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BANGLADESH

A COLLATION OF TREE AND BAMBOO
VOLUME TABLES
OF
BANGLADESH

COMPILED
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COLLATION OF TREE AND BAMBOO

VOLUME TABLES

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BGD/72/005

Chittagong.

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TREE AND BAMBOO VOLUME TABLES

IN

BANGLADESH

ABSTRACT



All the available tree volume tables and weight tables which have been prepared specifically in Bangladesh up to 1978 are presented. The relevant sections describing the collection of data and computation of volume equations and volume tables from inventory reports of "Forestat, Forestry and Engineering International, Ltd.," in the Chittagong Hill Tracts and the Sundarbans forests are reproduced. Most of the tables are site class volume tables which were specifically prepared for inventory work with deduction factors for defect and crook, a branch wood percentage table and a bamboo weight table.

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1. General

The tree volume and weight tables collected together under this single cover are those which have been compiled and published in Bangladesh and are currently available for use but to only a limited number of people. The purpose of this publication is to bring all this information together under one cover to enable wider circulation of this information and to assist in identifying the requirements of the Forest Department for species volume tables which will be of general value in the future.

Most of the information has been obtained from the reports of inventories carried out by "Forestal, Forestry and Engineering International Ltd., " in the Sundarbans Forests, 1958 and the Chittagong Hill Tracts Forests" 1963. Some volume tables have been obtained from forest working plans. A list of the species covered by the tables is given in appendix 1.

2. Volume and defect studies

2.1 Sundarbans Inventory 1959

2.1.1 Volume data

During the course of the 1959 inventory in the Sundarbans Forests, a total of 1,123 trees were felled throughout the area. The species distribution of these trees is shown in Table 1 below:

Table 1 - Sample Trees Felled

<u>Species</u>	<u>Number of Trees Felled</u>
Gewa	572
Sundri	404
Keora	34
Passur	67
Kankra	32
Baen	7
Other species	7
Total	1,123

These trees formed the basis for the construction of new volume tables. The resultant gross cubic-foot volume tables were prepared for Gewa and for Sundri in each of eight site classes and to each of four utilization standards. In the case of Keora, a species of limited distribution occurring on areas of uniform site quality, a standard volume table was computed for each of the four utilization standards, but not for separate site classes. Because species other than Gewa, Sundri and Keora are of secondary importance a check of existing volume tables was thought more suitable than construction of new tables. Cubic-foot volume to a 4-inch top DIB was calculated by the computer for each felled sample tree, and compared graphically with equivalent tree volume read from the modified Curtis table for the species. Differences between measured and table volume were insignificant. As a result of these tests the modified Curtis tables for Passur, Kankra, Baen and Goran were adopted without further modification. The modified Curtis table for "Miscellaneous Species" was adopted for volume compilation of Amur, Dhundal, Singra and all other such minor species.

2.1.2 Defect and Crook Factors

The volume tables were prepared for gross cubic foot volume to various utilization standards. These utilization standards were based solely on differences in top diameter. Therefore, it was necessary to determine deduction factors to apply to gross volumes in order to arrive at net and net merchantable volumes. In the report, volumes after deduction for rot or bark seam were called "net" volumes, and those after further deduction for crook were called "net merchantable" volumes. The necessary deduction factors were derived from data collected from the 1,123 felled sample trees, using the criteria for defect and for crook as follows:

a) Defect

Rot : In the case of heart rot, the amount deducted was equal to the volume of a section calculated according to Smalian's formula with the diameters and length being determined from the field measurements of the dimensions of the rot.

In the case of saprot, the diameter and length equivalents were estimated in the field and were used to calculate the deduction as for heart rot.

Bark seam: The cubic foot volume of a block of wood 2 inches wide and 2 inches deep multiplied by the length of the bark seam was deducted.



b) Crook.

Crook and sweep: The cubic-foot volume of the entire 4-foot piece (calculated by Smalians formula) was deducted if that piece had been marked for rejection by the field crews. A piece was rejected for poor form if the pith centre at the point of maximum crook or sweep was more than 4.5 inches from a straight line projected from the pith centre at one end to the pith centre at the other end.

Analyses were made separately for each sampling block and for each of the following DBH classes: 2 inches to 4 inches; 5 inches; 6 inches to 8 inches; and 9 inches and over. This was done for each of the four utilization standards. The actual cubic foot deductions for defect and for crook were calculated as percentages of the total gross volume for each diameter class within each block. No significant differences for either defect or crook were determined between blocks or between the diameter groupings. Accordingly, it was decided to apply a blanket percentage deduction for defect and a blanket percentage deduction for crook. A table showing these percentage deductions for each species and for each utilization standard is shown in Appendix II.

For current utilization standards for Gewa, i.e. to a top diameter of 3 to 4 inches, the following volume reductions apply:

Defect	-	2 to 3 per cent of gross volume
Crook	-	2 to 4 per cent of gross volume

The equivalent figures for Sundri are:

Defect	-	2.0 to 3.5 per cent of gross volume
Crook	-	2.0 to 3.5 per cent of gross volume

2.1.3 Accuracy standards

The accurate measurement of some 1,100 felled sample trees and the processing of these data resulted in reliable volume tables. The standards of accuracy achieved in the computation of the volume tables are as follows:

Gewa	-	Individual tree standard error	0.5 cubic feet
Sundri	-	" " "	1.2 cubic feet
Keora	-	" " "	6.7 cubic feet

The significance of these figures is that in compiling the volume of a sample of one hundred trees of any one of the three species mentioned, the direct volume table error would be less than 2 per cent.

The equivalent standard errors for defect and crook factors were not calculated. Because the factors themselves are small, only very large errors in them would appreciably affect inventory volumes.

2.2 Chittagong Hill Tracts inventory survey, 1963.

2.2.1 Volume data

Prior to this inventory survey carried out by Forestal the East Pakistan Forest Directorate had prepared volume tables for Civit. The data used in preparing these tables were taken into consideration but for the purposes of the forest inventory, new volume tables were prepared for the 23 species which were tallied and classed as merchantable and a separate table was prepared to cover all other species classed as miscellaneous see appendix 1. These tables were based on measurements of trees felled by F.I.D.C. in the course of their regular felling operations in the Kassalong Reserve. A few additional trees were felled to provide trees of any species or diameter or height class where data was insufficient. Some trees were also measured in the Rankhiang Reserve Forest to check on possible variations in form.

As basic data for volume table construction, 510 felled trees were measured in detail. The distribution by species is shown below:

Summary of Sample Trees Examined

<u>Species</u>	<u>No. of Trees</u>
Garjan	94
Civit	111
Banderhola	3
Batna	9
Chalmugra	7
Champ	27
Chapalish	11
Chikrassi	4
Chundul	18
Dhaki jam	9
Gamari	7
Jarul	15
Kadam	0
Kamdeb	6
Koroi	1

<u>Species</u>	<u>No. of Trees</u>
Nageswar	4
Narikeli	24
Other Jam	5
Pitali	1
Pitraj	18
Tali	32
Toon	2
Urim	8
Miscellaneous	94
	<hr/>
	510

Volume table studies were directed towards testing the applicability of a mathematical equation, expressing tree volume in terms of D.B.H. and total height. Species which were shown to have similar form were grouped and the equations derived were graphically tested to ensure that groupings were sound. Maximum height class volume tables were then constructed to represent the ranges of local stand heights.

During the conduct of this forest inventory all cull trees encountered on each plot were recorded by diameter. An accurate tally of culls by species was not possible due to the frequent absence of foliage on the culls. Also, during the measurement of trees for volume table data, an assessment of decay and insect damage was made. The extraction operations of F.I.D.C. were observed to assess the extent of loss from breakage during logging under different topographic conditions. By combining the three aforementioned factors, it was possible to estimate a reduction factor to convert gross volumes to net volumes.

A separate study of the volume of branchwood was also conducted.

2.2.2 Volume Table Accuracies

The standard error and aggregate difference of each timber volume table were statistically determined and the detailed results are shown in appendix 2.

The overall weighted average standard error was 17.5 percent. Although substantial for individual tree volume estimation, the error in measuring 100 trees would amount to only 1.75 percent and for 10,000 trees to 0.175 percent. The volume table error for this inventory, where millions of trees were involved was therefore negligible. This is shown by the fact that the aggregate difference between the actual measured volume and the tabular volume of the 510 trees used in volume table construction was only 0.0476 percent low.

<u>Species</u>	<u>No. of Trees</u>
Nageswar	4
Narikeli	24
Other Jam	5
Pitali	1
Pitraj	18
Tali	32
Toon	2
Urim	8
Miscellaneous	94
	<hr/>
	510

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2.3 Tree volume equation

In the office, the gross under bark volume of the merchantable portion of the bole - two foot stump to eight inch top D.U.B. or point of branching -- was computed for each tree. Individual cubic foot log volumes were calculated by the Smalian formula, wherein, the log end areas are averaged and its average in square feet is multiplied by the log length in feet.

A simple and effective tree volume equation, described by Spurr (1952), was adapted for this inventory. This equation is of the form:

$$V = a + b (D^2H)$$

where

V = tree volume in cubic feet

D = D.B.H. in inches

H = total height in feet

a and b are calculated constants

In applying this formula, the information for each species was grouped. The value of $D^2H/100$ was calculated for each tree. Curves of cubic foot volume over $D^2H/100$ were then drawn for each species. These curves were compared and similar ones were combined. Exact mathematical values for the constants "a" and "b" were calculated by the method of least squares. Standard check sums were carried throughout these calculations to eliminate any possibility of error.

