was the portion of the trees that produces saleable fuelwood. We took the weight of this portion after cutting into billets of about 1-1.5m long. We measured the mid girth and length for estimation of volumes. We also staked this portion and took length, width (length of the billets) and height of the stake. The third portion was the leaf and twigs that always and everywhere do not give economic return after deducting the costs of collection, transportation and time value. We took the weights of this portion with spring balance.

The smaller trees produced higher quantity of fuelwood in comparison to the larger trees near the division point (suitable for pole and not suitable for pole). We observed that the number of trees with GBH<32.0 cm is not high in the forests. Therefore, we estimated the fuelwood production of these smaller trees as average of the measured fuelwood. We selected estimation models by regression techniques for larger trees.

Estimation of Solid Wood Volume Conversion Factor: We measured the mid-girth and length of the billets. Then, we took the weights of the billets. Afterwards, we staked the billets and measured the length, width and height of the stake. We estimated the actual volumes of the billets in the office by multiplying the mid-cross-sectional area of the billets by the length of the billets. We estimated the total solid volume of all the billets in a stake by summing up the individual volumes of all the billets of the stake. Then we estimated the solid wood volume conversion factor by dividing the solid wood volume by the stake wood volume as given below:

Stake wood volume conversion factor (F) = Solid wood volume/stake wood volume
= Sum of all individual volumes of all billets in a stake/ length X width X height of the stake.

Compilation of Data for Volume Estimation: We computed volumes of all the sections except top portions by using the mean cross-sectional areas of the two ends of each section (Smallian formula). We assumed the top section cone and computed volume as one-third of the cylindrical volume of the portion. We considered the top end girth measurement for each tree as the base girth of the cone. We ignored the volumes of the sections with girth less than 30.0 cm for estimation of timber and underbark tree volumes. We estimated the individual tree volume by summing up the volume of required each sections of a tree. We used regression techniques to relate this individual total tree volumes (V) to GBH (G) and total height (H) using various functions and transformations as required in the models.

Computation of Volume Function: We did multiple regression analyses to select the best-suited equations. We tried the following models to select the equation of best fit with different variables as follows.

1. $V = b_0 + bG$
2. $V = b_0 + bG + cG^2$
3. $V = b_0 + bG^2$
4. $V = b_0 + bG^2H$
5. $V = b_0 + bG^2 + cH + dG^2H$
6. $V = b_0 + bG^2 + cGH + dG^2H$
7. $\ln(V) = b_0 + b \ln(G)$
8. $\ln(V) = b_0 + b \ln(G) + c \ln(H)$
9. $V/G^2 = b_0 + b/G^2 + c/G$
10. $V/G^2 = b_0 + b/G$
11. $V/G^2H = b_0 + b/G^2H$
12. $V/G^2H = b_0 + b/G^2 + cH/G^2 + GH$

where, V = volume in cubic metres,
G = girth at breast height in cm,
H = total height in metres
b_0 is the regression constant and b, c and d are regression coefficients.
The logarithmic functions are to the base e.

We chose the equations of the best fit based on the highest multiple coefficients of determination, F-ratio and lowest residual mean square.

Estimation of Underbark Timber Volume Conversion Factors: For conversion of overbark timber volume (VT) to underbark timber volume (V30) as a proportion of overbark timber volume, conversion factors (F30) were computed. All factors (F30) were predicted from girth at breast height (GBH) and meant to be applied to estimate underbark timber volume in metric units. A total of six regression models were examined:

1. $Y = a + bX$
2. $Y = a + b/X$
3. $Y = a + bX + cX^2$
4. $Y = a + (X^b)$
5. $Y = 1/(a + bX)$
6. $Y = X/(a + bX)$

where, X = GBH in centimetres and Y represents conversion factors (F) for the ratios.

Validation Test Procedure: The best-selected models for all the four species were tested with a set of independent data of 100 trees (akashmoni woodlot 24, akashmoni agroforestry 14, eucalyptus woodlot 27, eucalyptus agroforestry 16, mangium woodlot 12 and sissoo strip 7) for each species collected and compiled in the same procedure. The actual volumes of these trees were collectively compared with the corresponding volumes predicted by the selected models. The independent test for validation criteria were:

(1) The paired t-test:

$t = | \Sigma (A-E)/n |$, with (n-1) degrees of freedom at 0.05 level.

(2) Chi-square test:

$\chi^2 = \Sigma (A-E)^2 / E$, with (n-1) degrees of freedom at 0.05 level.

(3) Percent Absolute Deviation (% AD)

$\% AD = | \Sigma (A-E) | / \Sigma A \times 100$

where, A = Actual volume and E = Estimated volume.

RESULTS AND DISCUSSIONS:

Selected models/equations: We selected the following relationships for eucalyptus, akashmoni, mangium and sissoo planted in woodlot, agroforestry and strip plantations in Bangladesh:

1. Total volume overbark as a function of GBH (Vt-G relationship)
2. Total volume overbark as a function of GBH and height (Vt-G-H relationship)
3. Timber volume (volume up to top end girth of approximately 30.0cm as a function of GBH, VT-G relationship)
4. Timber volume (volume up to top end girth of approximately 30.0cm as a function of GBH and total height, VT-G – H relationship)
5. Conversion factors to estimate underbark timber volume (V30) up to top end girth of approximately 30.0cm from overbark timber volume (VT)
6. GBH – fuelwood production relationship

7. GBH – leaves and twigs (L & T) production relationship
8. GBH-total height relationship (H – G relationship)
9. GBH- heights up to 30.0cm top end girth relationship (H30 – G relationship)
10. GBH- heights up to 45.0cm top end girth relationship (H45 – G relationship)
11. Stump girth (basal girth, BG) – GBH relationship (G – BG relationship)
12. Stake wood volume conversion factor = Solid wood volume/stake wood volume and
13. Form factors

The selected models/equations are given in Table 3.

Table 3. Selected equations to estimate different parameters for the species eucalyptus, akashmoni, mangium and sissoo in plantations in Bangladesh

Plantation type	Species	Selected Model	N	R2	SE (Y)
Woodlot	Akashmoni	$Vt = -0.0216813 + 0.00067914 * G + 0.000054772 * G^2$	175	0.957	0.052
		$Vt = -0.05685226 + 0.0055484 * H + 0.000019628 * G^2 + 0.00000153866 * G^2 H$	175	0.972	0.042
		$VT = -0.073139 + 0.001323 * G + 0.000051832 * G^2$	141	0.950	0.058
		$VT = 0.027119694 + 0.00000240953 * G^2 H$	141	0.942	0.062
		$Fuelwood = 22.37917 + 0.003226 * G^2$	175	0.734	11.139
		$Leaves \& twigs = 15.28295 + 0.004662 * G^2$	141	0.603	11.602
		$H = 35.311 - 87.6057/G^{0.4}$	175	0.759	2.006
		$H30 = 19.70247 - 551.037/G$	147	0.820	1.823
		$H45 = 26.48525 - 243.405/ G^{0.6}$	106	0.777	1.646
		$GBH = -0.584 + 0.814 * SG$	175	0.968	
Agroforestry	Akashmoni	$Vt = -0.044269 + 0.00097598 * G + 0.000061867 * G^2$	130	0.951	0.031
		$Vt = -0.03268139 + 0.003235 * H + 0.000012807 * G^2 + 0.00000224532 * G^2 H$	130	0.974	0.023
		$VT = -0.13055 + 0.00261 * G + 0.0000498 * G^2$	114	0.907	0.041
		$VT = -0.01147886 + 0.00000301221 * G^2 H$	114	0.947	0.031
		$Fuelwood = 9.08828 + 0.00803 * G^2$	113	0.539	13.626
		$Leaves \& twigs = 9.051987 + 0.008866 * G^2$	139	0.552	15.442
		$H = 39.127 - 103.824/G^{0.4}$	139	0.740	2.092
		$H30 = 76.64729 - 149.493/G^{0.2}$	117	0.778	2.052
		$H45 = 85.935 - 181.8611/ G^{0.2}$	88	0.775	1.778
		$GBH = 2.1827 + 0.7673 * SG$	139	0.940	4.321
Strip	Akashmoni	$Vt = -0.0094878 - 0.0004247 * G + 0.000059764 * G^2$	71	0.927	0.053
		$Vt = -0.078606 + 0.0074058 * H + 0.0000256646 * G^2 + 0.00000116449 * G^2 H$	71	0.952	0.043
		$VT = -0.044833 - 0.0000266 * G + 0.0000575 * G^2$	68	0.924	0.055

Table 3 (continued)

		VT = 0.02059085 + 0.00000257258*G^2 H	68	0.929	0.052
		Fuelwood = 17.17526 + 0.011026* G^2	68	0.857	14.823
		Leaves & twigs = 17.7161 + 0.005383* G^2	71	0.523	16.987
		H = 54.8535 – 90.6548/$G^{0.2}$	70	0.678	2.060
		H30 = 55.886 – 108.24/ $G^{0.2}$	70	0.810	1.672
		H45 = 58.4298 – 122.444/ $G^{0.2}$	56	0.762	1.60
		GBH = 4.21 + 0.742*SG	71	0.900	7.358
Woodlot	Eucalyptus	Vt = – 0.0242488 – 0.0001779*G + 0.000081637* G^2	131	0.967	0.045
		Vt = – 0.062939+ 0.00458384*H + 0.000025752* G^2 + 0.00000176593*G^2 H	131	0.982	0.039
		VT = – 0.102617 + 0.00127*G + 0.0000732* G^2	117	0.965	0.047
		VT = 0.003083594 + 0.00000291538*G^2 H	117	0.974	0.040
		Leaves & twigs = 0.510253 + 0.008942*G^2	131	0.806	13.282
		Fuelwood = 0.170844 + 0.011976*G^2	117	0.693	23.846
		H = 71.5701 – 114.666/ $G^{0.2}$	131	0.772	2.329
		H30 = 29.6559 – 437.395/$G^{0.8}$	121	0.836	2.334
		H45 = 54.16862 – 242.90013/ $G^{0.4}$	90	0.865	1.973
		GBH = 0.535 + 0.79*SG	131	0.955	4.928
Agroforestry	Eucalyptus	Vt = – 0.045215+ 0.00091678*G + 0.000070213* G^2	75	0.975	0.031
		Vt = – 0.078525+ 0.00623662*H + 0.0000315878* G^2 + 0.00000117728*G^2 H	75	0.985	0.024
		VT = – 0.194075 + 0.004555*G + 0.0000452* G^2	60	0.971	0.034
		VT = 0.005034521 + 0.00000269095*G^2 H	60	0.960	0.039
		Fuelwood = 5.107743 + 0.008397*G^2	60	0.793	7.405
		Leaves & twigs = 2.659055 + 0.008147*G^2	75	0.820	9.428
		H = 77.035 – 125.205/ $G^{0.2}$	75	0.867	2.089
		H30 = 93.108 – 182.23/ $G^{0.2}$	66	0.918	1.858
		H45 = 58.766 – 266.9047/ $G^{0.4}$	43	0.910	1.498
		GBH = – 0.98 + 0.7978*SG	75	0.966	3.987
Strip	Eucalyptus	Vt = 0.343851- 0.0109602*G + 0.00013951* G^2	94	0.952	0.089
		Vt = 0.076339- 0.00058066*H + 0.000016216* G^2 + 0.0000032565*G^2 H	94	0.978	0.061
		VT = 0.321412 - 0.010935*G + 0.0001421* G^2	94	0.952	0.087
		VT = 0.00444242 + 0.00000274348*G^2 H	94	0.975	0.062
		Fuelwood = 21.67055 + 0.008916*G^2	26	0.805	27.901
		Leaves & twigs = 20.40226 + 0.004698*G^2	26	0.659	21.443
		H = 96.3518 – 184.772/ $G^{0.2}$	94	0.736	2.063
		H30 = 86.4366 – 177.663/ $G^{0.2}$	94	0.727	2.030
		H45 = 89.7657 – 194.447/ $G^{0.2}$	94	0.805	1.785
		GBH = 3.6965 + 0.7876*SG	94	0.941	5.414

