

Development of Allometric Biomass Models for *Hevea brasiliensis* Müll. Arg. Plantation of Bangladesh: A Non-Destructive Approach

Hevea brasiliensis Müll. Arg. is exotic in Bangladesh and largescale plantation has been established under governmental and private sectors for the production of natural rubber to meet the domestic demand. This species can sequester higher carbon compared to other species due to its fast-growing nature. Further promotion of this species is expecting in near future for both the economic and environmental benefits as a mitigation measure of climate change consequences. Allometric biomass models are important to estimate the biomass and carbon stocking. A non-destructive method was adopted to derive the allometric biomass models for *H. brasiliensis* in Bangladesh. The stem volume of 583 individuals of *H. brasiliensis* trees and biomass expansion factor (BEF) were used to estimate the total above-ground biomass (TAGB). A total of four allometric equations with natural logarithm were tested to derive best-fit biomass models for stem and TAGB. While five models were tested to derive the model of Biomass Expansion Factor (BEF). $BEF = 24.872 * D^{-0.765}$ was selected as the best-fit model of BEF. However, allometric models for stem and total above-ground biomass were $Ln(\text{Stem biomass}) = -2.476 + 1.655 * Ln(D) + 0.746 * Ln(H)$ and $Ln(TAGB) = 0.738 + 0.890 * Ln(D) + 0.746 * Ln(H)$ respectively. The best-fit TAGB model showed the highest efficiency in biomass estimation compared to commonly used regional, pan-tropical, and species-specific biomass models in terms of model prediction error (MPE), model efficiency (ME).

Key words: Allometric model, Bangladesh, Biomass, *Hevea brasiliensis*, Non-destructive

Introduction

Hevea brasiliensis, is native to South America (Fox and Vogler, 2005; BFD, 2016a). *Hevea brasiliensis* is one of the cash crops that is the source of natural latex (raw material of rubber). The wood of this species is also used in furniture industries. (Arokiaraj *et al.*, 2002; Tissari, 2002). The increasing demand rubber and rubber product insisted on the 1st commercial plantation of this species in Bangladesh during 1960 under the leadership of the Bangladesh Forest Department. Later on, large scale plantations of this species were developed in the central and eastern hilly parts of Bangladesh under the management of Bangladesh Forest Industries Corporation (BFIDC) (BFIDC, 1995). Presently, a total of 18,954 ha plantation of *H. brasiliensis* has been developed by both the governmental and private sectors of Bangladesh. BFIDC has planned to expand its plantation area further 1214 ha during 2020, and 0.1 million ha of land areas can be potential planting sites for the private sectors (BFIDC, 2015a; Hossain, 2016).

Plantation of *H. brasiliensis* has both the economic and ecological perspectives in Bangladesh. The mean annual production of RSS

The allometric biomass models for stem and total above-ground biomass of *Hevea brasiliensis* are $Ln(\text{Stem biomass}) = -2.476 + 1.655 * Ln(D) + 0.746 * Ln(H)$ and $Ln(TAGB) = 0.738 + 0.890 * Ln(D) + 0.746 * Ln(H)$ respectively.

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(Ribbed Smoke Sheet) for the period of 2001 to 2018 in Bangladesh is about 5840 tones (TILASTO, 2019) which meet a considerable portion of the annual domestic demand of rubber. Plantations of *H. brasiliensis* may have a higher capacity in carbon sequestration due to its fast-growing nature. Considering the environmental consequences, plantation of this species can play an important role in climate change mitigation measures in Bangladesh and as well as can be a remarkable source of carbon trading (BFIDC, 2015b). Besides this, the objectives of the second National Forest Inventory of Bangladesh shifted from a focus on volume for timber resources to biomass for carbon-related values (FD, 2017). Carbon stocking and sequestration in the plantation of *H. Brasiliensis* can be estimated using species-specific allometric biomass models (Mahmood *et al.*, 2019).