In some cases it was found that the curve fit could be improved by splitting the data into two groups and calculating the values of a and b separately for each group. This resulted in a lower standard error percent and a lower aggregate difference percent for the groups involved.

2.4 Height-Diameter Relationships:

To apply these volume equations, D.B.H. and average maximum stand height must be known. In the field, the diameter of every tree tallied was recorded. Height measurements of all these would have been both impractical and unnecessary. Instead, an analysis of the measured heights of over 8,000 sample trees was made. Within each stratum, total height measurements by species groups were plotted over D.B.H. and curves drawn. From these preliminary curves it was established that a series of parabolic curves, each commencing at breast height and rising to different maximum height would fit these data most satisfactorily.

Using a method described by Ker and Smith (1955), appropriate standard parabolic curves were calculated, having the form:

$$H = 4.5 + bD + cD^2$$

where H = total height in feet

D = D.B.H. in inches

b and c are calculated constants

2.5 Site Volume Table Construction:

Using the equation described in Para 2.4, the appropriate height equations for all D.B.H. classes in each species group were solved and a series of height-diameter relationships for each species groups were derived. Using these relationships and the range of diameters volumes were calculated for all combinations of height and diameter in each maximum height class for each species or species group. The complete volume tables are shown in Appendix 12-21.

3. Bamboo Weight Studies

3.1 The data. Field sampling of bamboo during the Chittagong Hill Tracts Inventory involved merely a tally of the number of culms by species and by diameter class. The expression of this tally in some useful unit had also to be achieved. Because bamboo culms are hollow and because the wall thickness and the internodal distance are variable, even within a species, it is more accurate and practical to express bamboo resources in units of weight rather than volume. Therefore, samples of merchantable culms, representative of the range of diameters and heights for each species were cut during the establishment of sample plots in each Forest Reserve. The merchantable portion of these culms was then weighed with a spring balance and the green weight measured. Small sections of these culms were weighed separately and sent to the laboratory at the Karnaphuli Paper Mills at Chandragona where their moisture content was determined. A level of 10 percent moisture was adopted as air-dry condition. The average ratio of air dry to green weight was then determined for each species.

3.2 Bamboo Weight Table Construction

Green weight stump diameter equations:

Parabolic equations for three bamboo species expressing green weight in terms of stump diameter were constructed from field measurements. Equations were calculated of the general form;

$$W = a + b D^2$$

W = green weight in pounds

"a" and "b" are constants

D = stump diameter in inches

The mathematical fit of the field data to the equations was determined and the following equations and error limits resulted:

Species	Number of Culms	Equation	Sampling Error of A Single Culm	
			Percent	Pounds
Daloo	57	$W = -0.81 + 4.55 D^2$	17	4.8
Orah	46	$W = 1.06 + 5.19 D^2$	15	8.6
Mitenga	91	$W = -10.55 + 6.72 D^2$	16	5.0

Green weight equations for Muli and Khaliserri bamboos could not be determined because of lack of mature culms.

3.3 Bamboo weight table accuracy

The weighted average sampling error of the weight table values for an individual culm is 15.9 percent. For 10,000 culms this error would amount to only 0.159 percent and for the millions of culms involved in the inventory, the error due to weight tables was negligible.

3.4 Conversion from green to air dry weight:

Moisture content studies were carried out to determine the ratio of air dry weight to green weight in bamboo culms. For the moderately thick-walled Mitenga and Orah bamboos moisture content (expressed as a percent of green weight) varied between 33 and 47 percent, averaging 41 percent. For the thin-walled Daloo bamboo, moisture content ranged from 45 to 60 percent and averaged 52 percent.

Moisture content studies of Karnafuli Paper Mills indicated that the moisture content of these bamboo species in India indicated a similar moisture content percent.

3.4.1 Conversion of green weight curves to air dry curves

3.4 Green weight curves were converted to air dry curves using the following ratios:

- for thick-walled Mitenga and Orah bamboo average moisture content 41 percent; air dry - green weight ratio equals $1.00 - (0.41-0.10) = 0.58$
- for thin-walled Daloo bamboo average moisture content 52 percent; air dry - green weight ratio equals $1.00 - (0.52-0.10) = 0.58$

3.4.2 Conversion of air dry curves from stump to breast height diameter basis:

A simple study was carried out on 330 mature culms to determine the relationship between stump height and breast height diameter. The following ratios were obtained.

Species	Culms Number of	Number of	Ratio of Breast Height Diameter to Stump Height Diameter
		Culms	
Daloo	199		1.08
Orah	91		1.03
Mitenga	40		1.04

Air dry stump diameter curves were replotted over the equivalent breast height diameter and equations and curves derived.

The following derived equations express the air dry weight in pounds of a merchantable bamboo culm by species and breast height diameter

$$\begin{aligned} \text{Daloo} \quad W &= -0.36 + 2.34 D^2 \\ \text{Orah} \quad W &= 0.57 + 3.33 D^2 \\ \text{Mitenga} \quad W &= -6.73 + 4.41 D^2 \end{aligned}$$

The complete weight tables are shown in Appendix 22.

Vernacular Name

	<u>Botanical Name</u>
Dharmara	<i>Stereospermum chelonoides</i> DC
Gundroi	<i>Cinnamomum cecidodaphne</i> Meissn.
Gutgutya	<i>Bursera serrate</i> Colebr.
Hansak	<i>Xanthophyllum flavescens</i> Roxb. ; <i>X. virens</i> Roxb.
Hargaza	<i>Dillenia pentagyna</i> Roxb.
Haritaki	<i>Terminalia chebula</i> Retz.; <i>T. citrina</i> Roxb.
Hatipoila	<i>Pterospermum acerifolium</i> Wild.
Jalpai	<i>Elaeocarpus</i> spp.
Jhau	<i>Casuarina equisetifolia</i> Forst.
Jhumka bhadi	<i>Engelhardtia spicata</i> Bl.
Jiul bhadi	<i>Lannea grandis</i>
Jungurjya	<i>Derris robusta</i> Bth.
Kalaboil	<i>Sapium baccatum</i> Roxb.
Kalda	<i>Miliusa velutina</i> Hook. f. and Th.
Kanak	<i>Schima wallichii</i> Choisy
Kanta koroi	<i>Anogeissus lanceolata</i>
Keabong	<i>Carallia lucida</i> Roxb.
Kon	<i>Adina sessilifolia</i> Hook. f.
Low bhadi	<i>Bischofia javanica</i> Blume
Minjiri	<i>Cassia siamea</i> Lamk..
Pacca saj	<i>Terminalia crenulata</i> Roth.
Panisaj	<i>Terminalia myriocarpa</i> Heurck and Muell. Arg.
Phata kharoola	<i>Aporosa roxburghii</i> Baill.
Rangkat	<i>Adina cordifolia</i> Hook. f.
Shaugan	<i>Sterculia scaphigera</i> Wall.
Sheradong	<i>Lophopetalum fimbriatum</i> Wight
Shonalu	<i>Cassia fistula</i> Linn.
Shilbhadi	<i>Garuga pinnata</i> Roxb.
Simul	<i>Bombax</i> spp.
Tejbahal	<i>Cinnamomum</i> spp.
Telsur	<i>Hopea odorata</i> Roxb.
Udal	<i>Sterculia colorata</i> Roxb.; <i>S. villosa</i> Roxb.

Sundarbans Forests

<i>Avicennia officinalis</i>	Baen	7
<i>Excoecaria agallocha</i>	Gewa	572
<i>Bruguiera gymnorhiza</i>	Kankra	32
<i>Sonneratia apetala</i>	Keora	34
<i>Carapa moluccensis</i>	Passur	67
var gangetica		
<i>Heritiera minor</i>	Sundri	404
Miscellaneous (as follows)		7
<i>Amoora cucullata</i>	Amur	
<i>Carapa obovata</i>	Dhundal	
<i>Cynometra ramiflora</i>	Singra	
Etc.		

SUMMATION OF VOLUME TABLE DATA FROM THE 1963 INVENTORY IN THE CHITTAGONG HILL TRACTS

SPECIES	RANGE	Volume Equation: $V = a + b \frac{D^{2H}}{100}$			Aggregate Diff. %	A.M.E.	b	c	Height Equation: $H = 4.5 - bD + cD^2$		
		a	b	SE %							
GARJAN	$\frac{D^{2H}}{100} < 500$	-3.866	0.21768	13.1	2.4 high	60	9.4068	-0.3986			
	$\frac{D^{2H}}{100} > 500$	16.161	0.17617	5.6	2.3 low	80	9.6795	-0.3102			
CIVIT	$\frac{D^{2H}}{100} < 600$	0.374	0.20046	20.0	0.9 high	60	9.3171	-0.2272			
	$\frac{D^{2H}}{100} > 600$	3.456	0.17352	18.5	0.0	80	8.6516	-0.1620			
MISCELLANEOUS	$\frac{D^{2H}}{100} < 250$	-1.334	0.19497	15.2	0.29 low	60	7.7650	-0.1112			
	$\frac{D^{2H}}{100} > 250$	-6.303	0.18629	23.4	0.09 low	80	7.1167	-0.0814			
URM	$\frac{D^{2H}}{100} < 1000$	0.916	0.18067	18.4	UTM	60	9.4068	-0.3986			
	$\frac{D^{2H}}{100} > 1000$	46.257	0.12530	15.3	CKR	80	8.6286	-0.2465			
		1000	0.12530	15.3	CMP	100	6.5411	-0.1120			

(Continued)

