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Construction of a model to predict stem carbon of *Eucalyptus grandis* Wall ex. Maiden grown in upcountry, Sri Lanka

A M H L Aththanayake,[1] W A R T W Bandara[1]* and W M P S B Wahala[2]

[1]*Department of Zoology and Environmental management, Faculty of Science, University of Kelaniya, Kelaniya*
[2]*Department of Tourism Management, Sabaragamuwa University of Sri Lanka, Belihul Oya*

Eucalyptus grandis is an important timber species in plantation forestry in Sri Lanka. *E. grandis* was selected for this study, assuming that maintaining of *E. grandis* plantations for carbon trading projects would provide an additional market value for this species with the current interest on global climate change mitigation, as forest plantations play an important role in carbon sequestration and carbon trading. However, there is no proper mechanism to estimate the amount of sequestered carbon in *E. grandis* stems. The primary objective of this study was to construct a precise model to predict stem carbon content of *E. grandis* individuals with the intention of calculating the value addition for *E. grandis* timber. To collect data, four study sites were selected from Nuwara Eliya (Kandapola and Bogawanthalawa), Badulla (Haputhale) and Ratnapura (Pinnawala) Districts to represent upcountry, intermediate zone and wet zone where *E. grandis* is confined to. Each plantation was divided into three strata and a 0.05 ha circular sample plot was laid out in each stratum. Each individual in the plot was measured for total tree height, canopy height and diameter at breast height. Plantation age was recorded from FORDATA database of Forest Department of Sri Lanka. Core sample from the stem at breast height was extracted and carbon content was calculated using loss-on-ignition method by oven-drying at 105 ^{o}C and igniting at 450 ^{o}C. The carbon content in the stem was estimated by aggregating this value. Simple linear regression method was used in model construction using MINITAB statistical package. The selected explanatory variables for the model construction were tree diameter at breast height (DBH) and total tree height (TTH) of individuals. The constructed model to predict stem carbon content of *Eucalyptus grandis* is;

log Carbon content of the stem = - 2.88 + 2.19 log DBH + 1.40 log TTH

The final model is able to predict the stem carbon content of *E. grandis* up to 98% reliability. According to model validation, the model could be used in the real world. Results of comparison of actual, predicted and assumed carbon content showed that there is a significant difference between the three methods (P=0.001). The assumed carbon content, obtained assuming 50% of the biomass is carbon, is significantly different from actual carbon content obtained by laboratory experiment and predicted carbon content, obtained by the constructed model. However, there is no significant difference between actual carbon content and carbon content predicted using the model. A majority (86%) of the collected samples contained a greater stem carbon content than the assumption that 50% of the biomass is carbon. These results indicate that use of the constructed model to predict stem carbon content of *E. grandis* will provide more precise results than the 50% assumption which is in practice at present.

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rangika@kln.ac.lk Tel: +94 112914479/ +94 112806197/ +94 71041528