Biomass of an individual tree or a forest can be estimated accurately by harvesting the whole tree, with further separation into its components (Ketterings *et al.*, 2001). But this method can be applied only to a limited extent because of its time and labor-consuming procedure of field sampling and its destructive nature. Instead of whole tree method, tree biomass can be estimated using allometric equations, which can be derived from the semi-destructive and non-destructive method (Picard *et al.*, 2012; Mahmood *et al.*, 2019, 2020) with easily measurable tree variables such as diameter at breast height (DBH), total height (H) and wood density (WD) (Sileshi, 2014). Allometric equations can be developed for a single species or multiple species; for local, regional or pantropical scales (Ketterings *et al.*, 2001; Manuri *et al.*, 2014; Maulana *et al.*, 2016). But, site and species specific allometric biomass models refer more accuracy than other models (Ketterings *et al.*, 2001; Mahmood *et al.*, 2015, 2016a; Njana *et al.*, 2016).

Allometric equations for rubber trees have been developed throughout the decades in different geographic areas using the parameters, e.g. DBH (Jia *et al.*, 2006; Tang *et al.*, 2009; Sone *et al.*, 2014; Hytonen *et al.*, 2018), the cross-sectional area of the rubber tree trunk at breast height (basal area, BA) (Schroth *et al.*, 2002), trunk circumference (girth, G) (Shorrocks *et al.*, 1965; Dey *et al.*, 1996; Wauters *et al.*, 2008), tree height (Jia *et al.*, 2006; Tang *et al.*, 2009; Sone *et al.*, 2014), crown area, and wood density (Wauters *et al.*, 2008). However, the applicability of the developed allometric biomass models can be restricted for the variability of the geographic areas (Yuen *et al.*, 2013, 2016). In Bangladesh, we have only the stem volume allometric models for *H. brasiliensis* (e.g. Islam *et al.*, 2014), which are not capable to accurately estimate the total above-ground biomass. Currently, the felling of trees from the government-owned forest lands are restricted in Bangladesh. Hence, the non-destructive method for the allometric model development is the only way to estimate biomass of trees or forests. Therefore, this

study aimed i) to develop a species-specific allometric biomass model for *H. brasiliensis* in Bangladesh ii) to evaluate the performances of the derived models in relation to the other multi-species regional and commonly used pan-tropical biomass models.

Material and Methods

Description of the study area

Hevea brasiliensis planted in the Hill and Sal zones, which are located in northeastern and southeastern hilly forest areas, and central Sal forest areas of Bangladesh (Fig. 1). These forest zones fall within the tropical rainforest and tropical moist forest climate category respectively with acidic soil. Organic matter of soil found to vary from 0.15 to 3.32% (Hossain *et al.*, 2014). The mean annual rainfall of the Hill and Sal zones is 2720 mm and 2040 mm respectively, while the mean annual temperature of these zones is 18.4 and 26.3 °C respectively (BFD, 2016a).

Development of allometric biomass models

Biomass Expansion Factor (BEF) : Twenty trees of *H. brasiliensis* were sampled purposively from the study area to cover a range of Diameter at Breast Height (DBH) and Total Height (TH) of 12 to 60 cm and 8 to 25 m respectively. The sampled trees were climbed and the base diameter of all smaller branches (diameter < 7 cm) was measured using diameter tape or tree caliper where appropriate. The stem and the bigger branches (diameter > 7 cm) were marked into suitable sections. The diameter at the thicker and thinner ends of each log section and the length each log section were measured to estimate their volume using Smalian's formula (Equation 1). Finally, the volumes of each log section were summed to get the total volume of that particular sampled tree (Picard *et al.*, 2015; Mahmood *et al.*, 2019). Biomass of stem and bigger branches of the sampled trees were measured from their volume and the wood density value (492 kg/m³, Zanne *et al.*, 2009). The density of wood and bark of stem and bigger branches vary from the base to the top of a tree. Moreover, wood density also varies from the periphery to the pith of the stem and bigger branch (Picard *et al.*, 2012). Biomass estimation of this study did not consider the bark density as well as variations in wood density. Therefore, this estimation has some uncertainty in biomass calculation. The biomass of smaller branches of each smaller tree was estimated from the branch allometric models derived by Mahmood *et al.* (2019) (Table 1).

