

# ASSESSMENT OF FOREST REGENERATION FOLLOWING A SERIES OF DISTURBANCES IN TWO TYPES OF PRIMARY FOREST AT BUNGO RANGE, BAU, SARAWAK

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Submitted February 2020; accepted September 2020

The forest regeneration study was conducted in a mixed dipterocarp forest and a heath forest at Bungo Range, Sarawak to determine the natural regeneration status after a series of forest disturbances. The research objectives were (i) to estimate the tree diversity in mixed dipterocarp forest and heath forest and (ii) to determine the natural regeneration status of dominant tree species with potentials for reforestation. The systematic sampling method using nested plots was conducted, in which three plots were placed at mixed dipterocarp forest and four at heath forest. The species diversity in the mixed dipterocarp forest was  $H' = 3.7$  and heath forest is  $H' = 3.8$ . *Neolamarckia cadamba* was found to be the dominant timber-producing species in mixed dipterocarp forest with good regeneration. Likewise, *Litsea lancifolia* and *Calophyllum inophyllum* were the dominant timber-producing species with good regeneration in the heath forest. There was only one non-timber producing species with good regeneration, i.e. *Goniothalamus uvarioides*, from the mixed dipterocarp forest.

Keywords: Reforestation, natural regeneration, diversity index, dominant species, forest disturbance

## INTRODUCTION

Forest acts as a multi-player in maintaining the ecosystem and biodiversity balances (Chazdon & Guariguata 2016). However, extensive deforestation either by natural phenomena such as forest fire and typhoon or human activities such as extensive logging and land clearing have disrupted forest functions (Egbe et al. 2012, Zafirah et al. 2017). The largest forest destruction due to forest fire, which happened back in 1997–1998, destroyed approximately 2.4 Mha of forests in Borneo, Indonesia and Southeast Asia (Dohong et al. 2017). The forest fire incident does not always happen naturally as shown by the 1997–1998 forest fire. The fire started from open burning activities to clear lands by plantation companies in Indonesia (Dohong et al. 2017). It did not only destroy the forest but also created pollution, damaged the ecology, contributed to global warming and soil erosion (Aini et al. 2000). Besides, logging and oil palm plantation are the biggest contributors to the declining forested areas of Sarawak. As of 2009, only 20% of 122,019 km<sup>2</sup> total land area in Sarawak were still intact forests and 58% were degraded (Bryan et al. 2013).

Several initiatives such as large-scale forest plantation, Payments for Ecosystem Services (PES) and reforestation have been carried out worldwide to mitigate deforestation (Scheidel & Work 2016, Jayachandran et al. 2017). Among the listed alternatives, reforestation has proved to be the most efficient alternative to mitigate deforestation (Hashim et al. 2015). Reforestation is proved to be an effective tool in mitigating and slowing climate change, as shown in Brazil (Ciccarese et al. 2012). It also contributes to forest biodiversity protection and biomass production in Malaysia (Raihana et al. 2018). In addition, it provides many social and economic benefits such as extra income and job opportunities for the local community, and to supply timber for the wood industries, as in Brazil (World Bank 2017).

Reforestation can be categorised into two, namely, the natural regeneration and artificial regeneration (USDA 1999, Schuck et al. 2002, Chazdon & Guariguata 2016). Natural regeneration is the forest regrowth or reestablishment process after disturbance, and the success of natural regeneration is usually