Table 3 (continued)

Agroforestry	Mangium	$Vt = 0.0379401 - 0.0027469*G + 0.000099945* G^2$	44	0.935	0.065
		$Vt = 0.01368013 - 0.00018226*H + 0.000005503* G^2 + 0.00000352188*G^2 H$	44	0.971	0.042
		$VT = 0.047423 - 0.00387*G + 0.000109* G^2$	37	0.908	0.073
		$VT = -0.02144725 + 0.00000334079*G^2 H$	37	0.956	0.049
		$Fuelwood = -3.61355 + 0.008262*G^2$	37	0.834	10.186
		$Leaves \& twigs = -0.0093 + 0.008147*G^2$	44	0.730	15.575
		$H = 63.702 - 101.98/ G^{0.2}$	44	0.747	2.661
		$H30 = 32.1585 - 239.319/ G^{0.6}$	37	0.768	2.071
		$H45 = 29.2585 - 602.69154/ G^{0.8}$	33	0.813	1.934
		$GBH = -0.195 + 0.8347*SG$	44	0.967	4.546
Woodlot	Mangium	$Vt = -0.0670236+0.00194737*G+0.000056832* G^2$	159	0.940	0.071
		$Vt = -0.04085 + 0.00437656*H + 0.0000627199* G^2 + 0.00000248335*G^2 H$	159	0.965	0.055
		$VT = -0.161116 + 0.003662*G + 0.000047832* G^2$	133	0.927	0.078
		$VT = 0.010632025 + 0.00000289124*G^2 H$	133	0.950	0.064
		$Fuelwood = 18.79797 + 0.003964*G^2$	133	0.626	11.993
		$Leaves \& twigs = 12.30126 + 0.005796*G^2$	131	0.806	16.274
		$H = 338.756 + 615.402/ G^{0.2}$	159	0.918	7.994
		$H30 = 26.423 - 381.696/ G^{0.8}$	143	0.856	2.085
		$H45 = 21.81173 - 2043/ G^{1.2}$	110	0.803	2.069
		$GBH = 0.54 + 0.8245*SG$	133	0.978	4.190
Strip	Sissoo	$Vt = 0.0801559 - 0.0044885*G + 0.00009212* G^2$	80	0.933	0.065
		$Vt = 0.012282107 + 0.00168945*H - 0.000019455* G^2 + 0.00000392037*G^2 H$	80	0.972	0.043
		$VT = 0.080612 - 0.004964*G + 0.00009522* G^2$	72	0.929	0.069
		$VT = -0.01165062 + 0.00000306165*G^2 H$	72	0.967	0.046
		$Fuelwood = 4.52644 + 0.022514*G^2$	72	0.840	39.098
		$Leaves \& twigs = 18.44734 + 0.005118*G^2$	80	0.571	17.750
		$H = 55.8623 - 96.92/ G^{0.2}$	80	0.803	2.024
		$H30 = 55.5474 - 109.495/ G^{0.2}$	74	0.713	2.499
		$H45 = 60.026 - 127.475/ G^{0.2}$	54	0.713	2.134
		$GBH = 3.1468 + 0.7727*SG$	80	0.967	5.170
Conversion factors to estimate underbark timber volume from overbark timber volume:					
All type	Akashmoni	$F30 = G/(36.98142 + 0.003359*G^2 + 0.388637*G)$	316	0.814	9.674
	Eucalyptus	$F30 = 1.108653 - 22.2897/G$	257	0.697	0.079
	Mangium	$F30 = G/(57.21812 + 0.006295*G^2 - 0.08664*G)$	167	0.827	9.664
	Sissoo	$F30 = G/(29.7443 + 0.001905*G^2 + 0.677735*G)$	66	0.908	8.037

The portion of trees with thin end girth of about 30.0cm is sold as volume. Therefore, we selected models/equations to estimate the overbark volume up to thin end girth of approximately 30.0cm as overbark timber volume.

Stake wood conversion factor: We estimated the conversion factor to estimate the solid wood volume from stake wood volume. It was observed that the factor depends on the size, shape and arrangement of the billets in the stake. As fuelwood is sold by weights, we also estimated the green weight for each cubic metre (Table 4).

Table 4. Stake wood volume conversion factors (fuelwood) for the species eucalyptus, akashmoni, mangium and sissoo in plantations in Bangladesh

Species	Observed conversion factors			Weight per cum. of solid volume (Kg)		
	Lowest	Highest	Average	Lowest	Highest	Average
Akashmoni	0.28	0.42	0.38	860	1090	1000
Eucalyptus	0.37	0.45	0.43	870	1170	1110
Mangium	0.29	0.50	0.41	700	850	750
Sissoo	0.29	0.46	0.31	850	1150	990

Form factor: The relationship in-between the actual volumes and cylindrical volumes (form factors) were estimated by dividing the actual volumes with the cylindrical volume of the same tree (Table 5). The cylindrical volumes were estimated by multiplying the basal area with the total height (length) of the tree.

Table 5. Form factors for akashmoni, eucalyptus, mangium and sissoo in plantations in Bangladesh

Species	Plantation type	Form factor for total volume overbark	Form factor for timber volume overbark	Form factor for underbark volume up to 30 cm top end girth
Akashmoni	Over all	0.4220	0.3359	0.2748
	Agroforestry	0.4285	0.3285	0.2666
	Strip	0.4246	0.3498	0.2904
	Woodlot	0.4160	0.3352	0.2740
Eucalyptus	Over all	0.4064	0.3400	0.2582
	Agroforestry	0.4220	0.3113	0.2100
	Strip	0.3706	0.3506	0.2966
	Woodlot	0.4274	0.3561	0.2520
Mangium	Over all	0.4238	0.3676	0.3013
	Agroforestry	0.4358	0.3820	0.3174
	Woodlot	0.4204	0.3636	0.2969
Sissoo	Strip	0.4162	0.3369	0.2567

Validation and Comparison of the Selected Models: We have collected data for validation of the selected volume models following the same procedure used for collection of original data. We compared the actual volumes of these trees with the predicted volumes by t-test, total deviation percent and chi-square goodness of fit. It was observed that the differences are within acceptable limit (Table 6).

Table 6. Validation statistics of the selected volume equations for akashmoni, eucalyptus, mangium and sissoo in plantations in Bangladesh

Species	Plantation Type	Test	Validation statistics	
			One –way	Two –way
Akashmoni	Agro-forestry	Chi-square	0.01	0.01
		T-value	0.07	0.11
		% AD	1.74	2.69
	Woodlot	Chi-square	0.13	0.05
		T-value	0.67	0.44
		% AD	4.07	4.86
Eucalyptus	Agro-forestry	Chi-square	0.17	0.17
		T-value	0.97	1.83
		% AD	-4.62	4.87
	Woodlot	Chi-square	0.09	0.17
		T-value	-0.56	-1.17
		% AD	-2.77	-5.64
Mangium	Woodlot	Chi-square	0.11	0.16
		T-value	-0.76	1.01
		% AD	-3.09	2.31
Sissoo	Strip	Chi-square	0.02	0.04
		T-value	0.41	0.45
		% AD	4.09	4.73

We also compared the predicted volumes by the selected volume equations with those of previously selected models. It was observed that in many cases the differences are not statistically significant and in some cases the differences are within acceptable limit with some exceptions. Selected two-way volume equations give precise estimates compared to the one-way volume equations. The estimates are within acceptable limit when the plantations have been raised in comparable environmental conditions, same plantation type and management techniques. The two-way volume equations selected for estimation of volumes of akashmoni trees in strip plantations gives statistically similar volumes of the trees planted on embankments and roadsides in the coastal areas. But one-way volume equations give different volumes. This may be due to growing of plants in different environment. The one-way volume equations selected for akashmoni woodlot plantations by Latif *et al.* (1995) gives statistically similar volumes. The volume estimates for sissoo in strip plantations is lower compared to the volume estimates for the species planted on roadsides and embankments in the coastal areas (Latif *et*

al. 1999). Again, this may be due to growing plants in different environmental conditions. Similarly, mangium in woodlot gives higher estimates compared to the volume equations selected by Latif *et al.* (1993). This is due to the fact that those volume tables were prepared for small and young mangium trees. Now, the trees have grown older and larger. The estimates for eucalyptus in the woodlot are within the acceptable limit of 5%. The estimates for akashmoni and mangium are 13.1% lower and are 3.7% higher respectively as compared to the volume shown in the FRMP report (Revilla 1997). It was tested to select a regression model for the pooled data of the woodlot, agroforestry and strip plantations. It was observed that it is possible only for two-way data of akashmoni and mangium. Eucalyptus needs individual volume equations for each of woodlot, agroforestry and strip plantations.

Latif *et al.* (1988) and Latif and Habib (1993, 1994) prepared volume and biomass tables and estimated conversion factors for estimation of air dry and oven dry weights for eucalyptus, akashmoni and mangium. Similarly, Davidson (1985), Latif *et al.* (1995d) and Latif and Habib (1993) prepared volume tables for eucalyptus, akashmoni and mangium. These equations and tables have been used to estimate the volume-weight relationships. The values are given in Table 7. It was not possible to estimate the conversion factor for estimation of air dry and oven dry weights of sissoo from green weight due to lack of data. The data for this estimation were collected during the months of March to July. The green weight per cubic metre of wood may vary depending on the moisture content at the time of data collection.

Table 7. Biomass and volume-weight conversion factors for eucalyptus, akashmoni, mangium and sissoo in plantations in Bangladesh.

Criteria	Statistics for the species			
	Eucalyptus	Akashmoni	Mangium	Sissoo
Green weight per cum.	1190	1094	820	1160
Air-dry: Green biomass	0.530	0.582	0.486	NA
Oven-dry: Green biomass	0.467	0.387	0.340	NA

We prepared one-way (total and timber), two-way timber volume tables and underbark timber volume estimation conversion factors (Table 9 – 27) for ready use. The use of one-way volume equations may give little higher differences from the actual volume. But, from the sample test, it was observed that the difference is within acceptable limit. Interested persons who want to estimate more precise volumes are suggested to use two-way volume equations (GBH – height – volume relationships). Here, the height is the total length from the base of the tree to the tip position of the tree and girth at breast height (GBH) is the circumference taken at 1.3m above ground level of the tree. Therefore, users are suggested to measure the total height and GBH precisely to get the precise estimates of volumes of trees. The selected models give estimates of the round wood. If some one is interested to get estimates of quarter girth or other type of volumes. then necessary convention is required. The round wood volume should be multiplied by a factor of 0.783 to convert it into quarter girth volume. We derived equations to estimate total overbark

volume up to tip of the tree for estimation purposes. But, we did not prepare the tables for ready use, as it is not used in general.