Table 1: Allometric models for leaf, leaf containing smaller branches (LCB) and woody part of smaller branches of *Hevea brasiliensis* of Bangladesh (Source: Mahmood *et al.*, 2019)

Allometric model	CF
Ln (Leaf) = -3.1346 + 1.4186*Ln (Base dia)	1.1059
Ln (LCB) = -3.3129 + 1.4186*Ln (Base dia)	1.1059
Ln (Woody part) = -2.6717 + 2.3207*Ln (Base dia)	1.0568

Note: CF= correction factor

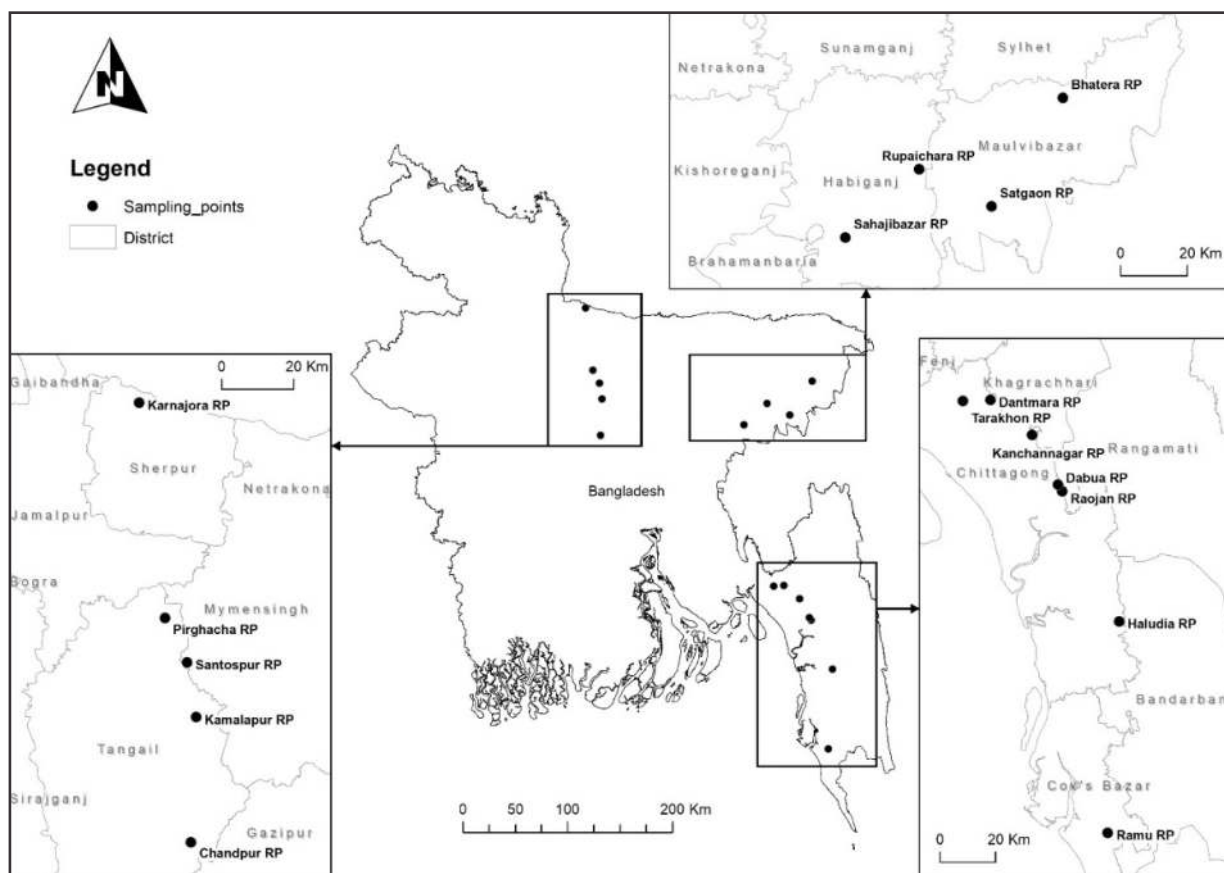


Fig. 1: Map of the study area

$$\text{Smalian's formula (V)} = \frac{\pi L (D_1^2 + D_2^2)}{8} \text{ ----- Equation 1}$$

