

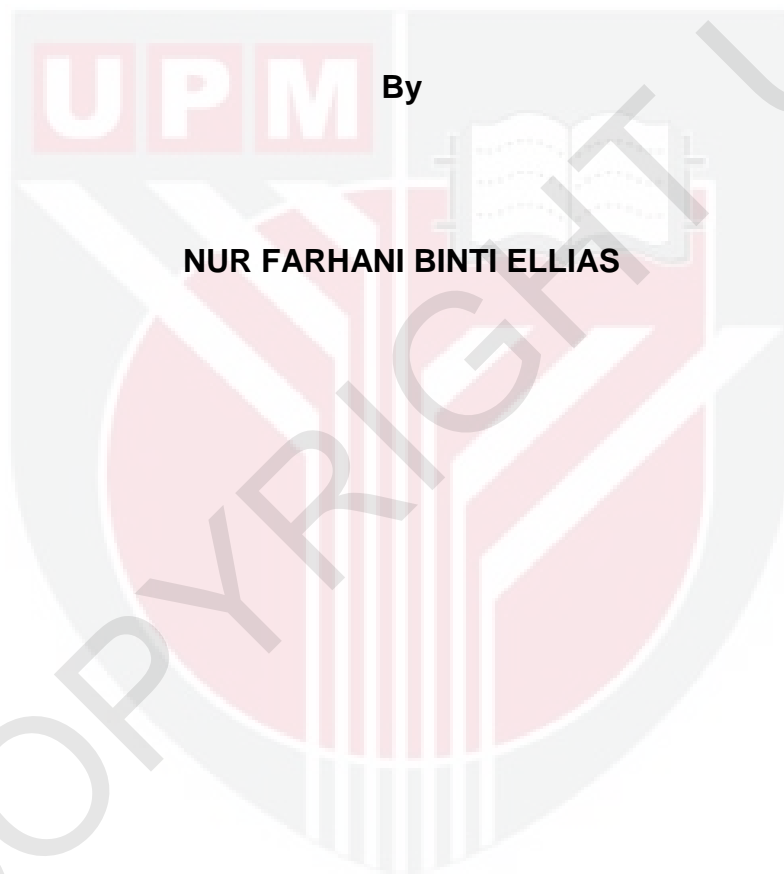


***REHABILITATION OF DISTURBED COASTAL FOREST USING SELECTED
TREE SPECIES AT PANTAI NENASI, PEKAN, PAHANG***

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REHABILITATION OF DISTURBED COASTAL FOREST USING SELECTED TREE SPECIES AT PANTAI NENASI, PEKAN, PAHANG



A Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor Science of Forestry in the Faculty of Forestry Universiti Putra Malaysia

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DEDICATION

With lovely and specially dedicated to my parents

Ellias Shawal & Harison Sha'ari

A lot thanks to

My supervisor

My academic advisor

All of my friends

All of the lecturers staffs of faculty of Forestry and INTROP

All Mr. and Mrs

For the helps in every aspects and always supporting me.

ABSTRACT

Rehabilitation programmes that have been conducted to recover the degraded ecosystem can fully achieve its objective if planning is being done properly. The selection of tree species must suit its function to the rehabilitation objective. A study was conducted at the coastal forest of Pantai Nenasi, Pekan, Pahang with the aims to investigate the suitable species combinations for rehabilitation of disturbed coastal forest and the effectiveness of shelter applied. The study consisted of six plots with three tree species planted randomly. In three plots, seedlings were sheltered by a net of 1 m x 1m x 1m fence while seedlings for the three species for other three plots were not sheltered. Each tree was planted at spacing 4 m x 4m and plot consisted of 30 trees from the 3 species. Total seedlings planted were 180 but 145 seedlings survived. The three species combination were *Casuarina equisetifolia*, *Syzygium grande* and *Calophyllum inophyllum*. Diameter and height growth data were recorded for 1-year study period. Based on One-way ANOVA result, there were highly significant differences in height but diameter increment of tree species were not significant differences at ($p < 0.05$). Post-hoc tests showed only *C. equisetifolia* had highly significant difference on height and diameter ($p < 0.05$) compared to the other two species while there was no significant difference between *C. inophyllum* and *S. grande* on height and diameter ($p > 0.05$). While due to the independent sample t-tests, there was highly significant difference between shelter treatment on height ($p < 0.05$) while there was no significant difference between shelter treatment on diameter ($p > 0.05$). This study indicated that this three species are suitable to be used in other rehabilitation effort on coastal dune area due to the trees are well-adapted to the environment. The shelter treatment creates more desirable condition compared to non-shelter treatment.

