Greenhouse Gas (GHG) Emission from Tropical Peatland*

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Arable land is among one of the worlds most important resources that influences a nation's wealth. In Sarawak, tropical peatland is the last frontier of arable land available for industrial agriculture development. Being the last exploited land resources, it is the least researched soil type among the tropical soils and making it the most least understood. Tropical peatlands co-existed with the tropical ecosystem are liken to mineral soils of the tropics and are quite different from temperate peats because they are formed under contrasting climatic (wet and dry seasons) and edaphic conditions. Temperate peats are mainly derived from the remains of low growing plants (Sphagnum spp., Gramineae spp. and Cyperaceae spp.) which are more cellulose in nature. Tropical peats, on the other hand, are formed from forest species and hence tend to have large amounts of undecomposed and partially decomposed logs, branches and other plant remains which are more lignified. Recently, there has been an increasing trend in oil palm cultivations on tropical peatland. Conversion of tropical peatland into oil palm plantation in South East Asia has been assumed to enhance decomposition process via peat oxidation due to drainage and water management, which leads to the raising level of greenhouse gas (GHG) emission. It has also been postulated that this process will increase in time with oil palm cultivation. However, the management has its contributing factor towards GHG emission from an oil palm plantation and its after effect of climate change due to peatland conversion. Drainage, compaction and water management formed a part of the development process for oil palm peat planting. To further understand the role of water table on soil carbon (C) flux in tropical peatland, a study on GHG from three different ecosystems on tropical peatland was commissioned i.e. oil palm plantation, secondary forest and tropical peat swamp forest for 12 months using a closed chamber method. The mean water table levels at these three ecosystems were -67.6 cm, -14.7 cm and -3.9 cm, respectively. Mean soil CH4 flux was lowest at the oil palm plantation (0.003 t CH4 halyr), followed by secondary forest (0.067 t CH4 halyr) and tropical peat swamp forest (0.179 t CH4 halyr). However, even though the mean water table levels in the three ecosystems differed by an average of 42.5 cm, the mean soil CO2 fluxes were quite similar: oil palm plantation (32.89 t CO2 halyr), secondary forest (41.10 t CO2 halyr) and tropical peat swamp forest (45.08 t CO2 halyr). These findings indicated that on tropical peatland soil CH4 flux was highly influenced by water table but not soil CO2 flux. Since the total soil CH4 flux was much lower compared with soil CO2 flux, it was concluded that water table was not the most important factor influencing the soil C flux in tropical peatland.

Keywords: Carbon flux, water table, carbon dioxide (CO), methane (CH), closed-chamber method.