Where, V = volume in m³, $\pi = 3.143$, L = Length of the log section (m), D_1^2 = Diameter at the thicker end (m), D_2^2 = Diameter at the thinner end (m)

Biomass expansion factor (BEF) of individual sampled tree was calculated according to Taeroe *et al.* (2015), where a ratio was obtained from the total aboveground biomass (TAGB) and stem biomass of a tree as follows (Equation 2).

$$\text{BEF} = \frac{\text{Total above - ground biomass}}{\text{Oven - dry stem biomass}} \text{ ----- Equation 2}$$

Five models ($\text{BEF} = a \cdot D^b$), $\text{BEF} = a \cdot (D/H)^b$, $\text{BEF} = a \cdot a \cdot (D^2/H)^b$, $\text{BEF} = a \cdot (H/D)^b$ and $\text{BEF} = a \cdot (H/D^2)^b$; Where D = Diameter at breast height, H = Total height) related to tree dimensions were used to derive BEF models according to Sanquetta *et al.* (2011) and Longuetaud *et al.* (2013). The best-fit model of BEF was selected by considering the lower value of Akaike Information Criterion (AIC) and Root Mean Square Error (RMSE) value of each model (Longuetaud *et al.*, 2013).

Allometric equation

Stem volume (excluding the bigger branch) raw data of 583 individuals *H. brasiliensis* was used for this study, which was utilized to develop volume tables by Bangladesh Forest Research Institute. The ranges of DBH and total height were 0.1 to 0.64 m and 7 to 27 m respectively (Islam *et al.*, 2014). Stem biomass (kg) of the individual sampled tree was estimated from the stem volume (m³) and wood density (492 kg/m³) value as derived by Zanne *et al.* (2009). Total above-ground biomass (TAGB) of individual trees was estimated from the stem biomass and the derived best fit BEF model (Soares and Tome, 2012). This method of biomass estimation has uncertainties related to use of overall wood density and tree specific BEF model (Njana *et al.*, 2016; Njana, 2017). Moreover, variation in wood and bark density of the stem and bigger branches were not considered. It is expected that about 10 to 16% of overestimation in biomass can be associated at the stand level compared to the destructive method as stated by Njana (2017). The total data set (583 individuals) was divided into Data Set A and B. The Data Set B contained randomly selected 90 individuals for model comparison, while Data Set A contained rest of the 493 individuals to derive the allometric model.

The independent variables (D = Diameter at Breast Height, H = Total height) and dependent variables (stem biomass and TAGB) were transformed to Ln (natural logarithm) to improve the linearity and homoscedasticity. A total of four allometric models (Ln (Biomass) = $a + b \cdot \text{Ln}(D)$; Ln (Biomass) = $a + b \cdot \text{Ln}(H)$; Ln (Biomass) = $a + b \cdot \text{Ln}(D^2 \cdot H)$ and Ln (Biomass) = $a + b \cdot \text{Ln}(D) + c \cdot \text{Ln}(H)$) were tested to derive the best fit allometric model for stem and total above-ground biomass. A correction factor (CF) was calculated for each equation to minimize the systematic bias during the back transformation of the natural logarithm to biomass value (Sprugel, 1983). The model having the lowest Akaike Information Criterion (AIC), Residual Standard Error (RSE) and Root Mean Square Error (RMSE); and the highest coefficient of determination (R^2) values was considered as best fit model (Sileshi, 2014; Picard *et al.*, 2015; Mahmood *et al.*, 2016b, 2019). Data analysis was done using R 3.6.0 statistical software.