ABSTRAK

Program pemulihan yang dijalankan boleh membawa kepada habitat asal jika perancangan dibuat dengan teliti. Pemilihan jenis pokok mestilah tepat dengan fungsinya untuk mencapai objektif pemuliharaan. Kajian telah dijalankan di Pantai Nenasi, Pekan, Pahang dengan objektif untuk melihat kesesuaian jenis pokok yang dipilih dan keberkesanan pelindungan terhadap pokok. Kajian dijalankan dengan pembinaan enam plot yang mana setiap pokok yang ditanam dalam tiga plot daripadanya dilindungi oleh pagar manakala pokok yang ditanam di tiga plot yang lain tidak dilindungi oleh pagar. Pagar dibina dengan 1 m x 1 m x 1 m yang ditutup dengan jaring. Jarak bagi setiap pokok yang ditanam adalah 4 m x 4 m. Setiap plot mengandungi 30 pokok. Jumlah yang ditanam ialah 180 anak pokok tetapi hanya 145 anak pokok yang hidup. Pokok yang ditanam ialah pokok *Casuarina equisetifolia*, pokok *Calophyllum inophyllum* dan pokok *Syzygium grande*. Data diameter dan tinggi pokok direkod bagi 1 tahun. Berdasarkan keputusan daripada *One-way ANOVA*, terdapat perbezaan yang ketara pada ketinggian dan diameter pokok bagi ketiga-tiga jenis pokok ($p < 0.05$). Manakala berdasarkan keputusan daripada *post hoc tests* menunjukkan hanya pokok *C. equisetifolia* sahaja yang mempunyai perbezaan ketara atas ketinggian dan diameter ($p < 0.05$) dibandingkan dengan dua jenis pokok yang lain manakala tiada perbezaan ketara antara pokok *C. inophyllum* dan pokok *S. grande* atas ketinggian dan diameter ($p > 0.05$). Sementara keputusan daripada *independent sample t-tests* menunjukkan terdapat perbezaan ketara semua jenis pokok atas ketinggian pokok ($p < 0.05$) manakala tiada perbezaan ketara semua jenis pokok atas diameter pokok ($p > 0.05$). Keputusan ini menunjukkan ketiga-tiga pokok ini sesuai digunakan untuk penanaman di kawasan hutan pantai. Perlindungan yang diberi memberikan keadaan yang lebih kondusif kepada ketinggian pokok berbanding dengan pokok yang tidak diberikan perlindungan.

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APPROVAL SHEET

I certify that this research project report entitled "Rehabilitation of Disturbed Coastal Forest Using Selected Tree Species at Pantai Nenasi, Pekan, Pahang" 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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LIST OF ABBREVIATIONS

INTROP	Institute of Tropical Forestry and Forest Product
SPSS	Statistical Pack for the Social Sciences
ANOVA	Analysis of Variance
DBH	Diameter at Breast Height
SE	Standard error
UPM	Universiti Putra Malaysia
°C	Celcius
N	Number of sample
BRIS	Bridge Ridge Interspersed with Swales



CHAPTER ONE

INTRODUCTION

1.1 Background

Rehabilitation is the process of bringing back the ecosystem that has been diminished to nearly of its original state (Field, 1998). The process of rehabilitation will recover the original structure and productivity but may not recover to its original undisturbed condition (Lamb & Gilmour, 2003). There are always low chances to achieve objectives set for every rehabilitation effort of coastal forests (Yap, 2000). Different forest types and site condition requires a different level of manpower and financial resources. Mangroves are admitted to be easier to rehabilitate compared to other coastal forests.

The success of rehabilitation programme can be determined by the effectiveness and efficiency of the planting (Chan & Baba, 2009). The rehabilitation by phased planting most probably would be work out at coastal forest which at the first phase will focus on planting pioneer herbaceous plant species to stabilize and enrich the nutrient of soil site. While at the second phase will then plant the site with the woody tree after the site is improved. If all rehabilitation effort failed in a given coastal area, the best choice would be to do nothing and let the environment do the job. Since the rehabilitation of disturbed coastal forest is the main concern, it is important to know the basic of the coastal forest formation.

Coastal wetlands are formed when terrestrial meet marine environments by tidal forces, fresh water-inputs, sediment transport and biota (Phillips, 2017; Barbier, 2013 and Lee et al, 2006). It is considered to be amongst the most productive ecosystem and play important roles in the storm surge, waves and floods buffering, enhanced water quality, fishery habitat, carbon sequestration and storage (Phillips, 2017; Sutton-Grier et al, 2015, Barbier et al, 2011).

The coastal wetlands are included salt marshes, swamps, mangroves, dunes, intertidal mudflats, seagrass beds and shallow subtidal habitat (Lee et al,2006; Sutton-Grier et al, 2015). There are three types of coastal forests including mangrove, beach and dune, and forests of coral islands (Chan & Baba, 2009). Beaches and dunes come together as a system where dunes reliant on beaches for sand supply while beaches depend on dunes for coastline natural barrier and protecting the inland area.

Coastal in Kelantan, Terengganu, partly in Pahang and small part in Johor are referred to Beach Ridges Interspersed Swales soil (BRIS) or dune ridge where plant community on BRIS soil are stranded (heath) vegetation due to its sandy soil, low fertility and low water-retaining capacity (Shamshuddin, 1990). Dune ridge also a stressful environment due to its dynamic landscapes of eroded sand by storm and extreme temperature of its soil. Despite its dynamic, the coastal stability achieved between alternate ridges and swales where the swales contribute to dark color underneath the sandy white surface of BRIS soil.

Two formations of stranded vegetation, Pes-caprae and Barringtonia formations, characteristic mainly of exposed sandy shores. Pes-casprae formation forms zone-of low-growing herbaceous plants which the most pioneer species is *Ipomoea pes-caprae* follow by *Spinifex littoreus*, *Cyperus maritime*, *Canavalia rosea*, *Desmodium umbellatum*. Behind it, Barringtonia formation occurs with the common tree species like *Barringtonia asiatica* and *Cerbera odollam* while shrub species include *Pluchea indica*, *Desmodium umbellatum*, *Sophora tomentosa*, *Pemphis acidula* and *Ximena americana* (Ozil, 2003).

1.2 Problem Statement

The study site had been degraded due to human activities such as man-made fire and open burning which turns into open field and been dominated by *Imperata cylindrica* (lalang). Thus, this study conducted to rehabilitate the degraded area with tree of coastal species and to see the effect of shelter to the new planting tree.

1.3 Objectives

This study aims:

1. To investigate the suitable species combinations for rehabilitation of disturbed coastal forest
2. To validate the effectiveness of shelter to tree species

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