Estimation of Volumes of the Lost Trees: Sometimes the trees could be cut and taken away without recording the GBH of the tree. But estimates of the volumes of these trees may be necessary. Therefore, we found out a procedure to estimate the volumes of these trees having at least 15.0cm high stump. We selected stump girth (girth at approximately 15.0cm above ground) and GBH relationships so that one can make use of the traditional volume equations (GBH-volume relationships).

Table 8. Comparison of selected overbark timber volume models for the species akashmoni, eucalyptus, mangium and sissoo in plantations in Bangladesh

Akashmoni	Agroforestry (One way)	Agroforestry (Two way)	Woodlot (One way)	Woodlot (Two way)	Strip (One way)	Strip (One way)
Agroforestry (One way)		-0.009	-10.142	-8.339	-1.609	-1.611
Agroforestry (Two way)	-0.009		-10.022	-8.224	-1.595	-1.597
Woodlot (One way)	-10.142	-10.022		-0.144	-6.327	-5.936
Woodlot (Two way)	-8.339	-8.339	-0.144		-6.270	-5.876
Strip (One way)	-1.609	-1.595	-6.327	-6.270		0.375
Strip (One way)	-1.661	-1.597	-5.936	-5.876	0.375	
Eucalyptus						
Agroforestry (One way)	-	0.003	-1.499	1.491	-6.495	-6.117
Agroforestry (Two way)	0.003		-1.507	-1.499	-6.507	-6.129
Woodlot (One way)	-1.499	-1.507		0.006	-5.574	-5.176
Woodlot (Two way)	-1.491	-1.499	0.006		-5.573	-5.176
Strip (One way)	-6.495	-6.507	-5.574	-5.573		-0.378
Strip (One way)	-6.117	-6.129	-5.176	-5.176	-0.378	
Mangium						
Agroforestry (One way)		-0.011	-0.176	-0.166		
Agroforestry (Two way)	-0.011		-0.160	-0.151		
Woodlot (One way)	-0.176	-0.160		-0.012		
Woodlot (Two way)	-0.166	-0.151	-0.012			

Comparison of the Selected Volume Estimation Models: We derived individual volume estimation models for each species and each plantation type. Each species have been planted at a maximum of three plantation types - woodlot, agroforestry and strip. It was tested whether one or more models may be used to estimate the volumes of trees of one species of all plantation types. This was done by t-test. It was observed that overbark timber volume estimation models selected for akashmoni for agroforestry plantations may be used for the trees of the strip plantations and *vise-versa* (Table 8). But, the models selected for woodlot plantations do not give precise estimate of volumes for trees of akashmoni planted in agroforestry and strip plantations. The overbark timber volume estimation models selected for eucalyptus in agroforestry plantations may be used for precise estimate of volumes of woodlot plantations. But, this is not applicable for eucalyptus

trees planted in strip plantations. The overbark timber volume estimation models selected for mangium in agroforestry plantations may safely be used for the mangium trees in woodlot plantations.

Confidence limit: It was observed in the validation tests that the selected models may be used to estimate the volumes of individual tree with some exceptions. Only in exceptional cases the differences in between the estimated volumes and observed volumes may be high. To avoid these, selected models and tables may be used for the mean tree of a stand that may be multiplied by the number of stems to get the estimate for the stand. Estimation of volumes, heights and fuelwood for trees beyond the height and GBH ranges shown in the stand table (Table 1) should only be done with caution. If the measured GBH and total height coincides with the tabular GBH and total height then the tabular values may be directly used. Otherwise, the volumes and conversion factors should be estimated first by using the respective equations followed by estimation of desired volumes. The one-way volume tables may similarly be used.

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Table 9. Conversion factors to estimate underbark volume up to top end girth of 30.0 cm for the species akashmoni, eucalyptus, mangium and sissoo in plantations in Bangladesh

GBH (cm)	Akashmoni	Eucalyptus	Mangium	Sissoo
30	0.581	0.366	0.498	0.579
33	0.617	0.433	0.539	0.609
36	0.651	0.489	0.578	0.636
39	0.681	0.537	0.615	0.660
42	0.709	0.578	0.649	0.682
45	0.734	0.613	0.681	0.702
48	0.757	0.644	0.710	0.720
51	0.778	0.672	0.737	0.736
54	0.797	0.696	0.762	0.751
57	0.814	0.718	0.784	0.764
60	0.829	0.737	0.803	0.777
63	0.842	0.755	0.821	0.787
66	0.854	0.771	0.836	0.797
69	0.865	0.786	0.850	0.806
72	0.874	0.799	0.861	0.814
75	0.882	0.811	0.871	0.822
78	0.889	0.823	0.879	0.828
81	0.895	0.833	0.885	0.834
84	0.900	0.843	0.890	0.839
87	0.904	0.852	0.894	0.844
90	0.908	0.861	0.896	0.848
93	0.910	0.869	0.898	0.851
96	0.912	0.876	0.898	0.854
99	0.913	0.884	0.897	0.857
102	0.914	0.890	0.896	0.859
105	0.914	0.896	0.893	0.861
108	0.914	0.902	0.890	0.863
111	0.914	0.908	0.887	0.864
114	0.912	0.913	0.883	0.865
117	0.911	0.918	0.878	0.866
120	0.909	0.923	0.873	0.866

Table 10: Height, volume and fuel wood production table for akashmoni in agroforestry plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.023	24.8	7.9
30	11.8	36.3	12.5	0.9		0.041		0.016	16.3	17.0
33	13.0	40.2	13.5	2.4		0.055	0.010	0.018	17.8	18.7
36	14.2	44.1	14.4	3.6		0.071	0.028	0.019	19.5	20.5
39	15.4	48.0	15.1	4.8		0.088	0.047	0.021	21.3	22.5
42	16.5	51.9	15.8	5.9		0.106	0.067	0.023	23.3	24.7
45	17.7	55.8	16.5	6.8	1.0	0.125	0.088	0.025	25.3	27.0
48	18.9	59.7	17.1	7.7	2.1	0.145	0.109	0.028	27.6	29.5
51	20.1	63.6	17.6	8.6	3.1	0.166	0.132	0.030	30.0	32.1
54	21.3	67.5	18.1	9.3	4.0	0.189	0.156	0.033	32.5	34.9
57	22.4	71.4	18.5	10.1	4.9	0.212	0.180	0.035	35.2	37.9
60	23.6	75.4	18.9	10.7	5.7	0.237	0.205	0.038	38.0	41.0
63	24.8	79.3	19.3	11.4	6.5	0.263	0.232	0.041	41.0	44.2
66	26.0	83.2	19.7	12.0	7.3	0.290	0.259	0.044	44.1	47.7
69	27.2	87.1	20.0	12.5	8.0	0.318	0.287	0.047	47.3	51.3
72	28.3	91.0	20.4	13.1	8.6	0.347	0.316	0.051	50.7	55.0
75	29.5	94.9	20.7	13.6	9.2	0.377	0.345	0.054	54.3	58.9
78	30.7	98.8	21.0	14.1	9.8	0.408	0.376	0.058	57.9	63.0
81	31.9	102.7	21.2	14.6	10.4	0.441	0.408	0.062	61.8	67.2
84	33.1	106.6	21.5	15.0	11.0	0.474	0.440	0.066	65.7	71.6
87	34.3	110.5	21.7	15.5	11.5	0.509	0.473	0.070	69.9	76.2
90	35.4	114.4	22.0	15.9	12.0	0.545	0.508	0.074	74.1	80.9
93	36.6	118.4	22.2	16.3	12.5	0.582	0.543	0.079	78.5	85.7
96	37.8	122.3	22.4	16.6	12.9	0.620	0.579	0.083	83.1	90.8
99	39.0	126.2	22.6	17.0	13.4	0.659	0.616	0.088	87.8	95.9
102	40.2	130.1	22.8	17.4	13.8	0.699	0.654	0.093	92.6	101.3
105	41.3	134.0	23.0	17.7	14.2	0.740	0.693	0.098	97.6	106.8
108	42.5	137.9	23.2	18.0	14.6	0.783	0.732	0.103	102.8	112.5
111	43.7	141.8	23.3	18.4	15.0	0.826	0.773	0.108	108.0	118.3
114	44.9	145.7	23.5	18.7	15.4	0.871	0.814	0.113	113.4	124.3
117	46.1	149.6	23.7	19.0	15.8	0.917	0.857	0.119	119.0	130.4
120	47.2	153.5	23.8	19.3	16.1	0.964	0.900	0.125	124.7	136.7

Table 11: Overbark timber volumes in cubic meters for akashmoni in agroforestry plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	8	10	12	14	16	18	20	22	24
30	0.0102	0.0156	0.0211	0.0265	0.0319	0.0373	0.0427	0.0482	0.0536
33	0.0148	0.0213	0.0279	0.0344	0.0410	0.0476	0.0541	0.0607	0.0672
36	0.0198	0.0276	0.0354	0.0432	0.0510	0.0588	0.0666	0.0744	0.0822
39	0.0252	0.0343	0.0435	0.0527	0.0618	0.0710	0.0802	0.0893	0.0985
42	0.0310	0.0417	0.0523	0.0629	0.0735	0.0842	0.0948	0.1054	0.1160
45	0.0373	0.0495	0.0617	0.0739	0.0861	0.0983	0.1105	0.1227	0.1349
48	0.0440	0.0579	0.0718	0.0857	0.0996	0.1134	0.1273	0.1412	0.1551
51	0.0512	0.0669	0.0825	0.0982	0.1139	0.1295	0.1452	0.1609	0.1766
54	0.0588	0.0764	0.0939	0.1115	0.1291	0.1466	0.1642	0.1818	0.1993
57	0.0668	0.0864	0.1060	0.1255	0.1451	0.1647	0.1843	0.2038	0.2234
60	0.0753	0.0970	0.1186	0.1403	0.1620	0.1837	0.2054	0.2271	0.2488
63	0.0842	0.1081	0.1320	0.1559	0.1798	0.2037	0.2276	0.2515	0.2755
66	0.0935	0.1197	0.1460	0.1722	0.1985	0.2247	0.2509	0.2772	0.3034
69	0.1033	0.1319	0.1606	0.1893	0.2180	0.2467	0.2753	0.3040	0.3327
72	0.1134	0.1447	0.1759	0.2071	0.2384	0.2696	0.3008	0.3321	0.3633
75	0.1241	0.1580	0.1918	0.2257	0.2596	0.2935	0.3274	0.3613	0.3952
78	0.1351	0.1718	0.2084	0.2451	0.2817	0.3184	0.3550	0.3917	0.4284
81	0.1466	0.1862	0.2257	0.2652	0.3047	0.3443	0.3838	0.4233	0.4628
84	0.1586	0.2011	0.2436	0.2861	0.3286	0.3711	0.4136	0.4561	0.4986
87	0.1709	0.2165	0.2621	0.3077	0.3533	0.3989	0.4445	0.4901	0.5357
90	0.1837	0.2325	0.2813	0.3301	0.3789	0.4277	0.4765	0.5253	0.5741
93	0.1969	0.2490	0.3012	0.3533	0.4054	0.4575	0.5096	0.5617	0.6138
96	0.2106	0.2661	0.3216	0.3772	0.4327	0.4882	0.5437	0.5993	0.6548
99	0.2247	0.2837	0.3428	0.4018	0.4609	0.5199	0.5790	0.6380	0.6971
102	0.2392	0.3019	0.3646	0.4273	0.4899	0.5526	0.6153	0.6780	0.7407
105	0.2542	0.3206	0.3870	0.4535	0.5199	0.5863	0.6527	0.7191	0.7856
108	0.2696	0.3399	0.4101	0.4804	0.5507	0.6209	0.6912	0.7615	0.8317
111	0.2854	0.3597	0.4339	0.5081	0.5823	0.6566	0.7308	0.8050	0.8792
114	0.3017	0.3800	0.4583	0.5366	0.6149	0.6932	0.7715	0.8497	0.9280
117	0.3184	0.4009	0.4833	0.5658	0.6483	0.7307	0.8132	0.8957	0.9781
120	0.3355	0.4223	0.5090	0.5958	0.6825	0.7693	0.8560	0.9428	1.0295

