



**UNIVERSITI PUTRA MALAYSIA**

***GROWTH PERFORMANCE OF *Intsia palembanica* UNDER  
THE CANOPY OF *Pterocymbium javanicum****

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**FH 2016 74**

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By

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**Project Report Submitted in Partial Fulfillment of the Requirement  
for the Degree of Bachelor of Forestry Science in the  
Faculty of Forestry  
Universiti Putra Malaysia**

2016

## DEDICATION

SPECIALLY AND SINCERELY DEDICATED TO

My supervisor

**Assoc. Prof. Dr. Mohd Zaki Bin Hamzah**

My beloved father and mother

**Abdul Aziz Bin Shaari**

**Salamah Binti Talib**

My friends

**Muhammad Nasrullah Mudzahar**

**Soliah Md Isa**

**Nur Akmar Aulia Mohd Basri**

**Raja Nurul Illani Raja Ideras Badiuzzaman**

For the assistance, guidance, advices, understanding and support.

## ABSTRACT

At present, most forest plantations preferred fast-growing commercial tree species as they are able to meet the needs of the domestic market as compared to slow-growing hardwood species such as *Intsia palembanica*. This slow growing heavy-hardwood species are depleting in the natural forest and demand of this tree species is very high in the timber market. The status of this species under IUCN Red List is vulnerable because the risk to facing extinction due to deforestation is still a major threat for this species. Therefore, a trial planting has conducted at Ragut 3, Ladang Universiti Putra Malaysia, Puchong Selangor with the objective of evaluating the growth performance of *Intsia palembanica* under the canopy of *Pterocymbium javanicum*. This study consisted of two blocks with the different canopy development of *P. javanicum* with the maximum crown diameter of 1.59 m (at Block 1) with percentage of light penetration about 80% and 3.4 m (at Block 2) with percentage of light penetration about 40%. Each tree was planted at spacing 1.5 x 2.5 m. Data on growth and physiological were recorded within four months for the study period. Based on the independent sample T-test result, the ( $p>0.05$ ) growth parameters of *I. palembanica* for both Block 1 and Block 2 shows there is no significant difference. This result indicates that the trees can adapt for different light conditions.

## ABSTRAK

Pada masa kini, sebahagian ladang hutan tertumpu pada spesies pokok yang cepat tumbesarnya sebagai berpotensi untuk memenuhi keperluan pasaran domestik berbanding spesies pokok kayu keras seperti merbau (*Intsia palembanica*). Spesies pokok lambat pertumbuhan ini semakin berkurang di dalam hutan semula jadi namun permintaan pokok kayu keras ini semakin tinggi dalam pasaran kayu. Status spesies ini di bawah IUCN Red List 2008 adalah lemah kerana risiko kepada kepupusan akibat penebangan hutan masih menjadi ancaman utama bagi spesies ini. Oleh itu, ladang percubaan telah dijalankan di Ragut 3, Ladang Universiti Putra Malaysia, Puchong Selangor dengan matlamat untuk memantau kadar pertumbuhan pokok merbau di bawah kanopi pokok melembu (*Pterocymbium javanicum*). Kajian ini terdiri daripada dua blok yang mempunyai perkembangan kanopi pokok melembu yang berbeza dengan saiz kanopi paling tinggi adalah 1.59 m (Blok 1) dengan peratus keamatan cahaya 80% dan 3.4 m (Blok 2) dengan peratus keamatan cahaya 40%. Setiap pokok ditanam dengan jarak 1.5 m x 2.5 m. Data pertumbuhan dan fisiologi pokok telah direkodkan sepanjang empat bulan kajian dijalankan. Berdasarkan keputusan independent sample T-test yang dijalankan untuk kadar pertumbuhan pokok merbau nilai ( $p > 0.05$ ), menunjukkan tiada perbezaan ketara di antara Blok 1 dan Blok 2. Keputusan ini menunjukkan bahawa pokok ini boleh menyesuaikan diri dengan keadaan keamatan cahaya yang berbeza.

## ACKNOWLEDGEMENTS

I would like to express my profound gratitude to Assoc. Prof. Dr. Mohd Zaki Bin Hamzah, my supervisor for his constant guidance, suggestions and encouragement throughout the preparation of this thesis.

I am highly indebted to Assoc. Prof. Dr. Hazandy Bin Abdul Hamid my examiner for his invaluable suggestions and comments.

Thanks are also extended to my beloved father Abdul Aziz Bin Shaari and mother Salamah Binti Talib, and also my family members for their encouragement for me to finish this study.

I would like to thank my friends for their continued support during the entire study period. Lastly, praise to the Almighty Allah for His blessing, guidance and love.