Model comparison

The derived TAGB models were compared and evaluated with the frequently used regional and pan-tropical (Brown, 1997; Brown *et al.*, 1989; Chave *et al.*, 2005, 2014; Mahmood *et al.*, 2019), and species-specific models (Sone *et al.*, 2014; Brahma *et al.*, 2017; Yang *et al.*, 2017). Data set B was used in this comparison in terms of Model Prediction Error (MEP), Model Efficiency (ME), and Root Mean Square Error (RMSE) (Equation 3 to 5) (Mayer and Butler, 1993).

$$\text{MPE (\%)} = \frac{100}{n} \times \sum \left[\frac{(Y_p - Y_o)}{Y_o} \right] \text{----- Equation 3}$$

$$\text{ME} = 1 - \left[\frac{\sum (Y_o - Y_p)^2}{\sum (Y_o - \bar{Y})^2} \right] \text{----- Equation 4}$$

$$\text{RMSE (\%)} = 100 \times \sqrt{\frac{1}{n} \sum_{i=1}^n (Y_p - Y_o)^2} \text{----- Equation 5}$$

Where, n = Number of trees, Y_p = Predicted biomass from model, Y_o = Observed biomass in field measurement and $\bar{Y}$ = Mean of the observed biomass

Results

Biomass Expansion Factor (BEF)

Estimation of biomass from stem volume and wood density generally requires the application of a biomass expansion factor (BEF) or biomass equations to obtain the aboveground and total biomass. Five models were tested and the best-fit model ($\text{BEF} = 24.872 \cdot D^{0.765}$) of BEF was selected having the lowest value of AIC (7.6700) and RMSE (0.240) and highest R^2 (0.557) value (Table 2).

Allometric equation

A total of four allometric models were tested to derive best fit models for both stem biomass and TAGB. Model 4 ($\text{Ln}(\text{Stem biomass}) = -2.476 + 1.655 \cdot \text{Ln}(D) + 0.746 \cdot \text{Ln}(H)$) was the best-fit allometric model for stem biomass compared to its close competitor Model 3 with the 2nd lowest value of AIC (-485.199) and

Table 2: Best fit model for Biomass Expansion Factor (BEF)

Models	a	b	Adjusted R^2	AIC	RMSE
*BEF = $a \cdot D^b$	24.872	-0.765	0.557	7.670	0.240
BEF = $a \cdot (D^2)^b$	24.958	-0.383	0.557	7.669	0.240
BEF = $a \cdot (D/H)^b$	3.971	-0.746	0.169	13.433	0.329
BEF = $a \cdot (D^2/H)^b$	11.792	-0.423	0.492	7.461	0.257
BEF = $a \cdot (H/D)^b$	3.967	0.745	0.170	13.445	0.329
BEF = $a \cdot (H/D^2)^b$	10.194	0.388	0.490	8.597	0.257

Note: 'a' and 'b' = regression co-efficient, R^2 = Coefficient of determination, AIC = Akaike Information Criterion and RMSE = Root Mean Square Error

Table 3: Best fit model for stem biomass

Models No.	Models	a	b	c	Adjusted R^2	RSE	AIC	RMSE	CF
1	$\text{Ln}(\text{Stem biomass}) = a + b \cdot \text{Ln}(D)$	-1.398	1.954		0.950	0.207	-151.788	0.009	1.022
2	$\text{Ln}(\text{Stem biomass}) = a + \text{Ln}(H)$	-2.466	2.702		0.616	0.572	852.508	0.026	1.178
3	$\text{Ln}(\text{Stem biomass}) = a + b \cdot \text{Ln}(D^2H)$	-2.555	0.812		0.974	0.148	-483.353	0.007	1.011
4	* $\text{Ln}(\text{Stem biomass}) = a + \text{Ln}(D) + \text{Ln}(H)$	-2.476	1.655	0.746	0.975	0.147	-485.199	0.007	1.011

Note: 'a', 'b' and 'c' = regression co-efficient, R^2 = Coefficient of determination, RSE = Residual Standard Error, AIC = Akaike Information Criterion, RMSE = Root Mean Square Error, CF = Correction factor

