BIODIVERSITAS
Volume 21, Number 5, May 2020
Pages: 1880-1889

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d210514

Assessment on the growth performance of planted *Dryobalanops beccarii* at reforestation sites after implementation of selective girdling

MOHD EFFENDI WASLI, DOUGLAS BUNGAN AMBUN, MEEKIONG KALU, MOGERET SIDI, HAFSAH NAHRAWI, HASHIMAH ELIAS

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

Manuscript received: 14 January 2020. Revision accepted: 9 April 2020.

Abstract. *Wasli ME, Ambun DB, Kalu M, Sidi M, Nahrawi H, Elias H. 2020. Assessment on the growth performance of planted* Dryobalanops beccarii *at reforestation sites after implementation of selective girdling. Biodiversitas 21: 1880-1889.* This study was conducted to evaluate the growth performance of planted *Dryobalanops beccarii* Dyer at reforestation sites after silvicultural practices in Gunung Apeng National Park (GANP), Sarawak. The assessed area was planted with *D. beccarii* in 2005 and undergo silvicultural treatment by understory clearing which implemented annually. Due to the suppressed growth rate of the planted trees, an additional silvicultural treatment, the selective girdling on selected pioneer species, was implemented once, in 2012. In this study, study plots with two treatments were established: T1: understory clearing only (control plot), and T2: additional selective girdling of existing pioneer species in addition to the understory clearing practice applied in T1. The growth performance of the planted *D. beccarii* in terms of DBH, height, survival and mean annual increments in diameter (MaiD) and height (MaiH) were assessed and monitored at the initial stage when the selective girdling treatment was applied and 4, 24, 36, 48, 60 and 72 months after girdling. Our findings showed that the survival rates of planted trees at 72 months under treatments T1 and T2 were 82.9% and 79.2%, respectively. The average tree DBH in T2 was significantly higher than that in T1, and the average tree DBH values for T1 and T2 were 7.5 cm and 9.4 cm, respectively. The average tree heights for T1 and T2 were 8.3 m and 9.2 m, respectively. In terms of the mean annual increments in height (MaiH) and diameter (MaiD), those in T2 were significantly higher than those in T1. Our findings indicated that T2 started to show better growth performance than T1 after a period of 36 months. In conclusion, the additional silvicultural treatment by selective girdling at the reforestation site had a long-term, progressive effect on the growth performance of the planted trees.

Keywords: *Dryobalanops beccarii*, growth performance, reforestation, selective girdling

INTRODUCTION

The loss of forests in Borneo has reached an alarming rate; an estimated 16.8 million ha of forest loss was reported from 1973-2010, and these losses were mainly due to extensive forest clearance to obtain forest products (Gaveau et al. 2014). This led to the destruction of habitat for flora and fauna and inevitably resulted in the loss of important medicinal plants and various climax tree species. Thus, reforesting the areas affected by these activities is essential for restoring the forest. Meanwhile, to ensure the success of the reforestation program, proper methods and techniques should be applied, such as the implementation of enrichment planting and suitable silvicultural practices. Enrichment planting is one of the methods used in attempts to supplement natural regeneration and improve the low tree growth performance observed in natural succession (Chai and Udarbe 1977; Appanah and Weinland 1993). Examples of enrichment planting, such as artificial gaps created by human intervention intended to reduce aboveground vegetation (Wyat-Smith 1963; Ådjers et al. 1995), reduce the competition between the planted tree and the adjacent bushes and shrubs. These practices can also be used to rehabilitate logged-over areas in tropical rainforests by using indigenous tree species; the process involves planting nursery-raised seedlings along a cleared line or in gaps that have been created naturally or artificially (WyatSmith 1963). In addition, Kammesheidt et al. (2003) investigated the irregular growth pattern of dipterocarps in response to competition and silviculture treatment in the lowland Mixed Dipterocarp Forest in Sarawak.

Silvicultural treatments have been widely used in logged forests to restore forests to their original conditions, or as close to the original conditions as possible (Villages et al. 2009). Many treatments can be applied, such as thinning, pruning, fertilizers, girdling, felling and others. The main purpose of applying these silvicultural methods is to control and manage the forest in a desirable manner by controlling forest change, accelerating change and maintaining the condition of the tree stands (Nyland 1996). Hence, better results can be obtained from reforestation efforts when the silvicultural treatments enhance the tree growth performance so that it is faster than that in forests without silvicultural intervention (Oliver 1992). Colin et al. (2018) reported that silvicultural practices are preferred for forest restoration purposes because they allow the direct manipulation of stand composition and structure. Even though the use of enrichment practices in forest plantations and in forest reserves has been reported (Romell 2007), making conclusions about the effects of various silvicultural treatments and the optimal conditions for enrichment planting is difficult due to the variability in natural forests