## APPROVAL SHEET

I certify that this research project entitled “Growth Performance of *Intsia palembanica* Under the Canopy of *Pterocymbium javanicum*” by Nor Farah Wahidah Binti Abdul Aziz has been examined and approved as a partial fulfilment of the requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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Date: 20 June 2016

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## LIST OF ABBREVIATIONS

AGR	Absolute Growth Rate
CIFOR	Center for International Forestry Research
DBH	Diameter at Breast Height
EP	Enrichment Planting
FAO	Food and Agriculture Organization
FRIM	Forest Research Institute Malaysia
HHW	Heavy-Hardwood
IUCN	International Union for Conservation of Nature
LHW	Light-Hardwood
MHW	Medium-Hardwood
MTIB	Malaysian Timber
RGR	Relative Growth Rate



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# CHAPTER ONE

## INTRODUCTION

### 1.1 General Background

Tropical rainforest is the main resources for timber products in the world besides contributing towards maintaining forest ecosystem and biodiversity. Malaysia's Tropical rainforest is one of the richest forests in the world. In Malaysia, the forests are estimated to cover about 19.54 million hectares, which is about 59.5% of the country area (Carle, 2002). As population increase, many area of natural forests been cleared for development, agriculture and industry. However, worldwide demands for timber products keep increasing while natural stands decline over the year due to deforestation of natural forests.

Although deforestation meets some human needs, it also has profound, sometimes devastating, consequences, including social conflict, extinction of plants and animals, and climate change. Deforestation is a worldwide environmental issue (Sayer et al., 2004). As the total area of forests is declining globally, the extent of plantations is increasing (FAO, 2009). Forest plantation cannot meet all the natural forest aspects, but the establishment of plantation may practicing sustainable forest management and contribute wood resources in the area that have been degraded, where that area does not have potential for any other uses.

Tropical forest rehabilitation efforts have tended to focus on the development of forestry and agroforestry systems aimed at maximizing production of a very limited number of species, or restoration plantings that aim to recreate the diverse forest ecosystem believed to have once occupied the site. Other than that, enrichment planting also has potential in order to sustain the natural forest timber sources. Intact forests are disappearing worldwide, causing massive species extinctions (Dirzo & Raven, 2003). Therefore, the massive species that have impact from the deforestation should be reintroduced to ensure the population the species still available in future. Enrichment planting introduces valuable timber species in existing, but degraded, and secondary forest (Aide et al., 2000).

Conversely, secondary forest is a rapidly increasing land-cover type in the tropics as a result of deforestation by logging and conversion to pasture and agricultural land (Foley et al., 2007). Besides, tree plantation can reduce soil erosion besides maintaining nutrient cycling and soil fertility. Generally, forest plantation has higher potential in producing commercial raw materials compared to natural forest. Forest plantation is easier to manage since only selected species planted compared to the stands in natural forest which highly diverse in term of their species. Nowadays, there are many degraded forest areas that has potential to be converted into productive forest plantation that can supply for timber products for the future.

Tree selection in plantation program usually based on the characteristics of annual growth such as diameter, height and crown diameter should be taken considerations in order to evaluate the growth performance. By recognizing the growth performance of selected trees, it is easier to predict the production from the plantation.

## 1.2 Problem Statement

Presently, many different types of plantation are established for different purposes and the majority are planted as monocultures with the aim of producing timber for products such as paper, solid wood and firewood (Evans, 2009). Mixed-species plantations, however, can have higher rates of above-ground biomass production and carbon (C) sequestration than monocultures (Anna, 2010). Besides, most forest plantations only preferred fast-growing commercial tree species such as *A. mangium* and *E. camaldulensis* as potentially able to meet the needs of the domestic market on 15-years rotations compare to slow-growing hardwood species such as *Intsia palembanica*.

Because of that, most of forest plantations in Malaysia do not want to take the risk planting the slow growing species due to cost and time consuming. The limited research of information to this type of species might be due to the lack of study or unrecorded research conducted previously especially about the suitability of light intensity and the environmental factors that influence their growth make this type of species are not wide practising in



plantation. This slow growing heavy-hardwood species are depleting in the natural forest and demand of this tree species is very high in the timber market. Forestry Department is looking for alternative species for forest plantations and for forest restoration programs (Krishnapillay, 2002).

One of the native heavy hardwood species that has potential for forest restoration is *I. palembanica*. Indeed, merbau was categorized as a lesser-known timber species as recently as the early 1990s (Lemmens et al., 1994). The status of this species under IUCN Red List 2008 is vulnerable because the risk to facing extinction due to deforestation is still a major threat for this species. Besides, enrichment planting of this species in poor forest reserve of secondary forest might be contributed in the future natural resources for slow growing species.

This intensive research and study as a trial planting of heavy-hardwood species under shelter wood at their early stage to evaluate their growth performance is useful for future planting management practices.

### **1.3 Aim and Objectives**

The aim of this study conducted was to attain the growth performance of *Intsia palembanica*.

Two specific objectives were designed to meet the aims which are:

- I. To evaluate the growth performance of *I. palembanica* by measuring the diameter, total height, number of leaf, and leaf area.

- II. To compare the growth performance of *I. palembanica* between two blocks.



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