GROWTH PERFORMANCE OF Magnolia elegans PLANTED IN RESTORATION AREA OF MONTANE FOREST IN CAMERON HIGHLAND, PAHANG

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By

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ABSTRACT

As the human population increases, deforestation rates and the emissions of carbon dioxide into the atmosphere also increase causing global warming. In Malaysia, there are many microclimates factors such as temperature and rainfall which growth may affect the performance of plants or trees and even human activities. The aim of this study is to monitor the growth performance of *Magnolia elegans* that was planted in restoration area in Cameron Highlands, which is located at the altitude of approximately 1330m above sea level. The trial plots were divided into 2 plots, Open-compacted and Secondary-vegetation. The growth parameters measured and analyzed were height, diameter and chlorophyll content. The result suggested that the planted species gave different rate of adaptation and growth according to the selected plot. Whereby the species planted in open-compacted plot grew significantly better compared to secondary-vegetation plot.

ABSTRAK

Apabila peningkatan populasi manusia, kadar penebangan hutan dan pelepasan karbon dioksida ke atmosfer juga meningkatkan penyebab pemanasan global. Di Malaysia, terdapat banyak mikroklimat seperti suhu dan hujan yang memperlihatkan pertumbuhan tumbuhan atau pokok walaupun aktiviti manusia. Tujuan kajian ini adalah untuk memantau prestasi pertumbuhan Magnolia elegans yang ditanam di kawasan pemulihan di Cameron Highlands, yang terletak di ketinggian kira-kira 1330m di atas paras laut. Plot percubaan dibahagikan kepada 2 plot, tanaman dipadatkan dan menengah. Parameter pertumbuhan yang diukur dan dianalisis adalah ketinggian, diameter dan kandungan klorofil. Hasilnya menunjukkan bahawa spesis terpilih memberikan kadar penyesuaian dan pertumbuhan yang berbeza mengikut plot yang dipilih. Keputusan menunjukkan bahawa spesies yang ditanam dalam plot yang dipadatkan terbuka tumbuh dengan lebih baik berbanding plot tumbuhan menengah.

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APPROVAL SHEET

I certify that this research project report entitled “Growth Performance of *Magnolia elegans* planted in restoration area” by Che Wan Muhammad Hafiz Bin Che Wan Razaley 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, University Putra Malaysia.

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INTRODUCTION

1.1 General Background

The tropical forest makes up 80% of the world forests and are recognized as having the greatest long-term potential to sequester atmospheric carbon (Nadagoudar, 2012). The reduction of natural forests, which are the main source of these resources and growing pressure for the conservation of these ecosystem underscore the important of planted forests, which could supply up to 50% of the global demand for wood by 2050 (WWF, 2012). Compared to natural forests, forest plantation can produce far greater quantity of wood and non-wood produces within a relatively shorter period of time from 3-30 years (Hashim*et el*, 2011). Furthermore, it also can act as store (sequester) the emissions greenhouse gas in the growth development process which in contributes to the global environment.

The establishment of forests plantation can deficit the problems of timber shortage and high pressure on natural forests caused by deforestation, where more information on species selection and performance are required in developing the successful plantation. Besides that, forest plantation also can help in depletion of carbon dioxide and act as a carbon sink through biochemical process photosynthesis.

As the human population increase, deforestation rates and the emissions of carbon dioxide into the atmosphere also increase cause global warming. In order to cease any more increase of CO_2 in the atmosphere by means of additional plantation areas could be an important means. The global concern in ameliorating global warming and climate change and they fulfilled their responsibility by expand the forest plantation in Malaysia.

Forest, which are the main component of so-called “land sink”, play a vital role in the global carbon cycle through the absorption of 2.9 6 0.8 Pg of carbon (C) per year (in the period 2004-2013), thus mitigating climate change related to the increase of anthropogenic carbon dioxide (CO2) in the atmosphere (Le Que’re’ et al. 2009).

Globally, land-use change accounts for 15-18% of anthropogenic carbon emissions and the vast majority of these come from deforestation and forest degradation in the tropics (IPCC 2007), with shifting cultivation often mentioned as one of the main sources (Mertz 2009). The resulting mechanism became known as the reduction of emissions from deforestation and forest degradation (REDD), which has been seen as a cost-effective way of reducing global greenhouse gas emissions (Stern 2007).

The REDD mechanism evolved into REDD+ that includes sustainable forest management, enhancement and conservation of forest carbon stocks (Schrope2009). While deforestation is clearly defined as land use conversion, there is no clear definition for forest degradation.

FAO (2003) emphasizes the reduction of forest carbon stock but given time, the stock should be able to recover. While there are still a lot of uncertainties in the REDD+ mechanism, its implementation will certainly affect the local people who are largely dependent on shifting cultivation and forest produce for their livelihood (Mertz 2009).

The rights of local people to farm, fallow and collect forest produces are not secured in terms of land tenure (Fox et al. 2009). Economic valuation methods have been used for assessing environmental value loss to the 1998 forest fire at a national scale (Varma 2003).

