



UNIVERSITI
TEKNOLOGI
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Institut
Pengajian
Siswazah

THE DOCTORAL RESEARCH ABSTRACTS

TWELFTH
ISSUE

Volume: 12, Issue 12

October 2017

IGS Biannual Publication



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Title : MODELLING AND MONITORING OF STAND VOLUME, ABOVE GROUND BIOMASS AND CARBON STOCKS OF OIL PALM (*Elaeis guineensis*) PLANTATIONS USING LANDSAT THEMATIC MAPPER IN MALAYSIA

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Oil palm (*Elaeis guineensis*) plantations play important roles in the economics and sources of income to Malaysia. Accurate and reliable information on forecasts of resource availability and contribution of oil palm plantations on global carbon cycle are needed for its management efforts and planning. The need for effective inventories and monitoring methods has prompted this research into supplementing the ground field survey with the information from satellite remote sensing for developing methods for oil palm plantation inventory. For monitoring purposes, the effective procedures were developed using three dates of Landsat Thematic Mapper (TM) imagery. Field-measured above ground biomass (AGB), stand volume and carbon stocks values from 230.8 ha of oil palm plantations were compared with individual Landsat TM bands and nine vegetation indices. The potential models selected were obtained using stepwise and backward elimination method where R^2 , adjusted R^2 , Standard Error of Estimate (SE_E), Root Mean Squared Error (RMSE) and C_p were examined in model development and validation. For stand volume, AGB and carbon stocks estimation, it was found that the most promising model provides moderately good prediction of about 62% of

the variability of the stand volume, AGB and carbon stocks with RMSE values of 14.31 m³/ha, 3.68 tonnes/ha and 1.66 tonnes/ha, respectively. In conclusion, Landsat TM offers the low cost of stand volume, AGB and carbon stock estimates and mapping of oil palm plantations with moderate accuracy in Malaysia. The combination use of a time series of Landsat TM data, post classification change detection and Geographic Information System (GIS) have provided useful tools and techniques to produce land cover/use change matrices and oil palm area change statistics which necessary in providing in-depth understanding on the general processes of changes, the factor that drives the changes in land cover/use types, and thus contributes to the good management and sustainable oil palm resources. In addition, the information from this thesis may provide useful tool for resource planners and oil palm related agencies in making resource forecasts, and assist in the development of management plan for the tree crop. The information is also useful in helping to assess the important indicators of sustainability and the way in which the resource availability vary over time.

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