

**METRIC VOLUME TABLES FOR
SOME TREE SPECIES FOUND IN
THE NATURAL FORESTS OF
BANGLADESH**

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BULLETIN No. 6**

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JULY, 1986

1. INTRODUCTION

A number of volume tables have been prepared in the past for several indigenous species growing in the forests of Bangladesh. In 1963 Forestal prepared some local-site tables for individual species and groups of species in connection with an inventory of the forest resources of the Chittagong Hill Tracts. Since then simple volume tables have been derived from commercial timber outturn data and some of these tables can be found in our current Working Plan Documents for Sylhet and Chittagong Forest Divisions.

The most recent set of volume tables for indigenous species was published by the Bangladesh Forest Research Institute (Islam, 1984) but these were presented in Imperial Units and no separate regression equations were given. Bangladesh has now adopted the metric scheme of measurement and it has become desirable to present the tables again, this time in metric form and complete with equations for both imperial and metric units to facilitate the change from one system to the other.

These tables apply to trees growing in natural forests and should not be used for the same species when grown in plantations.

Table 1

SPECIES INCLUDED IN THESE VOLUME TABLES

A. Single Species in Separate Tables

<u>Aphanamixis polystachya</u> Parker	Pitraj
<u>Artocarpus chaplasha</u> Roxb.	Chapalish
<u>Bombax ceiba</u> Linn.	Simul
<u>Dipterocarpus gracilis</u> Bl.	Dhali Garjan
<u>Dipterocarpus costatus</u> Gaertn.f.	Baita Garjan
<u>Dipterocarpus turbinatus</u> Gaertn.f.	Teli Garjan
<u>Duabanga grandiflora</u> Roxb.	Banderhola
<u>Mangifera sylvatica</u> Roxb.	Uriam
<u>Schima wallichii</u> Chorsy	Kanak
<u>Swintonia floribunda</u> Griff.	Civit
<u>Syzygium grande</u> (Wt.) Wald.	Dhakijam
<u>Terminalia bellerica</u> Roxb.	Bahera
<u>Tetrameles nudiflora</u> R.Br.	Chundul

B. Mixed Species Group in One Table

<u>Albizia chinensis</u> Merr.	Chakua Koroi
<u>Albizia procera</u> Benth.	Sada Koroi
<u>Alstonia scholaris</u> R. Br.	Chatian
<u>Anisoptera glabra</u> (Roxb.) Pierre	Boilum
<u>Artocarpus heterophyllus</u> Lam.	Barta
<u>Calophyllum polyanthum</u> Wall.	Kamdeb
<u>Toona ciliata</u> Roem.	Toon
<u>Chukrassia tabularis</u> A. Juss.	Chikrassi
<u>Hopea odorata</u> Roxb.	Telsur
<u>Mangifera indica</u> Linn.	Am
<u>Michelia champaca</u> Linn.	Champaful
<u>Sterculia alata</u> Roxb.	Harikell
<u>Terminalia chebula</u> Retz.	Naritaki
<u>Trewia nudiflora</u> Linn.	Pitali

2. DATA COLLECTION

Data were collected from a large number of felled trees of each species (refer to stand tables for actual numbers), extracted by contractors from different coupes in Chittagong and Cox's Bazar Forest Divisions from 1974.

The aim was to select upto twenty sample trees for each diameter/height class cell, for each species, but this was not always possible. Complete measurement of each felled sample tree was made. Stump height was measured first on the uphill side. The position of breast height at 4'6" (1.37 m) was identified by adding the stump height to the butt end of the first log. Diameter at breast height was measured with calipers and total tree height recorded. Sample trees were considered in 3.0 m (10 ft) sections and included merchantable branches. Log length and diameter of both ends of each log were determined. The length of stem from the top of the last log to the tip of the tree was also recorded.

3. COMPILATION OF DATA

Total stem volumes were computed by sectional method, summing the volumes for each three metre long billet.

In addition to the primary variables of Volume (V), Diameter at breast height (D) and total Height (H), various functions and ratios of these variables (D^2 , $1/D$, $1/D^2$, $\text{Log}(V)$, $\text{Log}(D)$, DH , D^2H , V/D^2H , $1/DH$, $1/D^2H$, H/D^2 , H/D and $\text{Log}(H)$) were derived to provide additional variables for testing in regression analyses.

4. COMPUTATION OF VOLUME FUNCTIONS

Fifteen regression models were tried for best fit with the different variables as follows:

1. $V = a + bD$
2. $V = a + bD + cD^2$
3. $V = a + bD^2$
4. $V = a + bD^2H$
5. $V = a + bD^2 + cH + dD^2H$
6. $V = a + bD^2 + cDH + dD^2H$
7. $\ln(V) = a + b \ln(D)$
8. $\ln(V) = a + b \ln(D) + c \ln(H)$
9. $V/D^2 = a + b/D^2 + c/D$
10. $V/D^2 = a + b/D$
11. $V/D^2H = a + b/D^2H$
12. $V/D^2H = a + b/D^2 + cH/D^2 + dH$
13. $V/D^2H = a + b/D^2H + c/H + d/D^2$
14. $V/D^2 = a + b/D^2 + cH/D + dH$
15. $V/D^2H = a + b/D^2H + c/H + d/D$

Where V, D and H are as described above, a is the regression constant and b, c and d are regression coefficients. The logarithmic functions are to the base e (natural logarithms).