SUMMATION OF VOLUME TABLE DATA FROM THE 1963 INVENTORY IN THE CHITTAGONG HILL TRACTS

SPECIES	RANGE	Volume Equation: $V = a + b \frac{D^2H}{100}$			Height Equation: $H = 4.5 - bD + cD^2$			
		a	b	SE%	Aggregate	Diff. %	A.M.E.	b
CND					CND	3.2 low	60	7.6552
NAR					NAR	0.9 low	80	-0.2877
KDB					KDB	15.8 high	100	-0.2105
							120	-0.1484
							140	-0.1017
							160	-0.0683
BDR	PRJ				PRJ	3.5 low	60	6.4535
BTN	TLI				TLI	1.7 low	80	-0.1876
CMG	KDM				KDM	-	100	-0.1603
NSW	PTI				PTI	-	120	-0.1300
OJM							140	-0.1061
								-0.0847
CPS					CPS	0.58 high	60	12.6136
DJM					DTM	0.0	80	-0.7167
GMR					GMR	2.8 low	100	-0.3268
JRL					JRL	4.6 low	120	-0.1469
KOR					KOR	-	140	-0.0704
TN					TN	-		-0.0614

R-100

গ্রামান্ব
বন বিদ্যুত
মন্ত্রণালয় - চাকী 187

Appendix 3.1

GEN A

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u>	<u>1</u>	<u>2+</u>	<u>2</u>	<u>2-</u>
<u>Height Class:</u>	<u>50' and over</u>	<u>45' - 50'</u>	<u>40' - 50'</u>	<u>35' - 40'</u>
<u>DBH (inches)</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>
2	19	-	18	18
3	25	-	24	24
4	30	-	29	28
5	36	1.8	33	32
6	40	3.0	37	35
7	44	4.5	39	37
8	47	6.4	41	37
9	50	8.7	42	37
10	52	11.3	42	37
11	54	14.2	42	37
12	55	17.3	42	37
13	55	20.3	42	37
14	55	23.6	42	37
15	55	27.1	42	37
16	55	30.9	42	37
17	55	34.9	-	-
18	55	39.2	-	-
19	55	43.7	-	-
20	55	48.4	-	-

Volume Equation: $V = -0.21707 + 0.00221(D^2H)$.

Height Equations:

Site Class 1 : H = 4.5 + 7.6555D - 0.2898 D ²
Site Class 2+ : H = 4.5 + 7.7476D - 0.3489 D ²
Site Class 2 : H = 4.5 + 7.7559D - 0.3956 D ²
Site Class 2- : H = 4.5 + 7.8570D - 0.4676 D ²

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u>	<u>3+</u>		<u>3</u>		<u>3-</u>		<u>4</u>		
<u>Height Class:</u>	<u>30'</u>	<u>35'</u>	<u>25'</u>	<u>30'</u>	<u>20'</u>	<u>25'</u>	<u>Less than 20'</u>	<u>AMH</u>	<u>VOL.</u>
<u>DBH (inches)</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	
2	18	-	18	-	17	-	16	-	
3	23	-	22	-	21	-	17	-	
4	27	-	25	-	22	-	17	-	
5	30	1.4	27	1.3	22	1.0	17	0.7	
6	32	2.3	27	1.9	22	1.5	17	1.1	
7	32	3.2	27	2.7	22	2.2	17	1.6	
8	32	4.3	27	3.6	22	2.9	17	2.2	
9	32	5.5	27	4.6	22	3.7	17	2.8	
10	32	6.9	27	5.7	22	4.6	17	3.5	
11	32	8.3	27	7.0	22	5.7	-	-	
12	32	10.0	27	8.4	22	6.8	-	-	
13	32	11.7	-	-	-	-	-	-	
14	32	13.6	-	-	-	-	-	-	
15	32	15.7	-	-	-	-	-	-	

Volume Equation: $V = -0.21707 + 0.00221(D^2H)$

Height Equations: Site Class 3+: $H = 4.5 + 7.8873D - 0.5554 D^2$
 Site Class 3 : $H = 4.5 + 8.0702D - 0.7079 D^2$
 Site Class 3-: $H = 4.5 + 8.1818D - 0.9297 D^2$
 Site Class 4 : $H = 4.5 + 8.6207D - 1.4863 D^2$

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 3-INCH TOP DIB

Site Class:	1		2+		2		2-	
	50' and over	AMH VOL.	45' - 50'	AMH VOL.	40' - 45'	AMH VOL.	35' - 40'	AMH VOL.
2	19	-	19	-	18	-	18	-
3	25	-	25	-	24	-	24	-
4	30	1.2	30	1.2	29	1.1	28	1.1
5	36	2.1	35	2.1	33	2.0	32	1.9
6	40	3.4	38	3.2	37	3.1	35	3.0
7	44	5.0	42	4.8	39	4.5	37	4.2
8	47	7.0	44	6.5	41	6.1	37	5.5
9	50	9.4	46	8.6	42	7.9	37	7.0
10	52	12.0	47	10.9	42	9.7	37	8.6
11	54	15.1	47	13.2	42	11.8	37	10.4
12	55	18.3	47	15.6	42	14.0	37	12.3
13	55	21.4	47	18.3	42	16.4	37	14.5
14	55	24.9	47	21.3	42	19.0	37	16.8
15	55	28.5	47	24.4	42	21.8	37	19.2
16	55	32.4	47	27.7	42	24.8	37	21.9
17	55	36.6	47	31.3	-	-	-	-
18	55	41.1	47	35.1	-	-	-	-
19	55	45.7	-	-	-	-	-	-
20	55	50.7	-	-	-	-	-	-

Volume Equation: $V = 0.07045 + 0.00230 (D_{II}^2)$

Height Equations:

Site Class 1 : $H = 4.5 + 7.6515D - 0.2898D^2$

Site Class 2+ : $H = 4.5 + 7.7476D - 0.3489D^2$

Site Class 2 : $H = 4.5 + 7.7550D - 0.3956D^2$

Site Class 2- : $H = 4.5 + 7.8570D - 0.4676D^2$

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 3-INCH TOP DIB

<u>Site Class:</u>	<u>3+</u>	<u>3</u>	<u>3-</u>	<u>4</u>
<u>Height Class:</u>	<u>30'</u> - <u>35'</u>	<u>25'</u> - <u>30'</u>	<u>20'-25'</u>	<u>Less than 20</u>
<u>DBH (inches)</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>
2	18	-	18	-
3	23	-	22	-
4	27	1.1	25	1.0
5	30	1.8	27	1.6
6	32	2.7	27	2.3
7	32	3.7	27	3.1
8	32	4.8	27	4.0
9	32	6.0	27	5.1
10	32	7.4	27	6.3
11	32	9.0	27	7.6
12	32	10.7	27	9.0
13	32	12.5	-	-
14	32	14.5	-	-
15	32	16.6	-	-

Volume Equation: $V = 0.07045 + 0.00230 (D^2H)$

Height Equations:

$$\begin{aligned} \text{Site Class 3+ : } H &= 4.5 + 7.8873D - 0.5554D^2 \\ \text{Site Class 3 : } H &= 4.5 + 8.0702D - 0.7079D^2 \\ \text{Site Class 3- : } H &= 4.5 + 8.1818D - 0.9297D^2 \\ \text{Site Class 4 : } H &= 4.5 + 8.6207D - 0.4863D^2 \end{aligned}$$

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 2-INCH TOP DIB

Site Class: Height Class: DBH (inches)	1 50' and over		2+ 45' - 50'		2 40' - 45'		2- 35' - 40'	
	AMH	VOL	AMH	VOL.	AMH	VOL.	AMH	VOL.
2	19	-	19	9-	18	-	18	-
3	25	0.8	25	0.8	24	0.8	24	0.8
4	30	1.4	30	1.4	29	1.3	28	1.3
5	36	2.4	35	2.3	33	2.2	32	2.1
		35						
6	40	3.6	38	3.4	37	3.4	35	3.2
7	44	5.3	42	5.1	39	4.7	37	4.5
8	47	7.3	44	6.8	41	6.4	37	5.8
9	50	9.7	46	9.0	42	8.2	37	7.3
10	52	12.4	47	11.2	42	10.1	37	8.9
11	54	15.5	47	13.6	42	12.1	37	10.7
12	55	18.8	47	16.1	42	14.4	37	12.7
13	55	22.0	47	18.8	42	16.9	37	14.9
14	55	25.5	47	21.8	42	19.5	37	17.2
15	55	29.2	47	25.0	42	22.4	37	19.7
16	55	33.2	47	28.4	42	25.4	37	22.4
17	55	37.4	47	32.0	-	-	-	-
18	55	41.9	47	35.9	-	-	-	-
19	55	46.7	-	-	-	-	-	-
20	55	51.7	-	-	-	-	-	-

Volume Equation:

$$V = 0.24722 + 0.00234 (D^2H)$$

Height Equations:

$$\begin{aligned} \text{Site Class 1 : } H &= 4.5 + 7.6515D - 0.2898D^2 \\ \text{Site Class 2+ : } H &= 4.5 + 7.7476D - 0.3489D^2 \\ \text{Site Class 2 : } H &= 4.5 + 7.7550D - 0.3956D^2 \\ \text{Site Class 2- : } H &= 4.5 + 7.8570D - 0.4676D^2 \end{aligned}$$

