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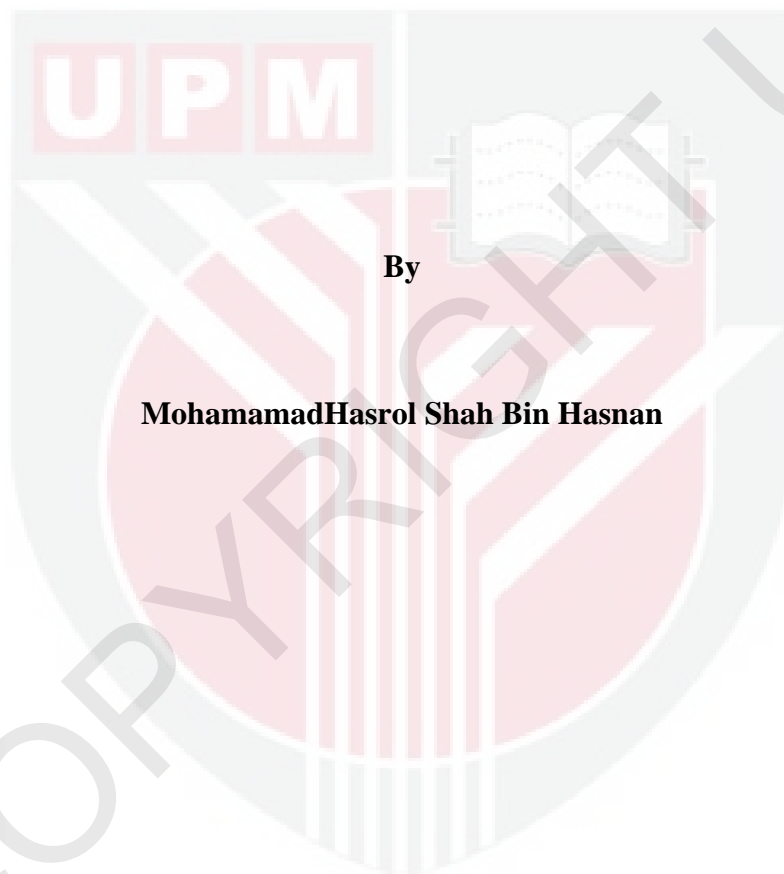
***QUANTITATIVE ASSESSMENT OF THREE SHOREA SPECIES
AT KENABOI FOREST RESERVE, NEGERI SEMBILAN***

MohamamadHasrol Shah Bin Hasnan

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QUANTITATIVE ASSESSMENT OF THREE *SHOREA* SPECIES

AT KENABOI FOREST RESERVE, NEGERI SEMBILAN



By

MohamamadHasrol Shah Bin Hasnan

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This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at time.

ABSTRACT

Shorea acuminata, *Shorea parvifolia* and *Shorea leprosula* are main Dipterocarps species in Malaysia and South East Asia countries. The species are fast growing *Shorea* species and highly utilised in buildings and construction. Two of the species except *S. parvifolia* is not listed in IUCN Red List of Threatened Species. Thus, it is important to carry out in situ and ex situ conservation. One of the ex situ effort is Taungya system. A total of 99 trees were selected using transect line in six plots. Height, dbh, volume and basal area were assessed in this study. *S. leprosula* outperformed *S. parvifolia* and *S. acuminata* in terms of dbh, height, basal area and volume. Mean dbh for *S. leprosula* is 53.41 followed by *S. parvifolia* (45.45 cm) and *S. acuminata* (40.59 cm). In terms of tree height, *S. leprosula* is 30.62 m followed by *S. parvifolia* (27.83 m) and *S. acuminata* (26.75 m). For basal area, *S. leprosula* is 0.23 m² followed by *S. parvifolia* (0.17 m²) and *S. acuminata* (0.14 m²). Lastly, for volume; *S. leprosula* is 3.01 m³ followed by *S. parvifolia* (2.18 m³) and *S. acuminata* (1.66 m³). Based on mean dbh and height showed *S. leprosula* outperformed the other two species however, with the conversion of basal area and volume to the one hectare basis, the ranking as follows: *S. parvifolia* > *S. acuminata* > *S. leprosula*. However, the result should be taken carefully due to norm that most/least number of samples influenced the results.