Table 12: Height, volume and fuel wood production table for akashmoni in woodlot plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.027	30.0	9.2
30	11.8	37.6	12.8	1.3		0.048	0.013	0.025	25.3	19.5
33	13.0	41.3	13.7	3.0		0.060	0.027	0.026	25.9	20.4
36	14.2	44.9	14.4	4.4		0.074	0.042	0.027	26.6	21.3
39	15.4	48.6	15.1	5.6		0.088	0.057	0.027	27.3	22.4
42	16.5	52.3	15.7	6.6		0.103	0.074	0.028	28.1	23.5
45	17.7	56.0	16.2	7.5	1.7	0.120	0.091	0.029	28.9	24.7
48	18.9	59.7	16.7	8.2	2.6	0.137	0.110	0.030	29.8	26.0
51	20.1	63.4	17.1	8.9	3.5	0.155	0.129	0.031	30.8	27.4
54	21.3	67.1	17.5	9.5	4.3	0.175	0.149	0.032	31.8	28.9
57	22.4	70.7	17.9	10.0	5.0	0.195	0.171	0.033	32.9	30.4
60	23.6	74.4	18.3	10.5	5.6	0.216	0.193	0.034	34.0	32.1
63	24.8	78.1	18.6	11.0	6.2	0.238	0.216	0.035	35.2	33.8
66	26.0	81.8	18.9	11.4	6.8	0.262	0.240	0.036	36.4	35.6
69	27.2	85.5	19.2	11.7	7.3	0.286	0.265	0.038	37.7	37.5
72	28.3	89.2	19.5	12.0	7.8	0.311	0.291	0.039	39.1	39.5
75	29.5	92.9	19.7	12.4	8.2	0.337	0.317	0.041	40.5	41.5
78	30.7	96.5	20.0	12.6	8.7	0.365	0.345	0.042	42.0	43.6
81	31.9	100.2	20.2	12.9	9.1	0.393	0.374	0.044	43.5	45.9
84	33.1	103.9	20.4	13.1	9.4	0.422	0.403	0.045	45.1	48.2
87	34.3	107.6	20.6	13.4	9.8	0.452	0.434	0.047	46.8	50.6
90	35.4	111.3	20.8	13.6	10.1	0.483	0.466	0.049	48.5	53.0
93	36.6	115.0	21.0	13.8	10.4	0.515	0.498	0.050	50.3	55.6
96	37.8	118.7	21.2	14.0	10.7	0.548	0.531	0.052	52.1	58.2
99	39.0	122.3	21.4	14.1	11.0	0.582	0.566	0.054	54.0	61.0
102	40.2	126.0	21.5	14.3	11.3	0.617	0.601	0.056	55.9	63.8
105	41.3	129.7	21.7	14.5	11.6	0.653	0.637	0.058	57.9	66.7
108	42.5	133.4	21.8	14.6	11.8	0.691	0.674	0.060	60.0	69.7
111	43.7	137.1	22.0	14.7	12.1	0.729	0.712	0.062	62.1	72.7
114	44.9	140.8	22.1	14.9	12.3	0.768	0.751	0.064	64.3	75.9
117	46.1	144.5	22.3	15.0	12.5	0.808	0.791	0.067	66.5	79.1
120	47.2	148.1	22.4	15.1	12.7	0.849	0.832	0.069	68.8	82.4

Table 13: Overbark timber volumes in cubic meters for akashmoni in woodlot plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	8	10	12	14	16	18	20	22	24
30	0.0445	0.0488	0.0531	0.0575	0.0618	0.0662	0.0705	0.0748	0.0792
33	0.0481	0.0534	0.0586	0.0639	0.0691	0.0744	0.0796	0.0848	0.0901
36	0.0521	0.0583	0.0646	0.0708	0.0771	0.0833	0.0896	0.0958	0.1021
39	0.0564	0.0638	0.0711	0.0784	0.0858	0.0931	0.1004	0.1077	0.1151
42	0.0611	0.0696	0.0781	0.0866	0.0951	0.1036	0.1121	0.1206	0.1291
45	0.0662	0.0759	0.0857	0.0954	0.1052	0.1149	0.1247	0.1345	0.1442
48	0.0715	0.0826	0.0937	0.1048	0.1159	0.1270	0.1382	0.1493	0.1604
51	0.0773	0.0898	0.1023	0.1149	0.1274	0.1399	0.1525	0.1650	0.1775
54	0.0833	0.0974	0.1114	0.1255	0.1395	0.1536	0.1676	0.1817	0.1957
57	0.0897	0.1054	0.1211	0.1367	0.1524	0.1680	0.1837	0.1993	0.2150
60	0.0965	0.1139	0.1312	0.1486	0.1659	0.1833	0.2006	0.2180	0.2353
63	0.1036	0.1228	0.1419	0.1610	0.1801	0.1993	0.2184	0.2375	0.2566
66	0.1111	0.1321	0.1531	0.1741	0.1951	0.2160	0.2370	0.2580	0.2790
69	0.1189	0.1418	0.1648	0.1877	0.2107	0.2336	0.2566	0.2795	0.3024
72	0.1270	0.1520	0.1770	0.2020	0.2270	0.2520	0.2769	0.3019	0.3269
75	0.1355	0.1627	0.1898	0.2169	0.2440	0.2711	0.2982	0.3253	0.3524
78	0.1444	0.1737	0.2030	0.2324	0.2617	0.2910	0.3203	0.3496	0.3789
81	0.1536	0.1852	0.2168	0.2484	0.2801	0.3117	0.3433	0.3749	0.4065
84	0.1631	0.1971	0.2311	0.2651	0.2991	0.3331	0.3672	0.4012	0.4352
87	0.1730	0.2095	0.2460	0.2824	0.3189	0.3554	0.3919	0.4283	0.4648
90	0.1833	0.2223	0.2613	0.3004	0.3394	0.3784	0.4175	0.4565	0.4955
93	0.1938	0.2355	0.2772	0.3189	0.3606	0.4022	0.4439	0.4856	0.5273
96	0.2048	0.2492	0.2936	0.3380	0.3824	0.4268	0.4712	0.5157	0.5601
99	0.2160	0.2633	0.3105	0.3577	0.4050	0.4522	0.4994	0.5467	0.5939
102	0.2277	0.2778	0.3279	0.3781	0.4282	0.4784	0.5285	0.5786	0.6288
105	0.2396	0.2928	0.3459	0.3990	0.4522	0.5053	0.5584	0.6116	0.6647
108	0.2520	0.3082	0.3644	0.4206	0.4768	0.5330	0.5892	0.6454	0.7016
111	0.2646	0.3240	0.3834	0.4427	0.5021	0.5615	0.6209	0.6803	0.7396
114	0.2776	0.3403	0.4029	0.4655	0.5281	0.5908	0.6534	0.7160	0.7787
117	0.2910	0.3570	0.4229	0.4889	0.5549	0.6208	0.6868	0.7528	0.8187
120	0.3047	0.3741	0.4435	0.5129	0.5823	0.6517	0.7211	0.7905	0.8599

Table 14: Height, volume and fuel wood production table for akashmoni in strip plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.032	34.7	9.7
30	11.8	34.8	8.9	1.1		0.032	0.006	0.027	27.1	22.6
33	13.0	38.8	9.8	2.1		0.042	0.017	0.029	29.2	23.6
36	14.2	42.8	10.6	3.0		0.053	0.029	0.031	31.5	24.7
39	15.4	46.9	11.3	3.9		0.065	0.042	0.034	33.9	25.9
42	16.5	50.9	11.9	4.6		0.078	0.055	0.037	36.6	27.2
45	17.7	55.0	12.5	5.3	1.2	0.092	0.070	0.040	39.5	28.6
48	18.9	59.0	13.1	6.0	2.0	0.108	0.086	0.043	42.6	30.1
51	20.1	63.1	13.6	6.6	2.7	0.124	0.103	0.046	45.9	31.7
54	21.3	67.1	14.0	7.1	3.3	0.142	0.121	0.049	49.3	33.4
57	22.4	71.1	14.5	7.7	3.9	0.160	0.140	0.053	53.0	35.2
60	23.6	75.2	14.9	8.2	4.4	0.180	0.161	0.057	56.9	37.1
63	24.8	79.2	15.3	8.6	5.0	0.201	0.182	0.061	60.9	39.1
66	26.0	83.3	15.6	9.1	5.5	0.223	0.204	0.065	65.2	41.2
69	27.2	87.3	16.0	9.5	5.9	0.246	0.227	0.070	69.7	43.3
72	28.3	91.4	16.3	9.9	6.4	0.270	0.251	0.074	74.3	45.6
75	29.5	95.4	16.6	10.2	6.8	0.295	0.277	0.079	79.2	48.0
78	30.7	99.4	16.9	10.6	7.2	0.321	0.303	0.084	84.3	50.5
81	31.9	103.5	17.2	10.9	7.6	0.348	0.330	0.090	89.5	53.0
84	33.1	107.5	17.5	11.3	8.0	0.377	0.359	0.095	95.0	55.7
87	34.3	111.6	17.7	11.6	8.3	0.406	0.388	0.101	100.6	58.5
90	35.4	115.6	18.0	11.9	8.6	0.436	0.419	0.106	106.5	61.3
93	36.6	119.7	18.2	12.2	9.0	0.468	0.450	0.113	112.5	64.3
96	37.8	123.7	18.5	12.4	9.3	0.501	0.483	0.119	118.8	67.3
99	39.0	127.7	18.7	12.7	9.6	0.534	0.516	0.125	125.2	70.5
102	40.2	131.8	18.9	13.0	9.9	0.569	0.551	0.132	131.9	73.7
105	41.3	135.8	19.1	13.2	10.2	0.605	0.586	0.139	138.7	77.1
108	42.5	139.9	19.3	13.5	10.4	0.642	0.623	0.146	145.8	80.5
111	43.7	143.9	19.5	13.7	10.7	0.680	0.661	0.153	153.0	84.0
114	44.9	148.0	19.7	13.9	10.9	0.719	0.699	0.160	160.5	87.7
117	46.1	152.0	19.9	14.1	11.2	0.759	0.739	0.168	168.1	91.4
120	47.2	156.1	20.1	14.3	11.4	0.800	0.780	0.176	175.9	95.2