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 2-INCH TOP DIB

<u>Site Class:</u>	3+		3		3-		4	
<u>Height Class:</u>	<u>30' - 35'</u>	<u>AMH</u>	<u>25' - 30'</u>	<u>AMH</u>	<u>VOL.</u>	<u>20' - 25'</u>	<u>AMH</u>	<u>Less than 20'</u>
<u>DBH (inches)</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>
2	18	-	18	-	17	-	16	-
3	23	00.7	22	0.7	21	0.7	17	0.6
4	27	1.3	25	1.2	22	1.1	17	0.9
5	30	2.0	27	1.8	22	1.5	17	1.2
6	32	2.9	27	2.5	22	2.1	17	11.7
7	32	3.9	27	3.3	22	2.8	17	2.2
8	32	5.0	27	4.3	22	3.5	17	2.8
9	32	6.3	27	5.4	22	4.4	17	3.5
10	32	7.7	27	6.6	22	5.4	17	4.2
11	32	9.3	27	7.9	22	6.5	-	-
12	32	11.0	27	9.3	22	7.7	-	-
13	32	12.9	-	-	-	-	-	-
14	32	14.9	-	-	-	-	-	-
15	32	17.1	-	-	-	-	-	-

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Volume Equation: $V = 0.24722 + 0.00234 (D^2H)$

Height Equations:

$$\begin{aligned} \text{Site Class 3+ : } H &= 4.5 + 7.8873D^2 - 0.5554D^2 \\ \text{Site Class 3 : } H &= 4.5 + 8.0702D - 0.7079D^2 \\ \text{Site Class 3- : } H &= 4.5 + 8.1818D - 0.9297D^2 \\ \text{Site Class 4 : } H &= 4.5 + 8.6207D - 0.4863D^2 \end{aligned}$$

GEWA

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB

Site Class: Height Class: DBH (inches)	1		2+		2		2-	
	50' and over AMH	VOL.	45' - 50' AMH	VOL.	40' - 45' AMH	VOL.	35' - 40' AMH	VOL.
2	19	0.5	19	0.5	18	0.5	18	0.5
3	25	0.9	25	0.9	24	0.9	24	0.9
4	30	1.5	30	1.5	29	1.5	28	1.4
5	36	2.5	35	2.5	33	2.3	32	2.3
6	40	3.9	38	3.7	37	3.6	35	3.4
7	44	5.6	42	5.4	39	5.0	37	4.8
8	47	7.7	44	7.2	41	6.8	37	6.1
9	50	10.2	46	9.5	42	8.7	37	7.7
10	52	13.1	47	11.8	42	10.6	37	9.4
11	54	16.3	47	14.3	42	12.8	37	11.3
12	55	19.4	47	16.9	42	15.1	37	13.4
13	55	23.1	47	19.8	42	17.7	37	15.6
14	55	26.7	47	22.9	42	20.5	37	18.1
15	55	30.6	47	26.2	42	23.5	37	20.7
16	55	34.8	47	29.8	42	26.7	37	23.5
17	55	39.3	47	33.6	-	-	-	-
18	55	44.0	47	37.6	-	-	-	-
19	55	49.0	-	-	-	-	-	-
20	55	54.2	-	-	-	-	-	-

Volume Equation: $V = 0.32588 + 0.00245 (D^2 H)$

Height Equations:

Site Class 1 : $H = 4.5 + 7.6515D - 0.2898D^2$
Site Class 2+ : $H = 4.5 + 7.7476D - 0.3489D^2$
Site Class 2 : $H = 4.5 + 7.7550D - 0.3956D^2$
Site Class 2- : $H = 4.5 + 7.8570D - 0.4676D^2$

GEWA

SITE CLASS TOTAL GROSS VOLUME TABLES
IN CUBIC FEET UB

Site Class: Height Class: DBH (inches)	3+		3		3-		4	
	AMH	VOL.	AMH	VOL.	AMH	VOL.	AMH	VOL.
2	18	0.5	18	0.5	17	0.5	2	0.5
3	23	0.8	22	0.8	21	0.8	3	0.7
4	27	1.4	25	1.3	22	1.2	4	0.0
5	30	2.2	27	2.0	22	1.7	5	1.4
6	32	3.1	27	2.7	22	2.3	6	1.8
7	32	4.2	27	3.0	22	3.0	7	2.4
8	32	5.3	27	4.6	22	3.8	8	3.0
9	32	6.7	27	5.7	22	4.7	9	3.7
10	32	8.2	27	6.9	22	5.7	10	4.5
11	32	9.8	27	8.3	22	6.8	-	-
12	32	11.6	27	9.9	22	8.1	-	-
13	32	13.6	-	-	-	-	-	-
14	32	15.7	-	-	-	-	-	-
15	32	18.0	-	-	-	-	-	-

Volume Equation:

$$V = 0.32588 + 0.00245 (D^2 H)$$

Height Equations:

$$\begin{aligned} \text{Site Class 3+ : } H &= 4.5 + 7.8873D - 0.5554D^2 \\ \text{Site Class 3 : } H &= 4.5 + 8.0702D - 0.7079D^2 \\ \text{Site Class 3- : } H &= 4.5 + 8.1818D - 0.9297D^2 \\ \text{Site Class 4 : } H &= 4.5 + 8.6207D - 1.4863D^2 \end{aligned}$$

Appendix 4.1

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 4-INCH TOP DIB

Site Class:	1		2+		2		2-	
	50' and over DBH (inches)	AMH VOL.	45' - 50' AMH VOL.	40' - 45' AMH VOL.	35' - 40' AMH VOL.	35' - 40' AMH VOL.	35' - 40' AMH VOL.	35' - 40' AMH VOL.
2	21	-	21	-	20	-	20	-
3	28	-	27	-	27	-	26	-
4	35	-	33	-	32	-	31	-
5	40	1.9	38	1.8	36	1.7	34	1.6
6	45	3.2	41	2.9	39	2.7	36	2.6
7	49	4.9	44	4.4	41	4.0	37	3.6
8	53	7.0	46	6.0	42	5.5	37	4.8
9	56	9.4	47	7.9	42	7.0	37	6.2
10	58	12.1	47	9.8	42	8.7	37	7.7
11	59	15.0	47	11.9	42	10.6	37	9.3
12	60	18.2	47	14.2	42	12.7	37	11.1
13	60	21.4	47	16.7	42	14.9	37	13.3
14	60	24.9	47	19.5	42	17.4	37	15.3
15	60	28.6	47	22.4	42	20.0	37	17.6
16	60	32.6	47	25.5	42	22.7	37	20.0
17	60	36.8	47	28.8	-	-	-	-
18	60	41.3	47	32.3	-	-	-	-
19	60	46.1	-	-	-	-	-	-
20	60	48.5	-	-	-	-	-	-
21	60	50.4	-	-	-	-	-	-
22	60	52.0	-	-	-	-	-	-
23	60	53.4	-	-	-	-	-	-
24	60	54.3	-	-	-	-	-	-
25	60	55.0	-	-	-	-	-	-

Volume Equation: $V = -0.26315 + .00214 (D^2H)$

Height Equations:

Site Class 1 : H = 4.5 + 8.9516D - 0.3609D ²
Site Class 2+ : H = 4.5 + 8.9582D - 0.4665D ²
Site Class 2 : H = 4.5 + 9.0476D - 0.5385D ²
Site Class 2- : H = 4.5 + 9.0410D - 0.6192D ²

NOTE: For trees 20 inches DBH and over, a second degree volume equation was used.

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u>	3+		3		3-		4									
<u>Height Class:</u>	<u>30'</u>	<u>-</u>	<u>35'</u>	<u>AMH</u>	<u>VOL.</u>	<u>25'</u>	<u>-</u>	<u>30'</u>	<u>AMH</u>	<u>VOL.</u>	<u>20'</u>	<u>-</u>	<u>25'</u>	<u>AMH</u>	<u>VOL.</u>	<u>Less than 20'</u>
<u>DBH (inches)</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>	<u>AMH</u>	<u>VOL.</u>
2	20	-	19	-	18	-	16	-								
3	25	-	24	-	22	-	17	-								
4	29	-	27	-	22	-	17	-								
5	32	1.4	27	1.2	22	0.9	17	0.6								
6	32	2.2	27	1.8	22	1.4	17	1.0								
7	32	3.1	27	2.6	22	2.0	17	1.5								
8	32	4.1	27	3.4	22	2.7	17	2.1								
9	32	5.3	27	4.4	22	3.6	17	2.7								
10	32	6.6	27	5.5	22	4.4	17	3.4								
11	32	8.0	27	6.7	22	5.4	-	-								
12	32	9.6	27	8.1	22	6.5	-	-								
13	32	11.3	-	-	-	-	-	-								
14	32	13.2	-	-	-	-	-	-								
15	32	15.1	-	-	-	-	-	-								

Volume Equation: $V = -0.26315 + .00214(D^2H)$

Height Equations: Site Class 3+: $H = 4.5 + 9.1802D - 0.7524D^2$
 Site Class 3 : $H = 4.5 + 9.2000D - 0.9200D^2$
 Site Class 3-: $H = 4.5 + 9.2306D - 1.1834D^2$
 Site Class 4 : $H = 4.5 + 9.6152D - 1.8491D^2$

