Carbon Flow and Budget in a Young Mature Oil Palm Agroecosystem on Deep Tropical Peat*

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An increasing area of deep tropical peat in Sarawak, which has been logged-over, is being cultivated with oil palm, generating revenue of about US 1 billion in 2006 for much needed socio-economic development. However, there is growing concern with this development in regard to greenhouse gas emissions and loss of carbon from the peat swamp. A study was therefore undertaken to investigate the C flow and budget in a 5-year-old oil palm plantation on deep tropical peat, and to determine if this oil palm agroecosystem is a C sink or source. Results showed that the peat soil contained 3771 t C/ha while the other C pools together accounted for only 0.7 per cent of the total C in the agroecosystem. The net primary production (NPP) by the palms was 12.01 t C/ha/yr while by-products increased soil organic C by 0.3 t C/ha/yr. The measured soil respiration was 15.4 t C/ha/yr with 60 per cent loss through heterotrophic respiration resulting in a subsidence of about 1.6 cm/yr. The oil palm was neither a net C sink nor source but the export of FFB without by-product utilisation will cause a negative C balance of 2.01 t C/ha/yr.

***Keywords**: Carbon sequestration, dynamics, pools.*

The oil palm (*Elaeis guineensis*) is now grown widely on logged over tropical peat swamp forest in Sarawak, Malaysia. It brought much needed revenue of about US$ 1 billion in 2006 for socio-economic development of the State. Much concern has now been expressed, however, mainly by non-government organisations, on the impact of this new land development on greenhouse gas emissions and the loss of soil carbon. Globally, carbon dioxide comprises about 57 per cent of greenhouse gases and 17 per cent of it arises from converting forest to other land uses (Shukla & Chandel, 2006). Whether or not an agro-ecosystem is a net sink or source of carbon depends on the types of crop, soils, climate and cultivation practices.

Henson (1999) showed that the annual uptake of carbon dioxide by mature oil palm on coastal soil in Malaysia was 46.4 t/ha/yr with a net fixation of 11.0 t/ha/yr based on the eddy covariance technique. In this study, soil respiration was estimated to be only 28.5 t/ha/yr which was about half of that reported by Melling *et al.* (2005) for peat soils under oil palm. The difference could be explained by the higher organic carbon content in the latter work. Neither of these articles discussed the

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