Table 15: Overbark timber volumes in cubic meters for akashmoni in strip plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	8	10	12	14	16	18	20	22	24
30	0.0391	0.0437	0.0484	0.0530	0.0576	0.0623	0.0669	0.0715	0.0762
33	0.0430	0.0486	0.0542	0.0598	0.0654	0.0710	0.0766	0.0822	0.0878
36	0.0473	0.0539	0.0606	0.0673	0.0739	0.0806	0.0873	0.0939	0.1006
39	0.0519	0.0597	0.0675	0.0754	0.0832	0.0910	0.0988	0.1067	0.1145
42	0.0569	0.0660	0.0750	0.0841	0.0932	0.1023	0.1114	0.1204	0.1295
45	0.0623	0.0727	0.0831	0.0935	0.1039	0.1144	0.1248	0.1352	0.1456
48	0.0680	0.0799	0.0917	0.1036	0.1154	0.1273	0.1391	0.1510	0.1628
51	0.0741	0.0875	0.1009	0.1143	0.1277	0.1410	0.1544	0.1678	0.1812
54	0.0806	0.0956	0.1106	0.1256	0.1406	0.1556	0.1706	0.1856	0.2006
57	0.0875	0.1042	0.1209	0.1376	0.1543	0.1710	0.1878	0.2045	0.2212
60	0.0947	0.1132	0.1317	0.1502	0.1688	0.1873	0.2058	0.2243	0.2429
63	0.1023	0.1227	0.1431	0.1635	0.1840	0.2044	0.2248	0.2452	0.2656
66	0.1102	0.1327	0.1551	0.1775	0.1999	0.2223	0.2447	0.2671	0.2895
69	0.1186	0.1431	0.1676	0.1921	0.2166	0.2411	0.2656	0.2900	0.3145
72	0.1273	0.1540	0.1806	0.2073	0.2340	0.2606	0.2873	0.3140	0.3407
75	0.1364	0.1653	0.1942	0.2232	0.2521	0.2811	0.3100	0.3389	0.3679
78	0.1458	0.1771	0.2084	0.2397	0.2710	0.3023	0.3336	0.3649	0.3962
81	0.1556	0.1894	0.2231	0.2569	0.2907	0.3244	0.3582	0.3919	0.4257
84	0.1658	0.2021	0.2384	0.2747	0.3110	0.3473	0.3836	0.4199	0.4562
87	0.1764	0.2153	0.2543	0.2932	0.3321	0.3711	0.4100	0.4490	0.4879
90	0.1873	0.2290	0.2706	0.3123	0.3540	0.3957	0.4373	0.4790	0.5207
93	0.1986	0.2431	0.2876	0.3321	0.3766	0.4211	0.4656	0.5101	0.5546
96	0.2103	0.2577	0.3051	0.3525	0.3999	0.4474	0.4948	0.5422	0.5896
99	0.2223	0.2727	0.3232	0.3736	0.4240	0.4744	0.5249	0.5753	0.6257
102	0.2347	0.2882	0.3418	0.3953	0.4488	0.5024	0.5559	0.6094	0.6630
105	0.2475	0.3042	0.3609	0.4177	0.4744	0.5311	0.5878	0.6446	0.7013
108	0.2606	0.3207	0.3807	0.4407	0.5007	0.5607	0.6207	0.6807	0.7407
111	0.2742	0.3376	0.4010	0.4643	0.5277	0.5911	0.6545	0.7179	0.7813
114	0.2881	0.3549	0.4218	0.4887	0.5555	0.6224	0.6893	0.7561	0.8230
117	0.3023	0.3728	0.4432	0.5136	0.5840	0.6545	0.7249	0.7953	0.8658
120	0.3170	0.3910	0.4651	0.5392	0.6133	0.6874	0.7615	0.8356	0.9097

Table 16: Height, volume and fuel wood production table for eucalyptus in woodlot plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.026	31.4	9.7
30	11.8	37.3	13.5	0.9		0.044		0.010	10.9	8.6
33	13.0	41.1	14.6	3.0		0.059	0.019	0.012	13.2	10.2
36	14.2	44.9	15.6	4.8		0.075	0.038	0.014	15.7	12.1
39	15.4	48.7	16.5	6.3		0.093	0.058	0.017	18.4	14.1
42	16.5	52.5	17.3	7.7		0.112	0.080	0.019	21.3	16.3
45	17.7	56.3	18.0	8.8	1.2	0.133	0.103	0.022	24.4	18.6
48	18.9	60.1	18.7	9.9	2.5	0.155	0.127	0.025	27.8	21.1
51	20.1	63.9	19.3	10.8	3.8	0.179	0.153	0.028	31.3	23.8
54	21.3	67.7	19.9	11.7	4.9	0.204	0.179	0.032	35.1	26.6
57	22.4	71.5	20.5	12.4	6.0	0.231	0.208	0.035	39.1	29.6
60	23.6	75.3	21.0	13.1	6.9	0.259	0.237	0.039	43.3	32.7
63	24.8	79.1	21.5	13.8	7.9	0.289	0.268	0.043	47.7	36.0
66	26.0	82.9	22.0	14.3	8.7	0.320	0.300	0.047	52.3	39.5
69	27.2	86.7	22.4	14.9	9.5	0.352	0.334	0.052	57.2	43.1
72	28.3	90.5	22.8	15.4	10.3	0.386	0.368	0.056	62.3	46.9
75	29.5	94.3	23.2	15.8	11.0	0.422	0.404	0.061	67.5	50.8
78	30.7	98.1	23.6	16.3	11.6	0.459	0.442	0.066	73.0	54.9
81	31.9	101.9	24.0	16.7	12.3	0.497	0.481	0.071	78.7	59.2
84	33.1	105.7	24.3	17.0	12.9	0.537	0.521	0.076	84.7	63.6
87	34.3	109.4	24.6	17.4	13.5	0.578	0.562	0.082	90.8	68.2
90	35.4	113.2	24.9	17.7	14.0	0.621	0.605	0.088	97.2	72.9
93	36.6	117.0	25.3	18.0	14.5	0.665	0.649	0.093	103.8	77.8
96	37.8	120.8	25.5	18.3	15.0	0.711	0.694	0.100	110.5	82.9
99	39.0	124.6	25.8	18.6	15.5	0.758	0.741	0.106	117.5	88.2
102	40.2	128.4	26.1	18.8	16.0	0.807	0.788	0.112	124.8	93.5
105	41.3	132.2	26.4	19.1	16.4	0.857	0.838	0.119	132.2	99.1
108	42.5	136.0	26.6	19.3	16.8	0.909	0.888	0.126	139.9	104.8
111	43.7	139.8	26.9	19.5	17.2	0.962	0.940	0.133	147.7	110.7
114	44.9	143.6	27.1	19.8	17.6	1.016	0.993	0.140	155.8	116.7
117	46.1	147.4	27.3	20.0	18.0	1.072	1.048	0.148	164.1	122.9
120	47.2	151.2	27.6	20.2	18.4	1.130	1.104	0.156	172.6	129.3

Table 17: Overbark timber volumes in cubic meters for eucalyptus in woodlot plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	12	14	16	18	20	22	24	26	28
30	0.0346	0.0398	0.0451	0.0503	0.0556	0.0608	0.0661	0.0713	0.0766
33	0.0412	0.0475	0.0539	0.0602	0.0666	0.0729	0.0793	0.0856	0.0920
36	0.0484	0.0560	0.0635	0.0711	0.0787	0.0862	0.0938	0.1013	0.1089
39	0.0563	0.0652	0.0740	0.0829	0.0918	0.1006	0.1095	0.1184	0.1272
42	0.0648	0.0751	0.0854	0.0957	0.1059	0.1162	0.1265	0.1368	0.1471
45	0.0739	0.0857	0.0975	0.1093	0.1212	0.1330	0.1448	0.1566	0.1684
48	0.0837	0.0971	0.1106	0.1240	0.1374	0.1509	0.1643	0.1777	0.1912
51	0.0941	0.1092	0.1244	0.1396	0.1547	0.1699	0.1851	0.2002	0.2154
54	0.1051	0.1221	0.1391	0.1561	0.1731	0.1901	0.2071	0.2241	0.2411
57	0.1167	0.1357	0.1546	0.1736	0.1925	0.2115	0.2304	0.2494	0.2683
60	0.1290	0.1500	0.1710	0.1920	0.2130	0.2340	0.2550	0.2760	0.2970
63	0.1419	0.1651	0.1882	0.2114	0.2345	0.2576	0.2808	0.3039	0.3271
66	0.1555	0.1809	0.2063	0.2317	0.2571	0.2825	0.3079	0.3333	0.3587
69	0.1696	0.1974	0.2252	0.2529	0.2807	0.3084	0.3362	0.3640	0.3917
72	0.1844	0.2147	0.2449	0.2751	0.3054	0.3356	0.3658	0.3960	0.4263
75	0.1999	0.2327	0.2655	0.2983	0.3311	0.3639	0.3967	0.4295	0.4623
78	0.2159	0.2514	0.2869	0.3224	0.3578	0.3933	0.4288	0.4643	0.4997
81	0.2326	0.2709	0.3091	0.3474	0.3856	0.4239	0.4622	0.5004	0.5387
84	0.2499	0.2911	0.3322	0.3734	0.4145	0.4556	0.4968	0.5379	0.5791
87	0.2679	0.3120	0.3561	0.4003	0.4444	0.4885	0.5327	0.5768	0.6209
90	0.2865	0.3337	0.3809	0.4281	0.4754	0.5226	0.5698	0.6171	0.6643
93	0.3057	0.3561	0.4065	0.4570	0.5074	0.5578	0.6082	0.6587	0.7091
96	0.3255	0.3792	0.4330	0.4867	0.5404	0.5942	0.6479	0.7017	0.7554
99	0.3460	0.4031	0.4603	0.5174	0.5746	0.6317	0.6889	0.7460	0.8031
102	0.3671	0.4277	0.4884	0.5491	0.6097	0.6704	0.7310	0.7917	0.8524
105	0.3888	0.4531	0.5174	0.5816	0.6459	0.7102	0.7745	0.8388	0.9031
108	0.4111	0.4792	0.5472	0.6152	0.6832	0.7512	0.8192	0.8872	0.9552
111	0.4341	0.5060	0.5778	0.6497	0.7215	0.7933	0.8652	0.9370	1.0089
114	0.4577	0.5335	0.6093	0.6851	0.7608	0.8366	0.9124	0.9882	1.0640
117	0.4820	0.5618	0.6416	0.7214	0.8013	0.8811	0.9609	1.0407	1.1205
120	0.5069	0.5908	0.6748	0.7588	0.8427	0.9267	1.0106	1.0946	1.1786