Appendix 4.3

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 3-INCH TOP DBH

Site Class Height Class: DBH (inches)	1 50' and over AMH VOL.		2+ 45' - 50' AMH VOL.		2 40' - 45' AMH VOL.		2- 35' - 40' AMH VOL.	
	AMH	VOL.	AMH	VOL.	AMH	VOL.	AMH	VOL.
2	21	-	21	-	20	-	20	-
3	28	-	27	-	27	-	26	-
4	35	1.4	33	1.3	32	1.3	31	1.2
5	40	2.3	38	2.2	36	2.1	34	2.0
6	45	3.7	41	3.4	39	3.2	36	3.0
7	49	5.4	44	4.9	41	4.5	37	4.1
8	53	7.5	46	6.6	42	6.0	37	5.3
9	56	10.0	47	8.4	42	7.6	37	6.7
10	58	12.8	47	10.4	42	9.3	37	8.2
11	59	15.7	47	12.5	42	11.2	37	9.9
12	60	19.0	47	14.9	42	13.3	37	11.8
13	60	22.3	47	17.5	42	15.6	37	13.8
14	60	25.8	47	20.2	42	18.1	37	16.0
15	60	29.6	47	23.2	42	20.8	37	18.3
16	60	33.6	47	26.4	42	23.6	37	20.8
17	60	38.0	47	29.8	-	-	-	-
18	60	42.5	47	33.3	-	-	-	-
19	60	47.4	47	-	-	-	-	-
20	60	49.9	-	-	-	-	-	-
21	60	51.8	-	-	-	-	-	-
22	60	53.6	-	-	-	-	-	-
23	60	55.0	-	-	-	-	-	-
24	60	56.1	-	-	-	-	-	-
25	60	56.9	-	-	-	-	-	-

Volume Equation: $V = 0.15066 + 00218 (D^2H)$

Height Equations:

$$\begin{aligned} \text{Site Class 1 : } H &= 4.5 + 8.9516D - 0.3609D^2 \\ \text{Site Class 2+ : } H &= 4.5 + 8.9582D - 0.4665D^2 \\ \text{Site Class 2 : } H &= 4.5 + 9.0476D - 0.5385D^2 \\ \text{Site Class 2- : } H &= 4.5 + 9.0410D - 0.6192D^2 \end{aligned}$$

NOTE. For trees 20-inches DBH and over, a second degree volume equation was used.

Appendix 4.4

SUNDRI

SITE CLASS GROSS VOLUME TABLES

IN CUBIC FEET UB
TO 3-INCH TOP DIB

<u>Site Class:</u>	3+		3		3-		4		
<u>Height Class:</u>	<u>30' - 35'</u>	<u>AMH</u>	<u>25' - 30'</u>	<u>AMH</u>	<u>20' - 25'</u>	<u>AMH</u>	<u>Less than 20'</u>	<u>AMH</u>	<u>VOL.</u>
<u>DBH (inches)</u>									
2	20	-	19	-	18	-	16	-	-
3	25	-	24	-	22	-	17	-	-
4	29	1.2	27	1.1	22	0.9	17	0.7	-
5	32	1.9	27	1.6	22	1.3	17	1.1	-
6	32	2.7	27	2.3	22	1.9	17	1.5	-
7	32	3.6	27	3.0	22	2.5	17	2.0	-
8	32	4.6	27	3.9	22	3.2	17	2.5	-
9	32	5.8	27	4.9	22	4.0	17	3.2	-
10	32	7.1	27	6.0	22	4.9	17	3.9	-
11	32	8.6	27	7.3	22	6.0	-	-	-
12	32	10.2	27	8.6	22	7.1	-	-	-
13	32	11.9	-	-	-	-	-	-	-
14	32	13.8	-	-	-	-	-	-	-
15	32	15.8	-	-	-	-	-	-	-

Volume Equation: $V = 0.15066 + .00218 (D^2 H)$

Height Equations:

$$\begin{aligned} \text{Site Class 3+ : } H &= 4.5 + 9.1802D - 0.7524D^2 \\ \text{Site Class 3 : } H &= 4.5 + 9.2000D - 0.9200D^2 \\ \text{Site Class 3- : } H &= 4.5 + 9.2306D - 1.1834D^2 \\ \text{Site Class 4 : } H &= 4.5 + 9.6152D - 1.8491D^2 \end{aligned}$$

Appendix 4.5

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET
TO 2-INCH TOP DIB

Site Class: Height Class: DBH (inches)	1		2+		2		2-	
	50' and over AMH	VOL.	45' - 50' AMH	VOL.	40' - 45' AMH	VOL.	35' - 40' AMH	VOL.
2	21	-	21	-	20	-	20	-
3	28	0.9	27	0.9	27	0.9	26	0.9
4	35	1.6	33	1.5	32	1.5	31	1.5
5	40	2.6	38	2.5	36	2.4	34	2.3
6	45	4.0	41	3.7	39	3.5	36	3.3
7	49	5.7	44	5.2	41	4.8	37	4.4
8	53	7.9	46	6.9	42	6.3	37	5.6
9	56	10.4	47	8.8	42	7.9	37	7.0
10	58	13.3	47	10.8	42	9.7	37	8.6
11	59	16.2	47	13.0	42	11.7	37	10.3
12	60	19.6	47	15.4	42	13.8	37	12.2
13	60	22.9	47	18.0	42	16.1	37	14.3
14	60	26.5	47	20.8	42	18.7	37	16.5
15	60	30.3	47	23.9	42	21.4	37	18.9
16	60	34.5	47	27.1	42	24.2	37	21.4
17	60	38.9	47	30.5	-	-	-	-
18	60	43.5	47	34.2	-	-	-	-
19	60	48.5	-	-	-	-	-	-
20	60	51.1	-	-	-	-	-	-
21	60	53.1	-	-	-	-	-	-
22	60	54.9	-	-	-	-	-	-
23	60	56.5	-	-	-	-	-	-
24	60	57.7	-	-	-	-	-	-
25	60	58.6	-	-	-	-	-	-

Volume Equation:

$$V = 0.37491 + .00222 (D^2H)$$

Height Equations:

$$\begin{aligned} \text{Site Class 1 : } H &= 4.5 + 8.9516D - 0.3609D^2 \\ \text{Site Class 2+ : } H &= 4.5 + 8.9582D - 0.4665D^2 \\ \text{Site Class 2- : } H &= 4.5 + 9.0476D - 0.5385D^2 \\ \text{Site Class 2- : } H &= 4.5 + 9.0410D - 0.6192D^2 \end{aligned}$$

NOTE: For trees 20-inches DBH and over, a second degree equation was used.

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB
TO 2-INCH TOP DIB

<u>Site Class:</u>	3+		3		3-		4	
<u>Height Class:</u>	<u>DBH (inches)</u>	<u>30' - 35'</u>	<u>AMH</u>	<u>VOL.</u>	<u>25' - 30'</u>	<u>AMH</u>	<u>VOL.</u>	<u>Less than 20'</u>
2	20	-	19	-	18	-	16	-
3	25	0.8	24	0.9	22	0.8	17	0.7
4	29	1.4	27	1.3	22	1.2	17	1.0
5	32	2.2	27	1.9	22	1.6	17	1.3
6	32	2.9	27	2.5	22	2.1	17	1.7
7	32	3.9	27	3.3	22	2.8	17	2.2
8	32	4.9	27	4.2	22	3.5	17	2.8
9	32	6.1	27	5.2	22	4.3	17	3.4
10	32	7.5	27	6.4	22	5.3	17	4.1
11	32	9.0	27	7.6	22	6.3	-	-
12	32	10.6	27	9.0	22	7.4	-	-
13	32	12.4	-	-	-	-	-	-
14	32	14.3	-	-	-	-	-	-
15	32	16.4	-	-	-	-	-	-

Volume Equation: $V = 0.37491 + .00222 (D^2H)$

Height Equations:

$$\begin{aligned} \text{Site Class 3+ : } H &= 4.5 + 9.1802D - 0.7524D^2 \\ \text{Site Class 3 : } H &= 4.5 + 9.2000D - 0.9200D^2 \\ \text{Site Class 3- : } H &= 4.5 + 9.2306D - 1.1834D^2 \\ \text{Site Class 4 : } H &= 4.5 + 9.6152D - 1.8491D^2 \end{aligned}$$

SUNDRI

SITE CLASS GROSS VOLUME TABLES
IN CUBIC FEET UB

Site Class: Height Class: DBH (inches)	1 50' and over AMH VOL.		2+ 45' - 50' AMH VOL.		2 40' - 45' AMH VOL.		2- 35' - 40' AMH VOL.	
	AMH	VOL.	AMH	VOL.	AMH	VOL.	AMH	VOL.
2	21	0.6	21	0.6	20	0.6	20	0.6
3	28	1.0	27	1.0	27	1.0	26	1.0
4	35	1.7	33	1.6	32	1.6	31	1.6
5	40	2.7	38	2.6	36	2.5	34	2.4
6	45	4.1	41	3.8	39	3.6	36	3.4
7	49	5.9	44	5.3	41	5.0	37	4.5
8	53	8.1	46	7.1	42	6.5	37	5.8
9	56	10.7	47	9.0	42	8.1	37	7.2
10	58	13.5	47	11.0	42	9.9	37	8.8
11	59	16.5	47	13.3	42	11.9	37	10.5
12	60	19.9	47	15.7	42	14.1	37	12.4
13	60	23.3	47	18.3	42	16.4	37	14.5
14	60	26.9	47	21.2	42	19.0	37	16.8
15	60	30.8	47	24.2	42	21.7	37	19.2
16	60	35.0	47	27.5	42	24.6	37	21.8
17	60	39.5	47	31.0	-	-	-	-
18	60	44.2	47	34.7	-	-	-	-
19	60	49.2	-	-	-	-	-	-
20	60	51.9	-	-	-	-	-	-
21	60	54.0	-	-	-	-	-	-
22	60	55.9	-	-	-	-	-	-
23	60	57.6	-	-	-	-	-	-
24	60	58.8	-	-	-	-	-	-
25	60	59.8	-	-	-	-	-	-

Volume Equation: $V = 0.45589 + .00225 (D^2 H)$

Height Equations:

Site Class 1 : $H = 4.5 + 8.9516D - 0.3609D^2$

Site Class 2+ : $H = 4.5 + 8.9582D - 0.4665D^2$

Site Class 2 : $H = 4.5 + 9.0476D - 0.5385D^2$

Site Class 2- : $H = 4.5 + 9.0410D - 0.6192D^2$

NOTE: For trees 20-inches DBH and over, a second degree equation was used.

