

Relationships between crown size and aboveground biomass of oil palms: An evaluation of allometric models

Abstract

Oil palms (OP) in Sabah, Malaysia were studied to explore the relationship between canopy size and aboveground biomass (AGB). Four available allometric equations were used to calculate the dry AGB. Pearson's correlation analysis was performed between crown diameter (CD) and crown area (CA) towards the variables of AGB, height and dbh. In this analysis, the transformation to natural log of variable resulted in better coefficient compared to the original one. The mean of various variables such as height (stem, total and height difference), biomass (crown, trunk and total), dbh (inner and outer) and number of petiole leaf were calculated based on 32 independent sample plots (N = 222 palms) across various age stages from 2 to 24 years. These variables were regressed against CD and age. AGB versus CD was a nonlinear with R² ranging from 0.950 to 0.975. Random modelling and cross validation between AGB and CD was applied at the ratio of 70:30. Upon checking, the best estimation was achieved by using the allometric equation based on total height due to the lowest relative root mean square error (RMSE) (18.5%) and the least fluctuation between predicted and actual AGB. The other three models had relative RMSE that ranged between 23.9 and 68.8%. This study shows that AGB can be estimated using CD of OP consistently at all ages.