ABSTRAK

Shorea acuminata, *Shorea parvifolia* dan *Shorea leprosula* adalah spesies Dipterokarpa yang utama di Malaysia dan juga di negara Asia timur. Spesies-spesies ini adalah spesies *Shorea* yang cepat tumbuh dan banyak digunakan dalam pembangunan dan juga pembinaan bangunan. Dua dari pada spesies tersebut kecuali *S. parvifolia* adalah tersenarai di dalam Senarai Merah IUCN. Maka, adalah amat penting untuk menjalankan pemuliharaan secara *in situ* dan juga *ex situ*. Salah satu cara pemuliharaan *ex situ* adalah Sistem Taungya. Sebanyak 99 pokok telah dipilih menggunakan kaedah garis transect sebanyak enam plot. Tinggi, diameter paras dada, isipadu pokok dan juga luas pangkal diukur di dalam kajian ini. *S. leprosula* mengatasi *S. parvifolia* dan *S. acuminata* untuk diameter paras dada, tinggi pokok, luas pangkal pokok dan isipadu pokok. Purata diameter paras dada untuk *S. leprosula* adalah 53.41 cm diikuti oleh *S. parvifolia* (45.45 cm) dan *S. acuminata* (40.59 cm). Merujuk kepada tinggi pokok, *S. leprosula* adalah 30.62 m diikuti oleh *S. parvifolia* (27.83 m) dan *S. acuminata* (26.75 m). Untuk luas pangkal pokok, *S. leprosula* adalah 0.23 m² diikuti oleh *S. parvifolia* (0.17 m²) dan *S. acuminata* (0.14 m²). Terakhir, untuk isipadu pokok; *S. leprosula* adalah 3.01 m³ diikuti oleh *S. parvifolia* (2.18 m³) dan *S. acuminata* (1.66 m³). Berdasarkan kepada keputusan kajian, boleh disimpulkan bahawa *S. leprosula* menunjukkan ciri pertumbuhan yang lebih baik daripada spesies-spesies yang lain. Walaubagaimanapun, dengan menukarkan luas pangkal pokok dan isipadu pokok berdasarkan keluasan satu hektar, kedudukan spesies adalah seperti berikut: *S. parvifolia* > *S. acuminata* > *S. leprosula*. Tetapi, perlu diingat bahawa, keputusan ini haruslah diambil secara berhati-hati memandangkan secara normanya jumlah sampel yang banyak/sedikit mempengaruhi keputusan kajian.

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APPROVAL SHEET

I certify that this research project entitled “Quantitative Assessment of Three *Shorea* Species at Kenaboi Forest Reserve, Negeri Sembilan, Malaysia” by Mohamad Hasrol Shah binHasnan has been examined and approved as a partial fulfillment of the requirements for the Degree of Bachelor of Forestry Science in Faculty of Forestry, Universiti Putra Malaysia.

Assoc. Prof.Dr. Mohamad Azani bin Alias
Faculty of Forestry
Universiti Putra Malaysia
(Supervisor)

Prof.Dr. Mohamed Zakaria bin Hussin
Dean
Faculty of Forestry
Univerisiti Putra Malaysia

Date: May 2016

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LIST OF ABBREVIATIONS

BA	Basal Area
dbh	Diameter Breast Height
FDPM	Forestry Department of Peninsular Malaysia
FRIM	Forest Research Institute Malaysia
ha	Hectare
MUS	Malayan Uniform System