Appendix 4.8

SUNDRI

SITE CLASS TOTAL GROSS VOLUME TABLES
IN CUBIC FEET UB

Site Class:	3+		3		3-		4		
	Height Class:	DBH (inches)	30' - 35'	AMH VOL.	25' - 30'	AMH VOL.	20' - 25'	AMH VOL.	Less than 20'
2		20	0.6	19	0.6	18	0.6	16	0.6
3		25	1.0	24	1.0	22	0.9	17	0.8
4		29	1.5	27	1.4	22	1.3	17	1.1
5		32	2.3	27	2.0	22	1.7	17	1.4
6		32	3.0	27	2.6	22	2.2	17	1.8
7		32	4.0	27	3.4	22	2.9	17	2.3
8		32	5.1	27	4.3	22	3.6	17	2.9
9		32	6.3	27	5.4	22	4.5	17	3.6
10		32	7.7	27	6.5	22	5.4	17	4.3
11		32	9.2	27	7.8	22	6.4	-	-
12		32	10.8	27	9.3	22	7.6	-	-
13		32	12.6	-	-	-	-	-	-
14		32	14.6	-	-	-	-	-	-
15		32	16.7	-	-	-	-	-	-

Volume Equation: $V = 0.45589 + .00225 (D^2H)$

Height Equations:

Site Class 3+: $H = 4.5 + 9.1802D - 0.7524D^2$

Site Class 3 : $H = 4.5 + 9.2000D - 0.9200D^2$

Site Class 3-: $H = 4.5 + 9.2306D - 1.1834D^2$

Site Class 4 : $H = 4.5 + 9.6152D - 1.8491D^2$

KEORA VOLUME TABLES

Appendix 5.

SITE CLASS GROSS VOLUMES IN CUBIC FEET UB

<u>DBH (inches)</u>	<u>AMH (feet)</u>	<u>Volume to 4-inch top DIB</u>	<u>Volume to 3-inch top DIB</u>	<u>Volume to 2-inch top DIB</u>	<u>Total Volume</u>
5	41	1.3	1.8	2.2	2.4
6	49	3.0	3.5	4.0	4.2
7	53	4.9	5.5	5.9	6.3
8	56	7.1	7.8	8.2	8.7
9	59	9.7	10.6	11.0	11.6
10	63	13.1	14.1	14.5	15.2
11	66	16.8	17.9	18.3	19.2
12	70	21.3	22.6	22.9	24.0
13	74	26.4	27.9	28.2	29.5
14	77	31.8	33.5	33.7	35.3
15	80	37.7	39.6	39.7	41.6
16	83	44.2	46.3	47.2	48.4
17	85	50.6	52.9	53.7	55.2
18	87	57.4	59.8	60.5	62.4
19	88	63.9	66.5	67.9	69.2
20	89	70.7	73.4	74.5	76.3
21	90	77.6	80.4	82.3	83.3
22	90	85.0	86.8	88.3	89.8
23	90	90.3	93.2	94.1	96.2
24	90	96.7	99.6	100.3	102.6
25	90	103.0	105.9	106.1	108.8
26	90	109.3	112.0	113.8	114.9
27	90	115.4	118.0	119.2	121.8
28	90	121.4	123.9	125.1	131.8
29	90	127.2	129.4	131.5	137.5
30	90	133.4	135.4	137.7	145.3
31	90	138.0	139.6	141.2	149.8
32	90	143.0	144.1	145.7	154.3
33	90	147.5	148.1	149.8	158.6
34	90	151.6	154.5	156.3	163.1
35	90	155.3	156.8	158.7	167.4
36	90	158.4	160.2	162.3	171.9
37	90	160.9	162.3	164.6	176.6
38	90	162.7	164.4	167.0	180.5
39	90	163.9	166.7	169.1	185.7
40	90	164.2	167.4	171.3	190.0

Volume Equations: $V_4 : V = -1.065 + .0023(D^2H) - .000000008(D^2H)^2$
 $V_3 : V = -0.67^2 + .0024(D^2H) - .000000009(D^2H)^2$
 $V_2 : V = -0.235 + .0024(D^2H) - .000000010(D^2H)^2$
 $V_1 : V = -0.166 + .0025(D^2H) - .000000010(D^2H)^2$

Height Equation: $H = 4.5 + 7.475D - .1625D^2$

NOTE: The values for trees 30 inches and over are extrapolated curve values rather than formula values.

Appendix 7

KANKRA
SITE CLASS VOLUME TABLE
(after CURTIS)

GROSS VOLUMES IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u> <u>DBH (inches)</u>	<u>1 and 2</u> <u>Vol.</u>	<u>3</u> <u>Vol.</u>	<u>4</u> <u>Vol.</u>
5	2.5	1.8	1.1
6	3.7	2.5	1.5
7	5.0	3.4	2.1
8	6.3	4.4	2.6
9	7.7	5.4	3.4
10	9.5	6.8	3.9
11	11.3	8.3	4.2
12	13.5	9.8	4.3
13	16.0	11.5	4.5
14	19.2		
15	23.0		
16+	27.0		

Appendix 8

BAEN
SITE CLASS VOL VOLUME TABLE
(after CURTIS)

GROSS VOLUMES IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u> <u>DBH (inches)</u>	<u>1</u> <u>Vol.</u>	<u>2</u> <u>Vol.</u>	<u>3 and 4</u> <u>Vol.</u>
5	1.8	1.5	1.3
6	3.0	2.5	2.1
7	4.3	3.6	3.0
8	6.0	5.0	4.1
9	7.9	6.8	5.5
10	10.0	8.5	7.2
11	12.4	10.8	9.0
12	15.0	13.2	11.1
13	18.0	15.7	13.5
14	21.1	18.4	15.6
15	24.0	20.9	18.0
16	27.2	23.5	20.1
17	30.5	26.5	22.5
18	35.0	30.0	
19+	45.5	34.5	

Appendix 9

MISCELLANEOUS SPECIES
SITE CLASS VOLUME TABLE
(after CURTIS)

GROSS VOLUMES IN CUBIC FEET UB
TO 4-INCH TOP DIB

<u>Site Class:</u> <u>DBH (inches)</u>	<u>1, 2, 3</u> <u>Vol.</u>	<u>4</u> <u>Vol.</u>
5	1.6	1.1
6	2.2	1.6
7	3.1	2.1
8	4.2	2.7
9	6.0	3.3
10	7.8	4.1
11	9.2	4.6
12	9.8	4.9
13+	10.0	5.0

Appendix 10

GORAN
GROSS VOLUMES IN CUBIC FEET
TO 4-INCH TOP DIB

DBH (inches)

5

One Site Class Only

0.5

Appendix 11

REDUCTION FACTORS FOR DEFECT AND CR OK FOR THE SPECIES IN APPENDICES 3-9

SPECIES	Deductions Expressed as a Percentage of Gross Volumes Defect (Rot plus Bark Seam)				Crook (Crook and Sweep) Utilization Standards			
	V4	V3	V2	V1	V4	V3	V2	V1
Gewa	22.00	3.0	4.0	4.0	2.0	4.0	5.5	5.5
Sundri	0.5	2.5	3.0	3.0	2.0	3.5	5.0	5.0
Koora	2.0	2.5	3.0	3.0	4.0	4.5	5.0	5.0
Mesur	1.5	2.5	3.5	3.5	3.0	5.0	6.0	6.0
Kenkra	1.0	2.0	3.0	3.0	3.5	5.0	6.0	6.0
Doen	10.0	11.0	12.5	12.5	5.0	7.0	7.5	7.5
Other Species	10.0	10.0	10.5	10.5	12.0	12.0	12.5	12.5

Notes:

(a) Utilization Standards:

V4 - volume to a 4-inch top DIB (6-inch stump)

V3 - volume to a 3-inch top DIB (6-inch stump)

V2 - volume to a 2-inch top DIB (6-inch stump)

V1 - total volume

(b) Defect factors (rot plus bark seam) and crook factors (crook and sweep) were each determined by diameter groups in each block. No significant variation was found between diameter groups or between blocks. Therefore, the above overall values have been adopted to facilitate application.

(c) All factors have been raised to the next nearest half of one percent.

KASSALONG AND RANKING
RESERVED FORESTS

HEIGHT CLASS VOLUME TABLE
IN CUBIC FEET, U.B.