The regression models of best fit for each species were chosen by reference to various parameters describing the regressions, including furnival index and multiple correlation coefficient. Models of best fit are listed in Table 2.

Table 2

REGRESSION MODELS OF BEST FIT

Species or Group	One-Way Table	Two-Way Table
<u>Aphanamixis polystachya</u>	7	8
<u>Artocarpus chaplasha</u>	7	8
<u>Bombax ceiba</u>	7	8
<u>Dipterocarpus gracilis</u>	7	8
<u>Dipterocarpus costatus</u>	7	8
<u>Dipterocarpus turbinatus</u>	7	8
<u>Daubanga grandiflora</u>	7	13
<u>Mangifera sylvatica</u>	7	8
<u>Schima wallichii</u>	7	13
<u>Swintonia floribunda</u>	7	8
<u>Syzygium grande</u>	2	14
<u>Terminalia bellerica</u>	7	8
<u>Tetrameles nudiflora</u>	7	8
Mixed Species Group	7	8

5. STAND TABLES

Almost 4 000 trees were sampled. Available stand tables for the sampled trees of each species are given in Tables 3 to 13.

Numbers of trees sampled by species (where now known) were as follows:

<u>Aphanamixis polystachya</u>	148
<u>Artocarpus chaplasha</u>	175
<u>Dipterocarpus gracilis</u>	84
<u>Dipterocarpus costatus</u>	1 181
<u>Dipterocarpus turbinatus</u>	672
<u>Duabanga grandiflora</u>	77
<u>Schima wallichii</u>	71
<u>Swintonia floribunda</u>	404
<u>Syzygium grande</u>	369
<u>Terminalia bellerica</u>	120
<u>Tetrameles nudiflora</u>	162
Mixed species	174

Since all of the computer-generated volume tables have the same format, in most some or even many of the values shown will be well outside the range of the original data set. Extrapolation much outside the range of height and diameter indicated in the appropriate stand table should only be done with caution.

Table 3

APHANAMIXIS POLYSTACHYA - STAND TABLE - NUMBER OF TREES SAMPLED IN DIAMETER/HEIGHT CLASSES

Diameter	HEIGHT CLASSES														Total
	15.0	25.0	35.0	45.0	55.0	65.0	75.0	85.0	95.0	105.0	115.0	125.0	GT*130.0		
10.0	3	17	10	3	0	0	0	0	0	0	0	0	0	0	33
14.0	0	11	14	12	7	8	1	0	0	0	0	0	0	0	53
18.0	1	4	5	11	5	11	1	2	2	2	0	0	0	0	42
22.0	0	2	0	2	1	1	1	0	0	0	0	0	0	0	7
26.0	0	0	1	1	1	1	0	2	0	0	0	0	0	0	6
30.0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3
34.0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	4
38.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GT40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	4	34	30	30	14	22	5	6	2	2	0	0	1	0	148

Note: This Stand Table is in imperial units. Height in feet, diameter in inches since the original data were collected in those units.

Table 4

ARTOCARPUS CHAPLASHA - STAND TABLE - NUMBER OF TREES SAMPLED IN DIAMETER/HEIGHT CLASSES

Diameter	HEIGHT CLASSES																Total
	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0	GT*125.0				
10.0	0	3	4	4	0	0	0	0	0	0	0	0	0	0	0	0	11
14.0	2	0	3	9	12	5	3	0	0	0	0	0	0	0	0	0	34
18.0	0	1	1	3	8	5	6	1	0	0	0	0	0	0	0	0	25
22.0	1	0	2	3	5	7	6	4	0	1	0	0	0	0	0	0	29
26.0	0	0	0	1	4	1	8	4	1	2	0	1	0	0	0	0	22
30.0	0	0	0	0	5	5	3	4	0	1	2	2	1	1	1	0	22
34.0	0	1	0	1	5	1	0	1	4	2	2	0	0	0	0	0	17
38.0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	5
42.0	0	0	0	1	0	0	2	0	0	1	1	0	0	0	0	0	5
46.0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	4
50.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
54.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GT56.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	5	10	23	43	26	29	14	5	9	5	2	2	1	1	1	175

Note: This stand table is in imperial units. Height in feet, diameter in inches, since the original data were collected in those units.

Table 5

DIPTEROCARPUS GRACILIS - STAND TABLE - NUMBER OF TREES SAMPLED IN DIAMETER/HEIGHT CLASSES

Diameter	HEIGHT CLASSES															Total
	35.0	45.0	55.0	65.0	75.0	85.0	95.0	105.0	115.0	125.0	135.0	145.0	GT*150.0			
12.0	2	5	2	4	5	1	0	0	0	0	0	0	0	0	0	19
16.0	0	1	6	5	6	3	0	1	0	0	0	0	0	0	0	22
20.0	0	0	0	3	6	6	3	0	1	2	0	0	0	0	0	21
24.0	0	0	0	1	0	4	0	3	1	1	0	0	0	0	0	10
28.0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	4
32.0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
36.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2
48.0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2
52.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GT54.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	2	6	8	13	18	16	6	4	2	5	2	1	1	1	1	84

Note: This stand table is in imperial units. Height in feet, diameter in inches, since the original data were collected in those units.