Table 4: Best fit model for Total above ground biomass (TAGB)

Models No.	Models	a	b	c	Adjusted R^2	RSE	AIC	RMSE	CF
1	$\text{Ln}(\text{TAGB}) = a + b \cdot \text{Ln}(D)$	1.816	1.189		0.875	0.207	-151.517	0.009	1.022
2	$\text{Ln}(\text{TAGB}) = a + \text{Ln}(H)$	0.743	1.798		0.678	0.332	314.892	0.015	1.057
3	$\text{Ln}(\text{TAGB}) = a + b \cdot \text{Ln}(D^2H)$	1.031	0.503		0.930	0.155	-436.763	0.007	1.012
4	* $\text{Ln}(\text{TAGB}) = a + \text{Ln}(D) + \text{Ln}(H)$	0.738	0.890	0.746	0.937	0.147	-484.811	0.007	1.011

Note: 'a', 'b' and 'c' = regression co-efficient, R^2 = Coefficient of determination, RSE = Residual Standard Error, AIC = Akaike Information Criterion, RMSE = Root Mean Square Error, CF = Correction factor

lowest RSE (0.147); and highest value of adjusted R^2 (0.985) (Table 3). Similarly, Model 4 ($\ln(\text{TAGB}) = 0.738 + 0.890 \cdot \ln(D) + 0.746 \cdot \ln(H)$) was the best fit allometric TAGB model with 2nd lowest value of AIC (-484.811) and lowest RSE (0.147); and highest value of adjusted R^2 (0.937) compared to the closest one Model 3 (Table 4).

TAGB model comparison

Nine regional and pan-tropical biomass models were compared with the four TAGB models of this study. The best-fit Model 4 showed higher model efficiency value (0.884 close to reference value 1) compared to the other models of this study and the frequently used regional, pantropical, and species-specific (*H. brasiliensis*) models developed for Indonesia, China, and India. Similarly, the lowest values of MEP (1.661%) and RMSE (6333.332) was observed for the best fit TAGB model (Table 5).

Discussion

Selection and proper analysis of authentic parameters are the prerequisite of appropriate allometric biomass models selection that directly leads the accuracy in biomass estimation (Sileshi, 2014; Birigazzi *et al.*, 2015; Mahmood *et al.*, 2016a; Nam *et al.*, 2016). The present study tested linear regression equations, where the independent variables (D = Diameter at Breast Height, H = Total height) and dependent variables (stem biomass and TAGB) were transformed to $\ln$ (natural logarithm) to get best-fitted one for stem biomass and TAGB estimation. The best fit models for the biomass expansion factor, stem biomass, and TAGB are selected considering the parameters; such as R^2 value, RSE, AIC, RMSE and CF (Correction Factor) (West and Wells, 1990; Zar, 1996; Parresol, 1999; Jarayaman, 1999). Allometric biomass models usually include Wood Density (W), stem diameter (D), and tree height (H) as predictor variables (Picard *et*

al., 2015). Wood density along with D and H usually capture the variabilities of different tree species for the development of a common allometric model (Ketterings *et al.*, 2001; Chave *et al.*, 2005; Mahmood *et al.*, 2019). Our study showed that D and H as independent variables have increased the efficiency of model selection parameters during the selection of the best-fit model for stem biomass and TAGB. Biomass allometric models with Das a single predictor variable is more convenient in the field measurement and biomass estimation (Chave *et al.*, 2014). But, D as a single predictor variable of this study has shown lower efficiency for the model selection parameters.

