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Soil Morphological and Physicochemical Properties at Reforestation Sites After Enrichment Planting of *Shorea Macrophylla* in Sampadi Forest Reserve, Sarawak, Malaysia

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ABSTRACT

Implementation of effective soil conservation management is required in order to rehabilitate and manage degraded forest land in the tropics. For the humid tropics of Sarawak, Malaysia, extensive information on the soil characteristics for rehabilitation of degraded forest lands is essential to guide future forest management programme. In this study, a preliminary assessment on the current status of the soil morphological and physicochemical properties at one of the reforestation sites in Sarawak which was established after enrichment planting of *Shorea macrophylla* in comparison to an adjacent secondary forest was conducted. The soil profiles in the study sites were established at the reforestation areas of different age stand (year 1996; SM96, 1997; SM97, 1998; SM98 and 1999; SM99) planted with *Shorea macrophylla* located in Sampadi Forest Reserve as well as existing secondary forest adjacent to the reforestation sites (secondary forest, SF). Soil profile description was conducted at each study sites and soil samples were collected from each identified soil horizon for determination of the soil physicochemical properties. The results showed that the soils in the study area consisted of mainly grey-white podzolic soils which derived from combination of sandstone, coarse-grained, humult ultisols and sandy residual parent material. According to the Sarawak Soil Classification, the morphological properties in the studied sites resemble of Bako soil series as a dominant unit in association with Saratok series in which, corresponds to Typic Paleaquults of Soil Taxonomy by USDA-NRCS Classification. The general soil physicochemical properties indicated that the soils at both reforestation sites and secondary forest were strongly acidic in nature with pH (H_2O) of less than (pH < 5.5) with low nutrient status. The acidic nature of the soils might be ascribed to the presence of high exchangeable Al which concomitantly, increased the level of Al saturation of the studied soils. Observation within each soil profiles indicated that soil acidity decreased with depth, resulting in higher pH (H_2O) at deeper horizons for all studied sites. For the soil total carbon and total nitrogen, soils at secondary forest depicted higher values in total carbon and total nitrogen at surface soils as compared to the reforestation sites which indicate large pool of organic matter at surface soil derived from the above vegetation. In terms of the soil physical properties, the soils observed were relatively of sandy texture and did not varied widely among the studied sites. In addition, the soil bulk density at reforestation sites was relatively higher than secondary forest due to higher penetration of roots and accumulation of organic matter contents in secondary forest. Based on the current progress of this study, it is recommended that determination on the soil characteristics should be taken into consideration as an important indicator prior or during the establishment of reforestation area in order to ensure the success of reforestation activity in tropical rainforests.

Keywords: Reforestation, Sarawak, *Shorea macrophylla*, soil physicochemical properties, tropical rainforests

INTRODUCTION

Tropical rainforests of Malaysia are considered as the richest and one of the most complex ecosystems in the world in terms of structure and species diversity existing among the earth ecosystems (Whitmore, 1998; FAO, 2001). According to Shukla *et al*. (1990), tropical rainforests have an outstanding prominent role and main influence in maintaining global climate change by reducing the accumulation of greenhouse gases. Although occupying only 7% of the earth's land surface, over half of the planet's life forms are found in tropical rainforests (Wilson, 1988). Tropical rainforests not only sustain biodiversity but provide homes to indigenous