Table 18: Height, volume and fuel wood production table for eucalyptus in agroforestry plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.022	26.5	7.1
30	11.8	38.8	13.6	0.8		0.045		0.011	12.7	10.0
33	13.0	42.6	14.8	2.6		0.062	0.005	0.013	14.3	11.5
36	14.2	46.4	15.9	4.1		0.079	0.028	0.014	16.0	13.2
39	15.4	50.1	16.9	5.5		0.097	0.052	0.016	17.9	15.1
42	16.5	53.9	17.7	6.8		0.117	0.077	0.018	19.9	17.0
45	17.7	57.6	18.6	8.0		0.138	0.102	0.020	22.1	19.2
48	18.9	61.4	19.3	9.1	2.0	0.161	0.129	0.022	24.5	21.4
51	20.1	65.2	20.0	10.1	3.4	0.184	0.156	0.024	26.9	23.8
54	21.3	68.9	20.7	11.0	4.6	0.209	0.184	0.027	29.6	26.4
57	22.4	72.7	21.3	11.9	5.8	0.235	0.212	0.029	32.4	29.1
60	23.6	76.4	21.8	12.8	6.9	0.263	0.242	0.032	35.3	32.0
63	24.8	80.2	22.4	13.5	7.9	0.291	0.272	0.035	38.4	35.0
66	26.0	84.0	22.9	14.3	8.8	0.321	0.303	0.038	41.7	38.1
69	27.2	87.7	23.4	15.0	9.7	0.352	0.335	0.041	45.1	41.4
72	28.3	91.5	23.8	15.6	10.5	0.385	0.368	0.044	48.6	44.9
75	29.5	95.2	24.2	16.3	11.3	0.418	0.402	0.047	52.3	48.5
78	30.7	99.0	24.7	16.9	12.0	0.453	0.436	0.051	56.2	52.2
81	31.9	102.8	25.0	17.4	12.7	0.490	0.471	0.054	60.2	56.1
84	33.1	106.5	25.4	18.0	13.4	0.527	0.507	0.058	64.4	60.1
87	34.3	110.3	25.8	18.5	14.0	0.566	0.544	0.062	68.7	64.3
90	35.4	114.0	26.1	19.0	14.6	0.606	0.582	0.066	73.1	68.6
93	36.6	117.8	26.5	19.5	15.2	0.647	0.620	0.070	77.7	73.1
96	37.8	121.6	26.8	20.0	15.8	0.690	0.660	0.074	82.5	77.7
99	39.0	125.3	27.1	20.4	16.3	0.734	0.700	0.079	87.4	82.5
102	40.2	129.1	27.4	20.8	16.8	0.779	0.741	0.083	92.5	87.4
105	41.3	132.8	27.7	21.3	17.3	0.825	0.783	0.088	97.7	92.5
108	42.5	136.6	28.0	21.7	17.7	0.873	0.825	0.093	103.1	97.7
111	43.7	140.4	28.2	22.1	18.2	0.922	0.868	0.098	108.6	103.0
114	44.9	144.1	28.5	22.4	18.6	0.972	0.913	0.103	114.2	108.5
117	46.1	147.9	28.7	22.8	19.0	1.023	0.958	0.108	120.1	114.2
120	47.2	151.6	29.0	23.2	19.4	1.076	1.003	0.114	126.0	120.0

Table 19: Overbark timber volumes in cubic meters for eucalyptus in agroforestry plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	12	14	16	18	20	22	24	26	28
30	0.0341	0.0389	0.0438	0.0486	0.0535	0.0583	0.0632	0.0680	0.0728
33	0.0402	0.0461	0.0519	0.0578	0.0636	0.0695	0.0754	0.0812	0.0871
36	0.0469	0.0539	0.0608	0.0678	0.0748	0.0818	0.0887	0.0957	0.1027
39	0.0541	0.0623	0.0705	0.0787	0.0869	0.0951	0.1033	0.1115	0.1196
42	0.0620	0.0715	0.0810	0.0905	0.1000	0.1095	0.1190	0.1285	0.1379
45	0.0704	0.0813	0.0922	0.1031	0.1140	0.1249	0.1358	0.1467	0.1576
48	0.0794	0.0918	0.1042	0.1166	0.1290	0.1414	0.1538	0.1662	0.1786
51	0.0890	0.1030	0.1170	0.1310	0.1450	0.1590	0.1730	0.1870	0.2010
54	0.0992	0.1149	0.1306	0.1463	0.1620	0.1777	0.1934	0.2091	0.2247
57	0.1099	0.1274	0.1449	0.1624	0.1799	0.1974	0.2149	0.2323	0.2498
60	0.1213	0.1407	0.1600	0.1794	0.1988	0.2182	0.2375	0.2569	0.2763
63	0.1332	0.1546	0.1759	0.1973	0.2186	0.2400	0.2614	0.2827	0.3041
66	0.1457	0.1691	0.1926	0.2160	0.2395	0.2629	0.2864	0.3098	0.3332
69	0.1588	0.1844	0.2100	0.2356	0.2613	0.2869	0.3125	0.3381	0.3638
72	0.1724	0.2003	0.2282	0.2561	0.2840	0.3119	0.3398	0.3677	0.3956
75	0.1867	0.2169	0.2472	0.2775	0.3078	0.3380	0.3683	0.3986	0.4289
78	0.2015	0.2342	0.2670	0.2997	0.3325	0.3652	0.3980	0.4307	0.4634
81	0.2169	0.2522	0.2875	0.3228	0.3581	0.3935	0.4288	0.4641	0.4994
84	0.2329	0.2709	0.3088	0.3468	0.3848	0.4228	0.4607	0.4987	0.5367
87	0.2494	0.2902	0.3309	0.3717	0.4124	0.4531	0.4939	0.5346	0.5753
90	0.2666	0.3102	0.3538	0.3974	0.4410	0.4846	0.5282	0.5717	0.6153
93	0.2843	0.3309	0.3774	0.4240	0.4705	0.5171	0.5636	0.6102	0.6567
96	0.3026	0.3522	0.4018	0.4514	0.5010	0.5506	0.6002	0.6498	0.6994
99	0.3215	0.3743	0.4270	0.4798	0.5325	0.5853	0.6380	0.6908	0.7435
102	0.3410	0.3970	0.4530	0.5090	0.5650	0.6210	0.6770	0.7329	0.7889
105	0.3610	0.4204	0.4797	0.5391	0.5984	0.6577	0.7171	0.7764	0.8357
108	0.3817	0.4445	0.5072	0.5700	0.6328	0.6956	0.7583	0.8211	0.8839
111	0.4029	0.4692	0.5355	0.6018	0.6681	0.7344	0.8008	0.8671	0.9334
114	0.4247	0.4946	0.5646	0.6345	0.7045	0.7744	0.8444	0.9143	0.9842
117	0.4471	0.5207	0.5944	0.6681	0.7418	0.8154	0.8891	0.9628	1.0365
120	0.4700	0.5475	0.6250	0.7025	0.7800	0.8575	0.9350	1.0125	1.0900

Table 20: Height, volume and fuel wood production table for eucalyptus in strip plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
30	11.8	33.4	2.8			0.141	0.119	0.027	29.7	24.6
33	13.0	37.2	4.5			0.134	0.113	0.028	31.4	25.5
36	14.2	41.0	6.1			0.130	0.109	0.030	33.2	26.5
39	15.4	44.8	7.5	1.1		0.129	0.108	0.032	35.2	27.5
42	16.5	48.6	8.9	2.3		0.130	0.109	0.034	37.4	28.7
45	17.7	52.4	10.1	3.5		0.133	0.113	0.036	39.7	29.9
48	18.9	56.3	11.2	4.5		0.139	0.119	0.038	42.2	31.2
51	20.1	60.1	12.2	5.5	1.2	0.148	0.128	0.040	44.9	32.6
54	21.3	63.9	13.1	6.4	2.2	0.159	0.139	0.043	47.7	34.1
57	22.4	67.7	14.0	7.3	3.1	0.172	0.153	0.046	50.6	35.7
60	23.6	71.5	14.9	8.1	4.0	0.188	0.169	0.048	53.8	37.3
63	24.8	75.3	15.7	8.9	4.9	0.207	0.188	0.051	57.1	39.0
66	26.0	79.1	16.4	9.6	5.6	0.228	0.210	0.055	60.5	40.9
69	27.2	82.9	17.1	10.3	6.4	0.252	0.233	0.058	64.1	42.8
72	28.3	86.7	17.8	10.9	7.1	0.278	0.260	0.061	67.9	44.8
75	29.5	90.5	18.4	11.5	7.8	0.307	0.289	0.065	71.8	46.8
78	30.7	94.3	19.0	12.1	8.4	0.338	0.320	0.068	75.9	49.0
81	31.9	98.2	19.6	12.7	9.0	0.371	0.354	0.072	80.2	51.2
84	33.1	102.0	20.2	13.2	9.6	0.408	0.391	0.076	84.6	53.6
87	34.3	105.8	20.7	13.7	10.2	0.446	0.430	0.080	89.2	56.0
90	35.4	109.6	21.2	14.2	10.7	0.487	0.471	0.085	93.9	58.5
93	36.6	113.4	21.7	14.7	11.2	0.531	0.515	0.089	98.8	61.0
96	37.8	117.2	22.2	15.1	11.7	0.577	0.562	0.094	103.8	63.7
99	39.0	121.0	22.6	15.6	12.2	0.626	0.611	0.098	109.1	66.4
102	40.2	124.8	23.1	16.0	12.7	0.677	0.663	0.103	114.4	69.3
105	41.3	128.6	23.5	16.4	13.1	0.731	0.717	0.108	120.0	72.2
108	42.5	132.4	23.9	16.8	13.5	0.787	0.773	0.113	125.7	75.2
111	43.7	136.2	24.3	17.2	14.0	0.846	0.833	0.118	131.5	78.3
114	44.9	140.1	24.7	17.5	14.4	0.907	0.894	0.124	137.5	81.5
117	46.1	143.9	25.1	17.9	14.7	0.971	0.958	0.129	143.7	84.7
120	47.2	147.7	25.4	18.2	15.1	1.038	1.025	0.135	150.1	88.1

Table 21: Overbark timber volumes in cubic meters for eucalyptus in strip plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	12	14	16	18	20	22	24	26	28
30	0.0341	0.0390	0.0439	0.0489	0.0538	0.0588	0.0637	0.0686	0.0736
33	0.0403	0.0463	0.0522	0.0582	0.0642	0.0702	0.0761	0.0821	0.0881
36	0.0471	0.0542	0.0613	0.0684	0.0756	0.0827	0.0898	0.0969	0.1040
39	0.0545	0.0629	0.0712	0.0796	0.0879	0.0962	0.1046	0.1129	0.1213
42	0.0625	0.0722	0.0819	0.0916	0.1012	0.1109	0.1206	0.1303	0.1399
45	0.0711	0.0822	0.0933	0.1044	0.1156	0.1267	0.1378	0.1489	0.1600
48	0.0803	0.0929	0.1056	0.1182	0.1309	0.1435	0.1561	0.1688	0.1814
51	0.0901	0.1043	0.1186	0.1329	0.1472	0.1614	0.1757	0.1900	0.2042
54	0.1004	0.1164	0.1324	0.1484	0.1644	0.1804	0.1964	0.2124	0.2284
57	0.1114	0.1292	0.1471	0.1649	0.1827	0.2005	0.2184	0.2362	0.2540
60	0.1230	0.1427	0.1625	0.1822	0.2020	0.2217	0.2415	0.2612	0.2810
63	0.1351	0.1569	0.1787	0.2004	0.2222	0.2440	0.2658	0.2876	0.3093
66	0.1478	0.1718	0.1957	0.2196	0.2435	0.2674	0.2913	0.3152	0.3391
69	0.1612	0.1873	0.2134	0.2396	0.2657	0.2918	0.3179	0.3440	0.3702
72	0.1751	0.2036	0.2320	0.2604	0.2889	0.3173	0.3458	0.3742	0.4027
75	0.1896	0.2205	0.2514	0.2822	0.3131	0.3439	0.3748	0.4057	0.4365
78	0.2047	0.2381	0.2715	0.3049	0.3383	0.3717	0.4050	0.4384	0.4718
81	0.2204	0.2564	0.2924	0.3284	0.3644	0.4004	0.4364	0.4724	0.5084
84	0.2367	0.2755	0.3142	0.3529	0.3916	0.4303	0.4690	0.5078	0.5465
87	0.2536	0.2952	0.3367	0.3782	0.4198	0.4613	0.5028	0.5443	0.5859
90	0.2711	0.3156	0.3600	0.4044	0.4489	0.4933	0.5378	0.5822	0.6267
93	0.2892	0.3366	0.3841	0.4316	0.4790	0.5265	0.5739	0.6214	0.6688
96	0.3078	0.3584	0.4090	0.4596	0.5101	0.5607	0.6113	0.6618	0.7124
99	0.3271	0.3809	0.4347	0.4884	0.5422	0.5960	0.6498	0.7036	0.7573
102	0.3470	0.4040	0.4611	0.5182	0.5753	0.6324	0.6895	0.7466	0.8037
105	0.3674	0.4279	0.4884	0.5489	0.6094	0.6699	0.7304	0.7909	0.8514
108	0.3884	0.4524	0.5164	0.5804	0.6444	0.7084	0.7724	0.8364	0.9004
111	0.4101	0.4777	0.5453	0.6129	0.6805	0.7481	0.8157	0.8833	0.9509
114	0.4323	0.5036	0.5749	0.6462	0.7175	0.7888	0.8601	0.9315	1.0028
117	0.4551	0.5302	0.6053	0.6804	0.7556	0.8307	0.9058	0.9809	1.0560
120	0.4785	0.5575	0.6365	0.7156	0.7946	0.8736	0.9526	1.0316	1.1106