Allometric equations provide an accurate estimation of biomass with some limitations of application in different geographic areas. Such limitations become a concern of researchers when the results showed a greater variability by comparing different local, regional and pantropical allometric models (Basuki *et al.*, 2009; Kenzo *et al.*, 2009; Alvarez *et al.*, 2012; Ngomanda *et al.*, 2014; Manuri *et al.*, 2014; Maulana *et al.*, 2016; Nam *et al.*, 2016). The best fit TAGB model of *H. brasiliensis* has shown wide variation in estimating biomass compared to the eight regional, pan-tropical, and species-specific models for Indonesia and China. Model Prediction Error (MEP) indicates that all the regional and pan-tropical biomass models overestimated the biomass of the sampled trees of *H. brasiliensis*. The variation in estimated biomass may be due to the differences in tree species, climatic conditions, site conditions, forest types with its composition and management practices which ultimately influence the architecture of tree and biomass partitioning (Mugasha *et al.*, 2016; Nam *et al.*, 2016). So, it is recommended to check the range of variation in using regional or pan-tropical allometric models to estimate the biomass of trees and forests (Mahmood *et al.*, 2019). While the biomass model of *H. brasiliensis* for India e.g. Brahma

Table 5: Model comparison for Total Above-ground Biomass (TAGB)

Source	Equation	Type	MPE (%)	ME	RMSE
Best fit	$\text{TAGB} = \exp(1.816 + 1.189 \cdot \ln(D))$	This study	3.041	0.786	8602.534
	$\text{TAGB} = \exp(0.743 + 1.798 \cdot \ln(H))$	This study	4.068	0.522	12862.981
	$\text{TAGB} = \exp(1.031 + 0.505 \cdot \ln(D^2H))$	This study	4.170	0.866	6798.635
	$\text{TAGB} = \exp(0.738 + 0.890 \cdot \ln(D) + 0.746 \cdot \ln(H))$	This study	1.661	0.884	6333.332
Mahmood <i>et al.</i> (2019a)	$\text{TAGB} = \exp(-6.6937 + 0.809 \cdot \ln(D^2H^2W))$	Hill zone, Bangladesh	26.164	-0.963	26599.617
Brown (1997)	$\text{TAGB} = \exp(-2.134 + 2.5430 \cdot \ln(D))$	Pan-tropical	109.892	-22.666	92369.199
Nelson <i>et al.</i> (1999)	$\text{TAGB} = \exp(-1.8985 + 2.1569 \cdot \ln(D) + 0.3888 \cdot \ln(H) + 0.7218 \cdot \ln(W))$	Central amazon	21.512	-2.230	34127.076
Chave <i>et al.</i> (2005)	$\text{TAGB} = \text{WD} \cdot \exp(-1.499 + 2.148 \cdot \ln(D) + 0.207 \cdot (\ln(D))^2 - 0.0281 \cdot (\ln(D))^3)$	Pan-tropical	83.069	-15.201	76425.808
Brown <i>et al.</i> (1989)	$\text{TAGB} = \exp(-2.4090 + 0.9522 \cdot \ln(D^2H^2W))$	Pan-tropical	25.397	-2.354	34775.542
Chave <i>et al.</i> (2014)	$\text{TAGB} = \exp(-2.6986 + 0.976 \cdot \ln(D^2H^2W))$	Pan-tropical	16.670	-1.784	31682.160
Sone <i>et al.</i> (2014)	$\text{TAGB} = 0.144 \cdot D^2.40$	<i>Hevea brasiliensis</i> Sumatra, Indonesia	53.771	-7.307	54725.826
Yang <i>et al.</i> (2017)	$\text{TAGB} = 0.0419 \cdot D^2.316 \cdot H^0.478$	<i>Hevea brasiliensis</i> Sub-tropical China	27.939	-4.011	42505.405
Brahma <i>et al.</i> (2017)	$\text{AGB} = (\exp(-3.31 + 0.95(\ln(D^2H^2W))) \cdot 1.02$	<i>Hevea brasiliensis</i> India	-0.115	-0.353	22085.077

Note: MEP = Model prediction error, ME = Model Efficiency and RMSE = Root Mean Square Error

et al. (2017) showed smaller under estimation in biomass calculation. Brahma *et al.* (2017) followed a destructive method to derive the allometric model. The climatic and geographical conditions of the study area of Brahma *et al.* (2017) and the present study sites are almost similar. So, the closeness of the allometric model of Brahma *et al.* (2017) and the best-fit TAGB model in terms of MPE, ME and RMSE values may indicate that present best-fit TAGB model derived from the non-destructive method can efficiently estimate the biomass of *H. brasiliensis* in Bangladesh.

