

ESTIMATING SOIL FERTILITY STATUS USING SOIL QUALITY INDICES AT REFORESTATION SITES IN SAMPADI FOREST RESERVE, SARAWAK, MALAYSIA

Mugunthan Perumal^{1*}, Mohd Effendi Wasli¹ and Jonathan Lat²

¹Department of Plant Science and Environmental Ecology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

²Forest Department of Sarawak, Wisma Sumber Alam, Petra Jaya 93660 Kuching, Sarawak, Malaysia

*Corresponding author: mugunthanperumal89@gmail.com

ABSTRACT

Soil fertility status can be estimated by using appropriate soil quality indices in order to provide fundamental information on the land suitability for reforestation activities. A study was conducted to characterize the soil physicochemical properties and to clarify the current soil fertility status using soil quality index for estimating soil fertility of more than 15 years after the initiation of forest rehabilitation at Sampadi Forest Reserve, Sarawak. Study plots with the size of 75 m x 50 m were established in the reforestation areas of different age stands (planted with *Shorea macrophylla* in the year 1996; SM96, 1997; SM97, 1998; SM98 and 1999; SM99) and outside reforestation area (secondary forest, SF). Composite and undisturbed soil samples were collected at the depth of 0-10 cm (surface soils) and 30-40 cm (subsurface soils) from several random points at plots in reforested areas and secondary forest for determination of the soil physicochemical properties. The soil fertility status was evaluated and quantified using two soil indices, Soil Fertility Index (SFI) and Soil Evaluation Factor (SEF). Our findings indicated that the soils at both reforestation sites and secondary forest were strongly acidic in nature with pH (H₂O) 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. Soil organic matter in secondary forest was significantly higher than that of the reforestation sites which indicate large pool of fresh organic matter and its accumulation at surface soils derived from the above vegetation. Notwithstanding, there were significant differences observed in soil available phosphorus between the sites at both surface and subsurface soils. In terms of soil fertility status, the SFI value in SM96 was higher than all the studied sites at surface soils with 23.76. In contrast, secondary forest depicted a higher value of SEF at surface and subsurface soils with 15.16 and 10.97, respectively. However, no clear significant differences were observed in terms of SEF at surface soils for all the studied sites. Based on the current progress of this study, SFI and SEF can be used as indicators of soil quality for estimating soil fertility status in this study.

Keywords: reforestation; *Shorea macrophylla*; soil fertility status; soil fertility index; soil evaluation factor

1.0 Introduction

Tropical rainforests of Malaysia are widely known as one of the most varied and abundant assemblage of complex ecosystems in terms of structure and species diversity on the earth surface (Arifin *et al.*, 2007). In Southeast Asia, the total forested area have been destroyed at unprecedented rate by human activities and is decreasing at an alarming rate due to