CONSTRUCTION OF A PRECISE GROWTH MODEL TO PREDICT THE NDIVIDUAL STEM VOLUME OF *Alstonia macrophylla* WALL. EX G. DON

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In order to reduce the pressure on existing Natural Forests in Sri Lanka, Forest Department promoted growing timber species as plantations and in home gardens. Among the suggested species *Alstonia macrophylla* (Hawarinuga) has recently become popular due to its fast growth rate, ease of establishment and timber value. There are about 1913 ha extent of *Alstonia macrophylla* plantations at the end of the year 1998 maintained by the Forest Department of Sri Lanka. However, this figure must be higher than that because many other private organizations are establishing *Alstonia macrophylla* plantations in the wet zone in large scale. This species is also grown in home gardens, alleys and borders as non-blocks (non-plantations).

However, at present there is no method at present for estimating the stem volume of this species, which is considered as the most important variable in commercial forestry. Therefore a mathematical model was constructed in this study to predict the individual stem volume of *Alstonia macrophylla* trees grown in plantations.

Since *Alstonia macrophylla* is widely found in wet zone of Sri Lanka, study sites were selected from Galle (two even-aged plantations from Pituwala and Wattehena Beats) districts. The ages of these plantations were 19 and 16 respectively. Ten 0.02 ha circular plots with slope correction were randomly laid out for each plantation, in order to measure the necessary parameters from the individual trees. Diameter at breast height (dbh), total height and height to the crown base of all the trees inside the plots were measured. Newton's formula was used in this research because it is the most accurate method. In order to calculate the volume using the Newton's formula, the stem of each tree was hypothetically divided into 4 -5 sections. Then the bottom, mid and top diameters and section lengths were measured using Speigal Relascope and Blume Leiss Altimeter respectively. The final section of the tree was assumed as a cone and only the bottom diameter and height were used in that particular section. The total volume of each section was estimated by adding the section volumes calculated using Newton's formula to the volume of the final section.

First a theoretical model structure was developed using the relationship of form factor with volume, height and area at the base. Regression analysis was used to fit the data into the model. Untransformed as well as transformed combinations of all variables were tested. In this procedure the combined variable (*basal area * tree height*) was always kept as the first explanatory variable. After trying with many combinations of selected variables with volume, final model was selected using its compatibility with the real world, R^2 values, and residual distributions, model bias value and modeling efficiency. The selected models at the preliminary stage indicated very high performance and insignificant bias. In order to select a final one, the above models were validated with a new set of data. The final selected model in this study to predict the individual stem volume with insignificant bias of *Alstonia macrophylla* is; $\sqrt{v} = 0.659 \log BA*Ht + 0.00404 \sqrt{Cr\ ht}$