Conclusion

The inclusion of total height (H) along with diameter at breast height (D) has increase the model efficiency. The derived allometric biomass models using non-destructive method are capable to estimate the biomass of stem and total above-ground biomass (TAGB) of *H. brasiliensis* at a higher accuracy compared to the frequently used regional or pan-tropical biomass models. Finally, species-specific allometric biomass models are recommended to estimate the biomass of any particular species.

बंगलादेश के हीवीया ब्रेसिलेन्सिस मूल. अर्ग. रोपण के लिए
एलोमेट्रिक जैवमात्रा मॉडलों का विकास: एक गैर विनाशक एप्रोच

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एवं हेनरी मतीयू

सारांश

हीवीया ब्रेसिलेन्सिस मूल: अर्ग बंगलादेश में विदेशज है। घरेलू मॉग को पूरा करने के लिए प्राकृतिक रबड़ के उत्पादन हेतु सरकारी और निजी सेक्टर के अन्तर्गत बड़े पैमाने पर रोपण स्थापित किए गए हैं। अपनी तेज वृद्धि प्रकृति के कारण अन्य प्रजातियों की तुलना में यह प्रजाति उच्च कार्बन का पृथक्करण कर सकती है। जलवायु परिवर्तन परिणामों के न्यूनीकरण उपाय के रूप में आर्थिक और पर्यावरणीय दोनों लाभों के लिए निकट भविष्य में इस प्रजाति को अधिक प्रोत्साहित किए जाने की आशा है। जैवमात्रा और कार्बन स्टकिंग के आकलन के लिए एलोमेट्रिक जैवमात्रा मॉडल महत्वपूर्ण हैं। बंगलादेश में हीवीया ब्रेसिलेन्सिस के लिए एलोमेट्रिक जैवमात्रा मॉडलों को व्युत्पन्न करने हेतु एक गैर-विनाशक विधि अपनाई गई है। कुल भूक्यूपरिक जैवमात्रा का आकलन करने के लिए हीवीया ब्रेसिलेन्सिस वृक्षों के 583 एकलों के तना आयतन और जैवमात्रा विस्तार कारक का उपयोग किया गया। तना और कुल भूक्यूपरिक जैवमात्रा के लिए सर्वोत्तम उपयुक्त जैवमात्रा मॉडलों को व्युत्पन्न करने हेतु प्राकृतिक लागरेथम के साथ कुल चार एलोमेट्रिक समीकरणों की जाँच की गई। जबकि जैवमात्रा विस्तार कारक के मॉडल व्युत्पन्न करने के लिए पाँच मॉडलों की जाँच की गई। जैवमात्रा विस्तार कारक (बी ई एफ) के सर्वोत्तम उपयुक्त मॉडल के रूप में बी ई एफ = $24.872 \cdot D^{0.765}$

चयन किया गया तथापि, तना और कुल भूक्यूपरिक जैवमात्रा के लिए एलोमेट्रिक मॉडल क्रमशः $\ln(\text{तना जैवमात्रा}) = -2.476 + 1.655 \cdot \ln(D) + 0.746 \cdot \ln(H)$ और $\ln(\text{TAGB}) = 0.738 + 0.890 \cdot \ln(D) + 0.746 \cdot \ln(H)$ थे। सर्वोत्तम-फिट कुल भूक्यूपरिक जैवमात्रा (टी ए जी बी) मॉडल ने मॉडल भविष्यकथन त्रुटि (एम पी ई), मॉडल क्षमता (एम ई) के संदर्भ में आमतौर पर प्रयुक्त क्षेत्रीय, पैर-उष्णकटिबंधीय और प्रजाति विशेष जैवमात्रा मॉडलों की तुलना में जैवमात्रा आकलन में उच्चतम क्षमता को दर्शाया।

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