Table 22: Height, volume and fuel wood production table for mangium in agroforestry plantation in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.028	22.9	5.9
30	11.8	36.2	12.0	1.1		0.045	0.029	0.005	3.8	7.3
33	13.0	39.8	13.0	2.8		0.056	0.038	0.007	5.4	8.9
36	14.2	43.4	13.9	4.3		0.069	0.049	0.009	7.1	10.5
39	15.4	47.0	14.7	5.6		0.083	0.062	0.012	9.0	12.4
42	16.5	50.6	15.4	6.7		0.099	0.077	0.015	11.0	14.4
45	17.7	54.1	16.1	7.8		0.117	0.094	0.017	13.1	16.5
48	18.9	57.7	16.7	8.7	2.0	0.136	0.113	0.021	15.4	18.8
51	20.1	61.3	17.3	9.5	3.3	0.158	0.134	0.024	17.9	21.2
54	21.3	64.9	17.8	10.3	4.5	0.181	0.156	0.027	20.5	23.7
57	22.4	68.5	18.3	11.0	5.5	0.206	0.181	0.031	23.2	26.5
60	23.6	72.1	18.7	11.6	6.5	0.233	0.208	0.035	26.1	29.3
63	24.8	75.7	19.2	12.2	7.3	0.262	0.236	0.039	29.2	32.3
66	26.0	79.3	19.6	12.8	8.1	0.292	0.267	0.043	32.4	35.5
69	27.2	82.9	20.0	13.3	8.9	0.324	0.299	0.048	35.7	38.8
72	28.3	86.5	20.3	13.8	9.6	0.358	0.334	0.052	39.2	42.2
75	29.5	90.1	20.7	14.2	10.2	0.394	0.370	0.057	42.9	45.8
78	30.7	93.7	21.0	14.6	10.8	0.432	0.409	0.062	46.7	49.6
81	31.9	97.3	21.4	15.0	11.3	0.471	0.449	0.067	50.6	53.4
84	33.1	100.9	21.7	15.4	11.9	0.512	0.491	0.073	54.7	57.5
87	34.3	104.5	22.0	15.7	12.3	0.555	0.536	0.079	58.9	61.7
90	35.4	108.1	22.2	16.1	12.8	0.600	0.582	0.084	63.3	66.0
93	36.6	111.7	22.5	16.4	13.2	0.647	0.630	0.090	67.8	70.5
96	37.8	115.2	22.8	16.7	13.6	0.695	0.680	0.097	72.5	75.1
99	39.0	118.8	23.0	17.0	14.0	0.746	0.733	0.103	77.4	79.8
102	40.2	122.4	23.3	17.2	14.4	0.798	0.787	0.110	82.3	84.8
105	41.3	126.0	23.5	17.5	14.7	0.851	0.843	0.117	87.5	89.8
108	42.5	129.6	23.7	17.7	15.0	0.907	0.901	0.124	92.8	95.0
111	43.7	133.2	23.9	18.0	15.3	0.964	0.961	0.131	98.2	100.4
114	44.9	136.8	24.2	18.2	15.6	1.024	1.023	0.138	103.8	105.9
117	46.1	140.4	24.4	18.4	15.9	1.085	1.087	0.146	109.5	111.5
120	47.2	144.0	24.6	18.6	16.2	1.148	1.153	0.154	115.4	117.3

Table 23: Overbark timber volumes in cubic meters for mangium in agroforestry plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	10	12	14	16	18	20	22	24	26
30	0.0086	0.0146	0.0206	0.0267	0.0327	0.0387	0.0447	0.0507	0.0567
33	0.0149	0.0222	0.0295	0.0368	0.0440	0.0513	0.0586	0.0659	0.0731
36	0.0218	0.0305	0.0392	0.0478	0.0565	0.0651	0.0738	0.0825	0.0911
39	0.0294	0.0395	0.0497	0.0599	0.0700	0.0802	0.0903	0.1005	0.1107
42	0.0375	0.0493	0.0611	0.0728	0.0846	0.0964	0.1082	0.1200	0.1318
45	0.0462	0.0597	0.0733	0.0868	0.1003	0.1139	0.1274	0.1409	0.1544
48	0.0555	0.0709	0.0863	0.1017	0.1171	0.1325	0.1479	0.1633	0.1787
51	0.0654	0.0828	0.1002	0.1176	0.1350	0.1523	0.1697	0.1871	0.2045
54	0.0760	0.0955	0.1149	0.1344	0.1539	0.1734	0.1929	0.2124	0.2318
57	0.0871	0.1088	0.1305	0.1522	0.1739	0.1956	0.2173	0.2391	0.2608
60	0.0988	0.1229	0.1469	0.1710	0.1950	0.2191	0.2431	0.2672	0.2913
63	0.1111	0.1377	0.1642	0.1907	0.2172	0.2437	0.2703	0.2968	0.3233
66	0.1241	0.1532	0.1823	0.2114	0.2405	0.2696	0.2987	0.3278	0.3569
69	0.1376	0.1694	0.2012	0.2330	0.2649	0.2967	0.3285	0.3603	0.3921
72	0.1517	0.1864	0.2210	0.2557	0.2903	0.3249	0.3596	0.3942	0.4288
75	0.1665	0.2041	0.2416	0.2792	0.3168	0.3544	0.3920	0.4296	0.4671
78	0.1818	0.2225	0.2631	0.3038	0.3444	0.3851	0.4257	0.4664	0.5070
81	0.1977	0.2416	0.2854	0.3293	0.3731	0.4169	0.4608	0.5046	0.5484
84	0.2143	0.2614	0.3086	0.3557	0.4029	0.4500	0.4972	0.5443	0.5914
87	0.2314	0.2820	0.3326	0.3831	0.4337	0.4843	0.5349	0.5854	0.6360
90	0.2492	0.3033	0.3574	0.4115	0.4656	0.5198	0.5739	0.6280	0.6821
93	0.2675	0.3253	0.3831	0.4409	0.4987	0.5564	0.6142	0.6720	0.7298
96	0.2864	0.3480	0.4096	0.4712	0.5327	0.5943	0.6559	0.7175	0.7791
99	0.3060	0.3715	0.4370	0.5024	0.5679	0.6334	0.6989	0.7644	0.8299
102	0.3261	0.3956	0.4652	0.5347	0.6042	0.6737	0.7432	0.8127	0.8822
105	0.3469	0.4205	0.4942	0.5679	0.6415	0.7152	0.7889	0.8625	0.9362
108	0.3682	0.4462	0.5241	0.6020	0.6800	0.7579	0.8358	0.9138	0.9917
111	0.3902	0.4725	0.5548	0.6371	0.7195	0.8018	0.8841	0.9664	1.0488
114	0.4127	0.4996	0.5864	0.6732	0.7601	0.8469	0.9337	1.0206	1.1074
117	0.4359	0.5273	0.6188	0.7103	0.8017	0.8932	0.9847	1.0761	1.1676
120	0.4596	0.5558	0.6521	0.7483	0.8445	0.9407	1.0369	1.1331	1.2293

Table 24: Height, volume and fuel wood production table for mangium in woodlot plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.039	32.3	9.2
30	11.8	35.7	13.1	1.3		0.043		0.030	22.4	17.5
33	13.0	39.4	14.1	3.1		0.059	0.012	0.031	23.1	18.6
36	14.2	43.0	15.0	4.7		0.077	0.033	0.032	23.9	19.8
39	15.4	46.6	15.7	6.1		0.095	0.054	0.033	24.8	21.1
42	16.5	50.3	16.4	7.2		0.115	0.077	0.034	25.8	22.5
45	17.7	53.9	17.1	8.3		0.136	0.100	0.036	26.8	24.0
48	18.9	57.6	17.7	9.2	2.2	0.157	0.125	0.037	27.9	25.7
51	20.1	61.2	18.2	10.0	3.6	0.180	0.150	0.039	29.1	27.4
54	21.3	64.8	18.7	10.7	4.8	0.204	0.176	0.040	30.4	29.2
57	22.4	68.5	19.1	11.4	5.8	0.229	0.203	0.042	31.7	31.1
60	23.6	72.1	19.5	12.0	6.8	0.254	0.231	0.044	33.1	33.2
63	24.8	75.8	19.9	12.5	7.6	0.281	0.259	0.046	34.5	35.3
66	26.0	79.4	20.3	13.1	8.4	0.309	0.289	0.048	36.1	37.5
69	27.2	83.0	20.6	13.5	9.1	0.338	0.319	0.050	37.7	39.9
72	28.3	86.7	21.0	14.0	9.7	0.368	0.350	0.052	39.3	42.3
75	29.5	90.3	21.3	14.4	10.3	0.399	0.382	0.055	41.1	44.9
78	30.7	93.9	21.6	14.7	10.8	0.431	0.415	0.057	42.9	47.6
81	31.9	97.6	21.8	15.1	11.3	0.464	0.449	0.060	44.8	50.3
84	33.1	101.2	22.1	15.4	11.8	0.498	0.484	0.062	46.8	53.2
87	34.3	104.9	22.3	15.7	12.2	0.533	0.519	0.065	48.8	56.2
90	35.4	108.5	22.6	16.0	12.6	0.569	0.556	0.068	50.9	59.2
93	36.6	112.1	22.8	16.3	12.9	0.606	0.593	0.071	53.1	62.4
96	37.8	115.8	23.0	16.5	13.3	0.644	0.631	0.074	55.3	65.7
99	39.0	119.4	23.2	16.8	13.6	0.683	0.670	0.077	57.6	69.1
102	40.2	123.1	23.4	17.0	13.9	0.723	0.710	0.080	60.0	72.6
105	41.3	126.7	23.6	17.2	14.1	0.764	0.750	0.083	62.5	76.2
108	42.5	130.3	23.8	17.4	14.4	0.806	0.792	0.087	65.0	79.9
111	43.7	134.0	24.0	17.6	14.6	0.849	0.834	0.090	67.6	83.7
114	44.9	137.6	24.1	17.8	14.9	0.894	0.878	0.094	70.3	87.6
117	46.1	141.2	24.3	18.0	15.1	0.939	0.922	0.097	73.1	91.6
120	47.2	144.9	24.4	18.1	15.3	0.985	0.967	0.101	75.9	95.8