SPECIES: GUM

D. B. H. Class (inches)	Average Maximum Height of Dominants and Codominants in Feet						D. B. H. Class (inches)		
	60	80	100	120	140	160	180	Ht.	Vol.
12	60	14.9	76	19.9	84	22.5	85	21.8	78
16	60	29.6	80	40.7	95	49.1	101	52.4	98
20	60	48.4	80	65.8	100	83.2	113	94.5	115
24	60	71.4	30	96.4	100	118	119	137	127
28	60	98.5	80	127	100	154	120	182	135
32	60	124	80	160	100	197	120	233	139
36	60	153	80	199	100	244	120	290	140
40	60	185	80	242	100	298	120	354	140
44	80	80	289	100	357	120	425	140	494
48	80	341	100	422	100	493	120	503	140
52	100	569	100	569	100	569	120	588	140
56	120	777	120	777	120	679	120	790	140
60	120	882	120	882	120	1157	140	1026	140
64	120	140	120	140	120	1477	160	1157	140
68	120	140	120	140	120	1477	160	1031	140
72	120	140	120	140	120	1477	160	1171	140

* Utilization: Stump height - 2 feet; Top diameter - 8 inches D.U.B. or at point of branching.

$$\text{Volume Equations: } \frac{D^2H}{100} < 500 : V = -3.866 + 0.21768 \frac{D^2H}{100}$$

$$\frac{D^2H}{100} \geq 500 : V = 16.161 + 0.17517 \frac{D^2H}{100}$$

KASSALONG AND RANKHING
RESERVED FORESTS

HEIGHT CLASS VOLUME TABLE
IN CUBIC FEET * UB

Average Maximum Height of Dominants and Codominants in Feet

D.B.H. Class (inches) Ht.	60 Vol. Ht.	80 Vol. Ht.	100 Vol. Ht.	120 Vol. Ht.	140 Vol. Ht.	160 Vol. Ht.	180 Vol. Ht.	D.B.H. Class (inches) Ht.	
12	55 60	16.3 31.2	66 76	19.4 39.4	74 45.0	21.7 93	22.6 48.1	76 95	22.3 49.1
16	60	48.5	80	64.5	96	77.4	106	110	89.3
20	60	69.7	80	92.7	100	115.8	114	117	128
24	60	94.7	80	112	100	139	119	165	125
28	60	110	80	146	100	181	120	217	131
32	60	138	80	183	100	228	120	273	137
36	60	170	80	226	100	281	120	337	140
40	60								
44	80								
48	80								
52	56								
56									
60									
64									
68									
72									

* Utilization: Stump height - 2 feet; Top diameter - 8 inches D.U.H. or at point of branching.

$$\text{Volume Equations: } \frac{D^2 H}{100} < 600 : V = 0.374 + 0.20046 \frac{D^2 H}{100}$$

$$\frac{D^2 H}{100} > 600 : V = 3.456 + 0.17352 \frac{D^2 H}{100}$$

KASSALONG AND RANKHING
RESERVED FORESTS

HEIGHT CLASS VOLUME TABLE
IN CUBIC FEET & UB

SPECIES: CND, KDB, NAR

D. B. H. Class (inches)	60 Ht.	Average 80 Vol.	Ht.	Vol.	Maximum Height of Dominants and Codominants in Feet			D. B. H. Class (inches)	12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72
					100	120	140		
12	58	20.4	75	25.1	82	27.0	79	26.2	73
16	60	33.9	80	43.8	94	50.7	99	52.2	91
20	60	50.9	80	66.0	100	81.5	111	90.0	108
24	60	71.0	80	93.2	100	115	118	136	122
28	60	95.1	80	125	100	156	120	186	133
32	60	123	80	162	100	202	120	212	138
36	60	154	80	204	100	255	120	305	140
40	60	190	80	251	100	313	120	375	140
44			80	303	100	378	120	453	140
48			80	360	100	449	120	538	140
52					100	526	120	631	140
56					100	610	120	731	140
60							120	839	140
64								978	140
68								1112	140
72								1255	140

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* Utilization: Stump height - 2 feet; Top diameter - 8 inches D.U.B. or at point of branching

Volume Equation: $V = 4.239 + 0.19314 \frac{D^2 H}{100}$

Appendix 14



KASSALONG AND BANKHUNG
RESERVED FORESTS

LIGHT CLASS VOL. TABLE
IN CUBIC FEET * UB

SPECIES: URM, CKR, GTP

D.B.H. Class (inches)	Ht.	Vol.	Average Maximum Height of Dominants and Codominants in Feet			D.B.H. Class (inches)					
			100	120	140						
12	60	16.5	73	19.9	67	18.4	59	16.3	53	14.7	12
16	60	28.7	79	37.4	80	37.9	73	34.7	67	31.9	16
20	60	44.3	80	58.7	91	66.7	86	63.1	79	58.0	20
24	60	63.4	80	84.2	97	102	96	101	91	95.6	24
28	60	85.9	80	114	100	143	105	150	101	144	28
32	60	112	80	149	100	175	111	189	110	187	32
36	60	141	80	176	100	209	116	235	118	238	36
40	60	174	80	207	100	247	119	285	124	295	40
44	80	240	100	289	120	337	120	337	130	362	44
48	80	277	100	335	120	393	120	393	134	433	48
52	100	385	100	439	120	453	120	453	137	510	52
56	100	439	100	497	120	518	120	518	139	592	56
60	64	68	72								

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Appendix 15

* Utilization: Stump height - 2 feet; Top diameter D.U.B or at point of Branching.

$$\frac{D^2 H}{100} < 1000 : V = 0.916 + 0.18067 \frac{D^2 H}{100}$$

$$\frac{D^2 H}{100} > 1000 : V = 40.257 + 0.12530 \frac{D^2 H}{100}$$

KASSALONG AND RANKHIANG
RESERVED FORESTS

HEIGHT CLASS VOLUME TABLE
IN CUBIC FEET* UB

SPECIES: CPS, DJM, GM, P,
KOR, JRL, TN

D. B. H. Class (inches)	Average Maximum Height of Dominants and Codominants in Feet						D. B. H. Class (inches)
	60	80	100	120	140	Vol.	
12	60	20.3	77	23.4	73	22.7	63
16	60	28.9	80	35.5	87	37.8	78
20	60	40.0	80	50.3	96	58.5	90
24	60	53.6	80	68.4	100	83.2	101
28	60	69.6	80	89.8	100	110	109
32	60	88.1	80	114	100	141	115
36	60	109	80	142	100	176	119
40	60	133	80	174	100	215	120
44	80	208	100	258	120	308	120
48	80	246	100	305	120	365	120
52	100	357	100	357	120	426	120
56	100	412	100	493	120	493	120
60	100	472	120	565	120	641	120
64	100	472	120	641	120	641	120
68	100	472	120	641	120	641	120
72	100	472	120	641	120	641	120

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* Utilization: Stump height - 2 feet; Top diameter - 8 inches D. B. H. or at point of branching.

$$\text{Volume Equation: } V = 9.168 + 0.12855 \frac{D^2H}{100}$$

Appendix

D. B. H. Class (inches)	Average Maximum Height of Dominants and Codominants in Feet						D. B. H. Class (inches)				
	60	80	100	120	140	160					
12	55	14.5	65	17.1	70	18.4	73	19.2	74	19.5	12
16	60	28.0	75	34.9	84	39.1	89	41.4	91	42.3	16
20	60	43.6	80	58.0	93	67.4	102	74.0	106	76.8	20
24	60	62.7	80	83.5	99	103	111	116	118	123	24
28	60	85.2	80	114	100	142	117	166	128	182	28
32	60	111	80	148	100	185	120	222	135	250	32
36	60	141	80	188	100	234	120	281	139	326	36
40	60	174	80	232	100	289	120	347	140	405	40
44	80	280	100	350	120	420	140	490	140	490	44
48	80	333	100	417	120	500	140	583	140	583	48
52			100	489	120	587	140	685	140	685	52
56			100	567	120	680	140	794	140	794	56
60					120	781	140	911	140	911	60
64					120	889	140	1037	140	1037	64
68							140	1170	140	1170	68
72											72

* Utilization: Stump height - 2 feet; Top diameter - 8 inches D. B. H. or at point of branching.

$$\text{Volume equation: } V = 0.203 + 0.18077 \frac{D^2 H}{100}$$

D. B. H. Class (inches)	Ht. Vol.	Average Maximum Height of Dominants and Codominants in Feet			Ht. Vol.	Ht. Vol.	Ht. Vol.	D. B. H Class (inches)
		80	100	120				
12	57	14.7	66	17.2	68	17.8	71	18.6
	60	28.6	76	36.6	82	39.6	87	42.1
16	60	45.5	80	53.3	92	62.3	100	68.2
	60	58.1	80	79.5	98	98.9	109	111
20	60							
24	60							
28	60	81.3	80	111	100	140	116	163
	60	108	80	146	100	184	119	221
32	60	139	80	187	100	235	120	283
	60							
36	60	173	80	232	100	292	120	351
40	60							
44								
48								
52								
56								
60								
64								
68								
72								

* Utilization: Stump height - 2 feet; Top diameter - 8 inches D. U. B. or at point of branching.

$$\text{Volume Equation: } \frac{D^2 H}{100} < 250 : V = -1,344 + 0.19497 \frac{D^2 H}{100}$$

$$\frac{D^2 H}{100} > 250 : V = -6.303 + 0.18629 \frac{D^2 H}{100}$$

Appendix 19

BRANCHWOOD PERCENTAGE TABLE FOR SPECIES IN THE CHITTAGONG
HILL TRACTS

Species	Small Sawlogs	Pulpwood	Total
Civit	15.3	5.5	20.8
Garjan	4.7	1.3	6.0
Banderhola	13.3	2.4	15.7
Batna	9.4		9.4
Champ	23.0	6.9	29.9
Chapalish	19.4	3.9	23.3
Chikrassi	24.3	9.2	33.5
Chundul	10.1	3.4	13.2
Dhaki jam	17.1	6.5	23.6
Gamari	8.2	8.7	16.9
Jarul	15.7	1.8	17.5
Kamdeb	13.4	5.1	18.5
Koroi	19.5	4.5	24.0
Narikeli	0.8	0.2	1.0
Jam	22.7	2.4	25.1
Pitraj	6.3	4.8	11.1
Tali	0.6	0.2	0.8
Toon	1.6	1.0	2.6
Urium	8.3	5.3	13.6
Miscellaneous	12.0	5.6	17.6
Average of all species	12.4	4.2	16.6

Small sawlogs and pulpwood, recoverable from branchwood, were measured on the sample trees and their volumes are expressed in cu m expressed in the table as percentages of the merchantable main stem volumes.

