CONSTRUCTION OF A GROWTH MODEL TO PREDICT THE INDIVIDUAL STEM VOLUME OF *Eucalyptus grandis* HILL EX MAIDEN (TOOLUR) IN SRI LANKA

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Toolur (*Eucalyptus grandis* Hill ex Maiden) belongs to family Myrtaceae has been planted widely in the hill country of Sri Lanka for high quality timber and fuel wood. For the present study a growth model was constructed to predict the total stem volume of individual toolur trees. Data were obtained using temporally sampled plots from the tree plantations in Badulla forest division and 6 plantations in Nuwara-Eliya forest division.

Data were first partitioned according to the quality of the site. An index developed using a top height / plantation age was used for site classification and three significantly different sites could be identified. In order to construct the model, 75% of sample plots from each plantation was used and the rest was reserved for the purpose of validating the constructed model with independent data.

The basic model structure was developed using the relationship between volume and form factor, basal area and total height. Form factor is difficult to measure because it varies with age, site quality, density etc. even for the same species. Therefore keeping the other two variables, it was tried to replace the form factor using other explanatory variables, which can be measured easily.

All possible combinations of the explanatory variables were tested in order to obtain the best models. The performance of the models was observed using statistical tests and standard residual distributions. For the selected models, the intercept was not significantly different from zero and number of trees per hectare and total basal area tested to represent the stand density was also not significant.

After selecting the four suitable models at the first stage, the possibility of using one set of parameters instead of separate parameters sets for different site types was tested. First the parameters were estimated for the pooled data. Using the resulted models, normal residuals were calculated separately for three site types. Then the significance of the residuals was tested using analysis of variance for select the final model with common set of parameters. A selected model contained basal area and total height of individual trees and a site quality factor as explanatory variables. It was then compared directly with the particular observed values. After all the tests, the results indicated that the model constructed in this study proved its strength on predicting the total volume of individual stems precisely because it indicated a very low bias and a high modeling efficiency of over 0.09.

The resultant model which can be used to predict the individual toolur stem volume for all site types is:

$$(Volume)^{1/2} = 0.5946*(basal\ area\ *\ total\ height)^{1/2} + 0.0356*(total\ basal\ area\ /\ top\ height).$$