CHAPTER ONE

INTRODUCTON

1.1 Introduction

There were 155 species of Dipterocarpaceae in Peninsular Malaysia. The dominance of these species is remarked by two types of our forest named after the family i.e. Lowland Dipterocarp and Hill Dipterocarp Forest. While in Borneo (Sarawak, Sabah and Kalimantan) there are a total of 267 species of Dipterocarpaceae (P. Ashton, 1982). There were 17 genera of Dipterocarpaceae and *Shorea* (Meranti or Balau) was one of the main genus. The genus having approximately 200 species and the main species in Malaysia are *Shorea leprosula* (Meranti tembaga), *Shorea acuminata* (Meranti rambai daun) and *Shorea parvifolia* (Meranti sarang punai) (S. Lee, Wickneswari, Mahani, & Zakri, 2000). The species have special characteristic such as having three wings on their fruits. Being native in Malaysia, these species were over utilized and it was reported that the numbers remaining were declined rapidly. To hinder extinction, *ex situ* and *in situ* conservation were conducted for the last decades by the Malaysian government through establishment of National Parks or Taman Negara, protected forests, arboretum and many other type of conservation programmes.

Based on Nyoka (2003), *in situ* conservation is the deliberate management and conservation of the species or its populations or individuals in the natural habitat whereas *ex situ* conservation, species' populations are protected and managed outside their native or original environment either as seed gene banks or arboretum. In Malaysia, based on 2007 data, a total of 14.3 million hectares of permanent reserve forest (PRF) whereas national parks and wildlife and bird sanctuary is 1.9 million hectares (FAO, 2010). The numbers for PRF decreased from 2006 to 2007 at the rate of 0.17% and for the latter is 0.6%. The degree of forest lost in Malaysia is at alarming rate (Jomo, Chang, & Khoo, 2004). Thus, it is important task to curb the deforestation by introducing rehabilitation, restoration and reforestation in our country.

On the other hand, *ex situ* conservation have being introduced in Malaysia since the early age of colonization i.e. establishment of states botanical garden i.e. Singapore Botanic Garden (1822) and Penang Botanic Gardens (1884) (Bastin, 1990). During that time and early 1900s, most of valuable timbers in Malay Peninsular states were extracted by the British for local development (railway lines), urbanization (new townships) and agriculture (rubber plantations). Most of the affected areas were Lowland Dipterocarp Forests. Thus, in 1947, Malayan Uniform System (MUS) was introduced for managing lowland dipterocarp forest in Malaya.

Forest restoration and rehabilitation in Malaysia have a long history. In 1950, Taungya System, one of the earliest community forestry programs that introduced by the Forestry Department in Peninsular Malaysia (FDPM) with the establishment of 133 hectares of Teak (*Tectona grandis*) plantation in Mata Ayer Forest Reserve,

Perlis. The areas were integrated with cash crop i.e. paddy and tobacco. The project was later followed by planting of about 200 hectares of Yamane (*Gmelina arborea*) intercropped with tobacco, in North of Perak from 1954 to 1960. Another area is Kenaboi Forest Reserve where it is one of the oldest known Taungya System that have been practiced in Malaysia (King, 1987). The word *taungya* originated from Burma (Myanmar) which means planting in hilly area. The system was practiced in forestry where it refers to forest tree planting with agriculture crop. It has been practiced on under-utilised, degraded and abundant areas. Krishnapillay et al., (2007) however reported that the system having poor survival rate. Since then, the FDPM introduces exotic fast growing species plantations includes teak, Acacias, pines and eucalyptus.

1.2 Problem statement

The numbers of these *Shorea* species at the Lowland Dipterocarp Forest is declining and most of the remaining species were distributed at areas that difficult to assess. Most of our Lowland Dipterocarp Forest were developed or converted into plantations areas. However, some of the early establishment of Dipterocarps plantations in the 1960's are still available to be studied. Three *Shorea* species namely *Shorea leprosula*, *Shorea parvifolia* and *Shorea acuminata* were brought from Sg. Menyala Forest Reserve in 1968 and it were planted at Kenaboi Forest Reserve using Taungya System. The system is basically a combination of forest and agriculture species. Therefore, this study intends to evaluate the success of these

plantations in term of basal area and volume for these three Shorea species after 45 years plantation.

1.3 Objectives

To determine the growth performance of three Shorea species after been planted since 1968 at compartment 107, Kenaboi Forest Rerserve Negeri Sembilan.



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