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ASSESSMENT OF FOREST ABOVEGROUND BIOMASS ESTIMATION FROM SUPERVIEW-1 SATELLITE IMAGE USING MACHINE LEARNING APPROACHES

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AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Estimating forest biomass in a small-scale forest area is more accurate as it depends on actual field measurements. However, measuring the field to estimate forest biomass in a large region is not feasible because it is labour intensive, a lengthy process and expensive. Therefore, this study aimed (i) to classify the forest aboveground biomass by estimating crown projection area using object-based image analysis (OBIA) and (ii) to determine the accuracy assessment for estimating forest aboveground biomass using an artificial neural network (ANN) and Random Forest (RF). Object-based image analysis (OBIA) is one of the methods designed to classify the satellite image using multiresolution segmentation to obtain the value of the crown projection area (CPA). In contrast, machine learning is used to calculate the accuracy assessment of dependent between independent variables. A combination of approaches has been tested to estimate the forest's aboveground biomass and carbon stock for Selangor's terrestrial ecosystem environment. The result shows the goodness of fit for the distance index (D) was 0.040. The total accuracy for 30 reference polygons was 96.6% and 96% for the total accuracy for distance index (D). The statistical values for min, max, mean, and standard deviation of carbon stock (kg/tree) were 4.891, 196.250, 101.142, and 46.340. The Random Forest algorithm was the best algorithm compared to the artificial neural network, which produced the highest R^2 (0.998) and lowered RSME (55.067). The suitable independent variables (hL, DBH, and CPA) were vital to estimating the dependent variable (Sc) and producing a carbon stock map for the final result. The significant of this study is to prove that the application of object-based image analysis classification and machine learning algorithms for forest aboveground biomass and carbon stock estimation has excellent potential for the future management of forests to maintain their existence and growth.

Keyword: Carbon Stock, Object-Based Image Analysis (OBIA), Artificial Neural Network (ANN) and Random Forest (RF)

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