UNIVERSITI TEKNOLOGI MARA

ALOS L-BAND SAR PARAMETERIZATION ANALYSIS FOR *HEVEA BRASILIENSIS* ABOVEGROUND BIOMASS ESTIMATION AND MODELLING

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Thesis submitted in fulfilment
of the requirements for the degree of
Doctor of Philosophy
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AUTHOR'S DECLARATION

I declare that the work in this thesis 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

Biomass is an important element in monitoring and management of climate change mitigation. There have many methods to estimate aboveground biomass of vegetation including destructive sampling and remote sensing methods. Destructive sampling is believed to obtain an accurate result of aboveground biomass but it suits for small area, tedious work, more cost and man power needed. Thus, microwave remote sensing is a remote sensing technology that penetrate the radar signal to earth surface and record the total amount of energy to the sensor and this technology has a potential to estimate aboveground biomass (AGB) and carbon stock of rubber tree plantations. The limitation of optical data has led the researcher to investigate the L-band Synthetic Aperture Radar (SAR) of Horizontal-Horizontal (HH) and Horizontal-Vertical (HV) polarization with AGB of rubber trees. This study was carried out to estimate the total amount of AGB of rubber tree plantations by using ALOS-2 PALSAR remotely sensed data in two rubber estates own by RRIM that are Permatang and Pelepah estates. A total of 80 sampling plots have been established in these rubber estates. The area of both Permatang and Pelepah estates is around 132.8 ha. Backcatter coefficient value was determined using Normalized Radar Cross Section (NRCS) equation and was correlated with field data sampling. The result demonstrated that the backscatter saturate at around AGB of 10 Mg ha^{-1}. Kernel size of 5x5 indicated as an ideal size for filtering process for both HH and HV polarizations images. Brown's equation represent the most reliable allometric equation for estimating AGB of rubber trees in the study area. By using linear exponential regression (Model 1), AGB can be estimated as AGB (Mg ha^{-1}) =278.6*exp(0.073512 *HV5x5) with RMSE of ±92.90 and accuracy at 74.53%. AGB also can be estimated by using multivariate regression (Model 2), which can expressed as AGB (Mg ha^{-1}) = 160.8+5.52 HH5x5 + 1.10 HV5x5 with RMSE of ±90.46 and accuracy at 73.39%. The study provided new information about the AGB of rubber trees that is important for the rubber plantation industry in Malaysia. This research can also contribute to the effective monitoring and management in the future.

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