Estimating Acacia mangium Plantation's Standing Timber Volume Using an Airborne Hyperspectral Imaging System

ABSTRACT

Individual tree mapping in the forest is usually done by several techniques such as the sequential target and point origin mapping. Generally, the estimation of standing timber volume operation is considered a difficult task as ground survey is expensive. Most of this task is being done on the ground and takes a lot of time to be accomplished. However, the use of airborne remote sensing such as the UPM-APSB's Airborne Imaging Spectrometers for Applications (AISA) that plays its part in Global Positioning System (GPS) could change the way on how tree mapping and standing timber volume estimation are done. The general objective of this study is to map the individual wild A. mangium trees and estimate their standing timber volume using the airborne hyperspectral imaging technique. The specific objectives were to assess the capability of UPM-APSB's AISA airborne hyperspectral data in mapping A. mangium plantation and estimate its standing timber volume by delineating the individual trees crown areas. The hyperspectral image of A. mangium plantation in Lebuh Silikon, UPM in ENVI (.img) format taken on February 2004 was enhanced using the ENVI software. The age of the A. mangium stand was about 30 years old. Results indicated the presence of 29 canopies of A. mangium trees over a 0.8 ha plot. A single crown or canopy represented a single tree. A set of simple linear regression model for predicting volume from the crown area was developed using the 29 samples of tree crown. The value for r2 was 0.801 for this fit of the model, which showed 80.1% erratum data could be evaded. The equation developed in this study was V = 0.1045 + 0.0111(CA) where it provided a mean for predicting volume from the crown size measurement using the airborne sensor. The total standing timber volume mapped and quantified by the UPM-APSB's for the study site of 0.8 ha A. mangium plantation was about 20.73 m3 with a mapping accuracy of 80.45%. In practice, users of airborne hyperspectral data can now predict the timber volume by measuring tree crown size using ENVI software and apply the appropriate equation developed from linear regression as the indirect method of timber volume estimation. Further work in this area is to estimate the above ground biomass, carbon sequestration and biodiversity of planted A. mangium plantations in Malaysia.