Table 25: Overbark timber volumes in cubic meters for mangium in woodlot plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	10	12	14	16	18	20	22	24	26
30	0.0367	0.0419	0.0471	0.0523	0.0575	0.0627	0.0679	0.0731	0.0783
33	0.0421	0.0484	0.0547	0.0610	0.0673	0.0736	0.0799	0.0862	0.0925
36	0.0481	0.0556	0.0631	0.0706	0.0781	0.0856	0.0931	0.1006	0.1081
39	0.0546	0.0634	0.0722	0.0810	0.0898	0.0986	0.1074	0.1162	0.1250
42	0.0616	0.0718	0.0820	0.0922	0.1024	0.1126	0.1228	0.1330	0.1432
45	0.0692	0.0809	0.0926	0.1043	0.1160	0.1277	0.1394	0.1511	0.1629
48	0.0772	0.0906	0.1039	0.1172	0.1305	0.1439	0.1572	0.1705	0.1838
51	0.0858	0.1009	0.1159	0.1310	0.1460	0.1610	0.1761	0.1911	0.2062
54	0.0949	0.1118	0.1287	0.1455	0.1624	0.1792	0.1961	0.2130	0.2298
57	0.1046	0.1234	0.1421	0.1609	0.1797	0.1985	0.2173	0.2361	0.2549
60	0.1147	0.1355	0.1564	0.1772	0.1980	0.2188	0.2396	0.2604	0.2813
63	0.1254	0.1483	0.1713	0.1942	0.2172	0.2401	0.2631	0.2860	0.3090
66	0.1366	0.1618	0.1870	0.2121	0.2373	0.2625	0.2877	0.3129	0.3381
69	0.1483	0.1758	0.2033	0.2309	0.2584	0.2859	0.3135	0.3410	0.3685
72	0.1605	0.1905	0.2205	0.2504	0.2804	0.3104	0.3404	0.3703	0.4003
75	0.1733	0.2058	0.2383	0.2708	0.3034	0.3359	0.3684	0.4009	0.4335
78	0.1865	0.2217	0.2569	0.2921	0.3273	0.3624	0.3976	0.4328	0.4680
81	0.2003	0.2383	0.2762	0.3141	0.3521	0.3900	0.4280	0.4659	0.5038
84	0.2146	0.2554	0.2962	0.3370	0.3778	0.4186	0.4594	0.5002	0.5410
87	0.2295	0.2732	0.3170	0.3608	0.4045	0.4483	0.4921	0.5358	0.5796
90	0.2448	0.2917	0.3385	0.3853	0.4322	0.4790	0.5259	0.5727	0.6195
93	0.2607	0.3107	0.3607	0.4107	0.4607	0.5108	0.5608	0.6108	0.6608
96	0.2771	0.3304	0.3837	0.4370	0.4903	0.5435	0.5968	0.6501	0.7034
99	0.2940	0.3507	0.4074	0.4640	0.5207	0.5774	0.6340	0.6907	0.7474
102	0.3114	0.3716	0.4318	0.4919	0.5521	0.6122	0.6724	0.7326	0.7927
105	0.3294	0.3931	0.4569	0.5206	0.5844	0.6482	0.7119	0.7757	0.8394
108	0.3479	0.4153	0.4828	0.5502	0.6177	0.6851	0.7525	0.8200	0.8874
111	0.3669	0.4381	0.5094	0.5806	0.6518	0.7231	0.7943	0.8656	0.9368
114	0.3864	0.4615	0.5367	0.6118	0.6870	0.7621	0.8373	0.9124	0.9876
117	0.4064	0.4856	0.5647	0.6439	0.7230	0.8022	0.8814	0.9605	1.0397
120	0.4270	0.5102	0.5935	0.6768	0.7600	0.8433	0.9266	1.0098	1.0931

Table 26: Height, volume and fuel wood production table for sissoo in strip plantations in Bangladesh.

GBH (cm)	GBH (inch)	B.girth (cm)	Height (m)	H30 (m)	H45 (m)	Total volume OB, cum.	Timber volume OB, cum.	Fuel wood		L&T (Kg.)
								Cum.	Kg.	
<30								0.026	30.5	8.0
30	11.8	34.8	6.8	0.1	-4.5	0.028	0.017	0.025	24.8	23.1
33	13.0	38.6	7.7	1.1	-3.3	0.032	0.020	0.029	29.0	24.0
36	14.2	42.5	8.5	2.1	-2.2	0.038	0.025	0.034	33.7	25.1
39	15.4	46.4	9.3	2.9	-1.2	0.045	0.032	0.039	38.8	26.2
42	16.5	50.3	10.0	3.7	-0.3	0.054	0.040	0.045	44.2	27.5
45	17.7	54.2	10.6	4.4	0.5	0.065	0.050	0.051	50.1	28.8
48	18.9	58.0	11.2	5.1	1.3	0.077	0.061	0.057	56.4	30.2
51	20.1	61.9	11.7	5.7	2.0	0.091	0.075	0.064	63.1	31.8
54	21.3	65.8	12.2	6.2	2.6	0.106	0.090	0.071	70.2	33.4
57	22.4	69.7	12.7	6.8	3.2	0.124	0.106	0.078	77.7	35.1
60	23.6	73.6	13.1	7.3	3.8	0.142	0.125	0.086	85.6	36.9
63	24.8	77.5	13.5	7.7	4.4	0.163	0.145	0.095	93.9	38.8
66	26.0	81.3	13.9	8.2	4.9	0.185	0.167	0.104	102.6	40.7
69	27.2	85.2	14.3	8.6	5.4	0.209	0.190	0.113	111.7	42.8
72	28.3	89.1	14.7	9.0	5.8	0.235	0.216	0.122	121.2	45.0
75	29.5	93.0	15.0	9.4	6.3	0.262	0.243	0.132	131.2	47.2
78	30.7	96.9	15.3	9.7	6.7	0.291	0.271	0.143	141.5	49.6
81	31.9	100.8	15.6	10.1	7.1	0.321	0.302	0.154	152.2	52.0
84	33.1	104.6	15.9	10.4	7.5	0.353	0.334	0.165	163.4	54.6
87	34.3	108.5	16.2	10.7	7.8	0.387	0.368	0.177	174.9	57.2
90	35.4	112.4	16.5	11.0	8.2	0.422	0.403	0.189	186.9	59.9
93	36.6	116.3	16.7	11.3	8.5	0.459	0.441	0.201	199.3	62.7
96	37.8	120.2	17.0	11.6	8.9	0.498	0.480	0.214	212.0	65.6
99	39.0	124.0	17.2	11.9	9.2	0.539	0.520	0.227	225.2	68.6
102	40.2	127.9	17.4	12.1	9.5	0.581	0.563	0.241	238.8	71.7
105	41.3	131.8	17.7	12.4	9.8	0.624	0.607	0.255	252.7	74.9
108	42.5	135.7	17.9	12.6	10.1	0.670	0.653	0.270	267.1	78.1
111	43.7	139.6	18.1	12.9	10.3	0.717	0.700	0.285	281.9	81.5
114	44.9	143.5	18.3	13.1	10.6	0.766	0.749	0.300	297.1	85.0
117	46.1	147.3	18.5	13.3	10.8	0.816	0.800	0.316	312.7	88.5
120	47.2	151.2	18.7	13.5	11.1	0.868	0.853	0.332	328.7	92.1

Table 27: Overbark timber volumes in cubic meters for sissoo in strip plantations in Bangladesh

GBH\HT	Timber volume overbark in cubic metres for height in metres								
	8	10	12	14	16	18	20	22	24
30	0.0104	0.0159	0.0214	0.0269	0.0324	0.0379	0.0435	0.0490	0.0545
33	0.0150	0.0217	0.0284	0.0350	0.0417	0.0484	0.0550	0.0617	0.0684
36	0.0201	0.0280	0.0360	0.0439	0.0518	0.0598	0.0677	0.0756	0.0836
39	0.0256	0.0349	0.0442	0.0535	0.0629	0.0722	0.0815	0.0908	0.1001
42	0.0316	0.0424	0.0532	0.0640	0.0748	0.0856	0.0964	0.1072	0.1180
45	0.0379	0.0503	0.0627	0.0751	0.0875	0.0999	0.1123	0.1247	0.1371
48	0.0448	0.0589	0.0730	0.0871	0.1012	0.1153	0.1294	0.1435	0.1576
51	0.0521	0.0680	0.0839	0.0998	0.1158	0.1317	0.1476	0.1635	0.1795
54	0.0598	0.0776	0.0955	0.1133	0.1312	0.1490	0.1669	0.1848	0.2026
57	0.0679	0.0878	0.1077	0.1276	0.1475	0.1674	0.1873	0.2072	0.2271
60	0.0765	0.0986	0.1206	0.1427	0.1647	0.1867	0.2088	0.2308	0.2529
63	0.0856	0.1099	0.1342	0.1585	0.1828	0.2071	0.2314	0.2557	0.2800
66	0.0950	0.1217	0.1484	0.1751	0.2017	0.2284	0.2551	0.2818	0.3084
69	0.1050	0.1341	0.1633	0.1924	0.2216	0.2507	0.2799	0.3090	0.3382
72	0.1153	0.1471	0.1788	0.2106	0.2423	0.2740	0.3058	0.3375	0.3693
75	0.1261	0.1606	0.1950	0.2295	0.2639	0.2983	0.3328	0.3672	0.4017
78	0.1374	0.1746	0.2119	0.2491	0.2864	0.3236	0.3609	0.3981	0.4354
81	0.1490	0.1892	0.2294	0.2696	0.3097	0.3499	0.3901	0.4303	0.4704
84	0.1612	0.2044	0.2476	0.2908	0.3340	0.3772	0.4204	0.4636	0.5068
87	0.1737	0.2201	0.2664	0.3128	0.3591	0.4055	0.4518	0.4982	0.5445
90	0.1867	0.2363	0.2859	0.3355	0.3851	0.4347	0.4843	0.5339	0.5835
93	0.2002	0.2532	0.3061	0.3591	0.4120	0.4650	0.5180	0.5709	0.6239
96	0.2141	0.2705	0.3269	0.3834	0.4398	0.4962	0.5527	0.6091	0.6655
99	0.2284	0.2884	0.3484	0.4085	0.4685	0.5285	0.5885	0.6485	0.7085
102	0.2432	0.3069	0.3706	0.4343	0.4980	0.5617	0.6254	0.6891	0.7528
105	0.2584	0.3259	0.3934	0.4609	0.5284	0.5959	0.6634	0.7310	0.7985
108	0.2740	0.3455	0.4169	0.4883	0.5597	0.6311	0.7026	0.7740	0.8454
111	0.2901	0.3656	0.4410	0.5165	0.5919	0.6674	0.7428	0.8182	0.8937
114	0.3067	0.3862	0.4658	0.5454	0.6250	0.7046	0.7841	0.8637	0.9433
117	0.3236	0.4075	0.4913	0.5751	0.6589	0.7427	0.8266	0.9104	0.9942
120	0.3411	0.4292	0.5174	0.6056	0.6938	0.7819	0.8701	0.9583	1.0465

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