Appendix 21

CULL TREE PERCENTAGE TABLE BY SAMPLING UNITS FOR
THE CHITTAGONG HILL TRACTS

Forest	S.U.No.	Diameter Range		
		4.1"	- 10.0"	10.1" and over
	1		4.7	6.7
	2		4.7	4.6
	3		4.3	5.6
	4		3.3	5.6
Average			4.3	5.6
	1		2.7	9.6
	2		5.4	21.8
Average			4.1	15.9
of Kassalong and combined			4.2	9.3

In the above table, the number of cull trees has been expressed as a percentage of the total number of merchantable stems tallied.

Volume table for GARJAN, CHAPALISH and OTHER Species.

(Extracted from Chapter VI of the revised Working Plan for the Forests of the Chittagong Division for the period from 1968-69 to 1977-78.)

Commercial Timber outturn figures - The following outturn figures have been worked out from data collected from a large number of trees felled and extracted by contractors in the Halda Valley area including the outturn of both sound and defective trees.

Breast Height Girths and Volumes in Cu. feet $\frac{1}{4}$ Girth Squared, o.b.

Class of Forest.	Species	3' to 3'-11"	4' to 4'-11"	5" to 5'-11"	6' to 6'-11"	7' to 7'-11"	8' to 8'-11"	9' to 9'-11"	10' and over.
Reserved Forests	Garjan and Chapalish	2		40	50	70	90	110	130
	Others	20	30						
Protected Forests	Garjan and Chapalish	15	25	35	40	55	70	90	110
	Others	35	50	65	80	100	120
		30	35	50	65	80	95

Commercial outturn figures at Mainimukh in the Chittagong Hill Tracts district work out at from 40 per cent to 100 per cent above those given for reserved forests in the table above. Similar figures collected at Barabakia and Tetang, in the Jaldi range, where the quality of the Garjan is very low, gave a figure which is about 30 per cent. below that given for garjan from the reserved forests in the above table.

Appendix 24

Volume table for GARJAN, BOILAM, CHAPALISH and OTHER SPECIES.

(Extracted from Chapter VII of the Working Plan of Cox's Bazar Forest Division for the period from 1968-69 to 1977-78)

Commercial Timber Outturn Figures - The following outturn figures have been worked out from data collected from a large number of trees felled and extracted by collectors in the Halda valley in the Chittagong Division area including the outturn of sound and defective trees. (Collected from Gani's Working Plan.)

Breast Height Girths and Volumes in cu. feet. quarter girth squared, o.b.

of Forest.	Species.	5' to 5'-11"	6' to 6'-11"	7' to 7'-11"	8' to 8'-11"	9' to 9'-11"	10 and over
Reserved forest ..	Garjan Boilam and Chapalish.	40	50	70	90	110	130
	Others	40	55	70	90	110
Protected forest.	Garjan and Chapalish ..	35	50	65	80	100	120
	Others	30	35	50	65	80	95

Commercial outturn figures at Mainimura in the Chittagong Hill Tracts district are out at from per cent. to 100 per cent. above those given for reserved forests in the table above. Similar figures collected at Barabakia and Tetag in the Chittagong Jaldi division where the quality of garjan is very low, gave a figure which is about 30 per cent. below, that given for garjan, from the reserved forests in the above table.

Appendix 25

Volume table for CHAM, GARJAN, POMA, RATA and OTHER species.

(Extracted from Chapter VI of the Working Plan for the Forests
of the Sylhet Division for the period 1963-64 to 1982-83)

Breast Height Girths and volumes in Cu. Feet $\frac{1}{4}$ Girth squared, o.b.

Species. 1	3' to 3'-11" 2	4' to 4'-11" 3	5' to 5'-11" 4	6' to 6'-11" 5	7' to 7'-11" 6	8' to 8'-11" 7	9' to 9'-11" 8	10 and over. 9
Cham	8	30	45	60	75	100	125	150
Garjan	25	45	70	85	100	125	150	180
Poma	25	35	45	60	75
Rata	20	30	40	50	60	80
Others	15	25	35	45	60	75	90	110

This table has been worked out from data collected from the records of a large number of trees felled in the past in different felling centres and include both sound and defective trees.

Appendix 26

Volume Tables and correction factors to be applied to hoppus volume factors for CIVIT, GARJAN, CHAPALISH, and OTHER SPECIES.

(Extracted from Chapter VI of the Working Plan of Sangu and Matamahuri Reserved Forests for the period 1967-87).

43. Commercial timber outturn figures. -- A gross commercial volume table based on Girard form factor, D.B.H. class and commercial heights (by logs 16 feet, and half log, 8 feet) has been prepared and is included in the Appendix of this plan.

Girard form factor is determined by the following formula.

Diameter outside bark at Breast Height = Girard form factor X Diameter inside bark at 16 feet above stump. If buttress extends to 4½ feet above ground level then a point 2 feet above buttress will be taken for D.B.H. measurement.

The volume table is based on measurements of 800 Garjan trees of the Kassalong Reserved Forests that was furnished to this Division. The average Girard form factor of the sample trees was .84.

Proper use of the volume table involves the necessity of determining the average Girard form factor. The volumes are to be adjusted by +3 per cent, for each percentage over .84 and -3 per cent. for each percentage below .84.

Sample measurements taken in connection with the enumeration of the Sangu and Mathamuhari Reserved Forests indicated the following average Girard form factors and corrective factors to be applied to the volume table.

Species	Average Girard form Factor.	Correction factor to be applied to volume table.
Civit	.86	Per cent. +6
Garjan	.82	-6
Chapalish	.82	-6
Other species	.83	-3

Hoppus Cubic Foot ub. Volume Table for CIVIT

(Extracted from appendix XVI of the Working Plan of the
Sangu and Mathamuhari Reserved Forests for the period
1967-87)

Diam. 2' above Butt Swell (inches).	Number of 16-foot logs to commercial top.									
	1	1½	2	2½	3	3½	4	4½	5	
18	24	33	39	46	50	
20	30	38	54	60	65	
22	40	57	70	76	81	
24	48	68	85	104	112	
26	57	81	101	128	148	172	185	199	210	
28	67	99	115	136	162	181	200	216	228	
30	76	111	131	158	178	199	216	235	248	
32	85	122	146	176	197	221	237	255	270	
34	93	131	161	193	216	241	260	281	295	
36	103	143	178	215	240	268	287	308	325	
38	115	164	196	235	265	297	318	342	357	
40	126	180	214	261	293	328	350	379	397	
42	143	198	235	281	231	365	393	424	443	

Heavy line encloses basic data on 86 Civit trees, measured during
F.I.D.C. Timber Extraction Operation at Pablakhali in February, 1960.

Volume computation based on formula $\frac{(\text{Midgirth})^2}{4} \times \text{Length}$.

(Diam, under bark at 16' above Butt Swell)

Average Girard form factor (Diam, outside bark at 2' above Butt Swell) is 0.81.

Appendix 28

Hopuss Cubic Foot up Volume Table for GARJAN.

(Extracted from appendix XVII of the Working Plan of the Sangu and Matamahuri Reserved Forests for the period 1967-87)

D.H. (B) ches.	Number of 16-foot logs up to commercial top.												
	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7
14	11	16	20	24	27	30	32
16	15	21	26	31	36	40	43
18	18	25	32	38	43	48	53	57	60
20	22	32	40	48	54	60	66	71	75
22	27	38	48	58	64	73	80	86	91	97	102
24	32	45	57	69	77	86	94	101	107	113	118
26	37	53	66	80	90	100	108	117	124	131	136	141	145
28	42	61	76	93	106	118	130	140	148	156	162	168	173
30	48	70	87	107	124	140	152	163	173	182	189	196	202
32	55	78	98	121	140	158	170	185	196	206	215	223	230
34	62	88	112	137	158	177	193	209	222	234	245	254	261
36	69	99	128	153	177	198	217	235	250	265	276	286	294
38	78	110	140	171	197	221	243	262	279	294	307	319	329
40	86	122	155	188	217	243	267	288	307	324	337	350	362
42	94	134	172	207	238	266	292	315	336	353	369	383	396
44	101	145	186	223	257	289	318	344	366	387	404	419	433
46	110	159	204	240	282	316	347	381	404	426	444	463	480
48	121	175	224	269	312	350	386	424	447	469	488	517	536
50	132	190	244	296	342	387	424	464	493	520	544	576	596
52	142	205	264	319	372	420	461	505	539	570	610	632	648
54	152	222	286	348	405	455	502	547	588	624	658	631	720
56	164	238	306	372	432	488	539	588	634	673	710	746	778
58	176	255	329	398	462	524	578	627	685	724	766	815	846
60	188	272	348	425	492	559	618	674	727	775	823	865	902
62	200	288	369	450	528	59	661	723	718	827	882	928	966
64	214	310	393	480	560	634	705	775	833	890	947	995	1035
66	230	332	418	518	605	680	753	828	894	955	1016	1068	1110
68	246	356	447	553	643	730	806	892	960	1030	1090	1145	1194
70	265	381	482	594	675	782	866	957	1032	1110	1170	1232	1286
72	284	409	526	636	745	843	937	1023	1112	1195	1260	1334	1400

Heavy line encloses basic data of 770 trees furnished by Silvicultural Research Division, Dacca.

Volume computation based on formula $\frac{(\text{Mid-girth})^2}{4} \times \text{Length.}$

Average Girard form factor $\left(\frac{\text{Diam. under bark at 161. above stump}}{\text{Diam. outside bark at Breast Height}} \right)$ is 0.84.

Reduct-3 per cent from volume table table values for each per cent, the average factor decreases below 84%.