Contingent Valuation Method (CVM) therefore is able to provide information concerning the level of compensation needed by people who have to forego the use of the forest for their livelihood activities (Hanley et al. 2010). Plant development progresses through distinct phases are vegetative growth, followed by a reproductive phase and eventually seed set and senescence.

Rate of plant growth and development is dependent upon the temperature surrounding the plant and each species has a specific temperature range represented by a minimum, maximum, and optimum. Vegetative development (node and leaf appearance rate) increases as temperatures rise to the species optimum level. For most plant species, vegetative development usually has a higher optimum temperature than for reproductive development.

Faster development of non-perennial crops results in a shorter life cycle resulting in smaller plants, shorter reproductive duration, and lower yield potential. Temperatures which would be considered extreme and fall below or above specific thresholds at critical times during development can significantly impact productivity. In general, extreme high temperatures during the reproductive stage will affect pollen viability, fertilization, and grain or fruit formation (Hatfield et al., 2008, Hatfield et al., 2011).

When investigating the impact of climate change on vegetation whether natural or part of an agricultural system, recognizing the non-linear nature and sensitivities of vegetation growth are important. Thus, to really understand the impact of climate change on a particular species, its climate sensitivities needs to be known and explicitly examined in the climate change projections (Dickinson, 2012). Another aspect of the ecological impact of climate change has been the potential to cause species extinction.

A simple example is that of mountain species that will migrate up the mountain as the climate warms, until there is nowhere left to go (Frei et al., 2010). Ashcroft et al. (2008) studied the environmental factors that influence the distribution of species and found that wind exposure and distance from the coast were both important factors in their region.

Understanding the effects of site conditions and climatic factors on forest growth is important for the development of forest cover and forest management (Worrell and Malcolm, 1990a, b). Given the rapid rise of temperature (Houghton *et al*., 2001) and the possible average increase in precipitation of about 3.4 per cent globally per 1°C temperature rise that we face (Allen and Ingram, 2002), it is critical that we take climatic factors into consideration in the assessment of forest growth and prediction (Bonan *et al.*, 1990; Tyler *et al.*, 1995; Raich *et al.*, 1997) especially in areas where climatic change is likely to reduce forest growth and cover.

1.2 Problem Statement

Information about the carbon sequestration's function of forests was a great concern not only for production but also to assess the possible effects on the global warming phenomenon, where forests plantations in particular would play a leading role in the future. Most study of forests plantations species composition and growth.

However, in term to grow trees efficiently, foresters must understand how the trees grow and this requires some understanding of trees physiology (Kramer. P. J, 1986). Therefore, intensive research needs to be done to clarify the role of exotic forest plantation for improving carbon sink as well as reducing emissions greenhouse gas in line with the Kyoto Protocol.

In Malaysia, there are many microclimate parameters such as temperature and rainfall that can affect growth performance of plants or trees, and even human activities. The climate of Malaysia are uniform temperature, high humidity and copious rainfall. Winds were generally light and variable. The seasonal wind flow patterns coupled with the local topographic features determine the rainfall distribution patterns over the country. It is best to describe the rainfall distribution of the country according to seasons.

Deforestation refers to the loss of forest cover land that is permanently converted from forest to agricultural land, golf courses, cattle pasture, homes, lakes or desert. The FAO (Food and Agriculture Organization of the U.N.) defines tropical deforestation as “change of forest with depletion of tree crown cover to less than 10%." Depletion of forest to tree crown cover greater than 10% (say from 100% to 12%) is considered forest degradation. Logging most often falls under the category of forest degradation and thus is not included in deforestation statistics. Therefore, forest degradation rates are considerably higher than deforestation rates. One of the main causes of deforestation actually was for agriculture activities.

The study area has been disturbed or degraded by agricultural activities which are the citizen farming the crops in that area. Pahang is one of the states in Malaysia that still have a large area of forest and they have a lot of issues about illegal logging. So, the government has acted on this issue. One of the actions is they should protect and conserve some hot areas of illegal logging and Cameron Highland is one of them. The agriculture and plantation site that had been abandon for a long-term have changed into an open area and the site should be restored and conserved.

Replanting the selective species of plants is one of the ways to conserve that area and can avoid natural disaster happen. The soil has become dry and cracked after that area has not conserved properly for a long time. To avoid this matter continuously happen, the government has taken new alternative ways that are make replanting in that area. When the restoration has success, the natural disaster issues like the landslide, flash flood, and the other issues will decrease.

1.3 Objective

The general objective of this study is to study the growth rate of *Magnolia Elegans* species planted at the montane forest on the current status of degraded forest. These specific objectives were designed to meet this aim are:

I. To identify the growth rate of *M. elegans*and adaptability of the species to the micro climate in Cameron Highland.

II. To study the role of chlorophyll content for the growth performance of *M. elegans.*

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