

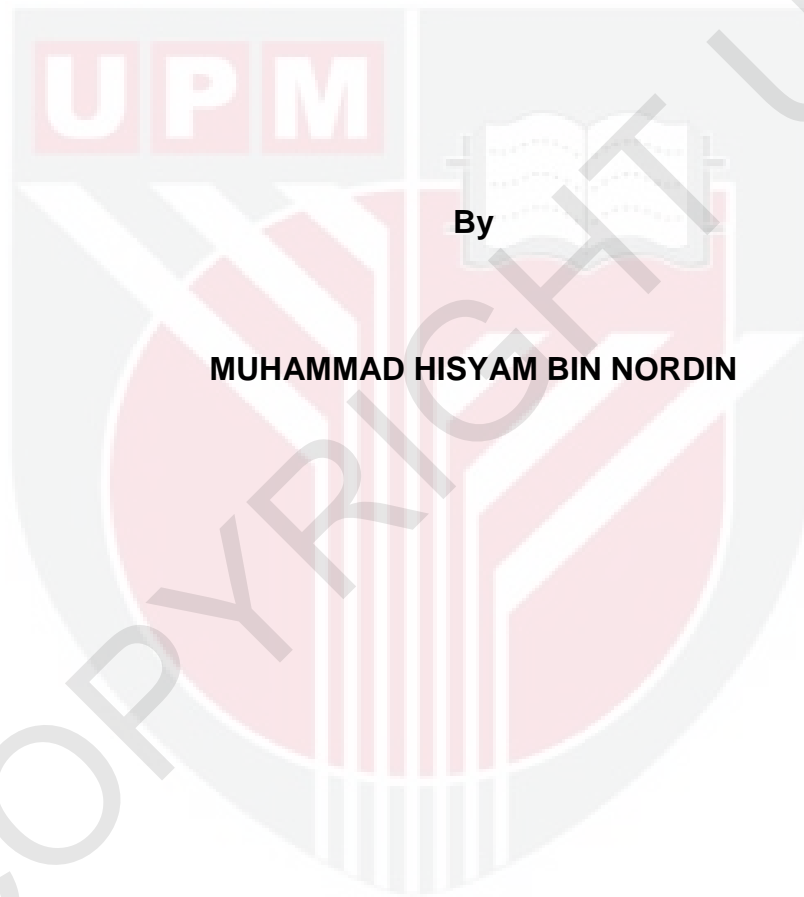


HAULING EFFICIENCY IN MATANG MANGROVE FOREST RESERVE

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By

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**A Project Report Submitted in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Forestry Science in the
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DEDICATION

Special thanks to my beloved parent, supervisor and examiner, my FYP partners

For their helping hands and guidance

To all my friends,

Thank you for your encouragements and continuous supports

And the sacrifices that you have given.

Thank you for everything. May Allah Bless All of us.

ABSTRACT

Matang mangrove forest is sustainably managed for its timber production purposes. Harvesting operation in this mangrove forest is challenging due to topographical and work environment condition. Muddy soil and the need of preserving the rich ecosystem in the mangrove forest have made mechanized skidding unsuitable to be applied during the harvesting process. Coherently, the increased demand of charcoal production has forced the charcoal factory owners to find ways in improving their timber transportation system. Log hauling is the only appropriate method in extracting timber out to log pond in mangrove forest timber production. This study was carried out to investigate timber productivity and time of extraction process as well as performance of hauling operation using wheelbarrow. Travel time data from the ten trips of hauling cycle was recorded. Manual hauling method consists of four main work elements which were return, loading, hauling with load, and unloading. Factors of the delay also were recorded. Regression analysis was performed to examine the relationship between time and productivity of timber production. Results of hauling extraction system showed that the effective log amount was eight, with 123 meters efficient hauling distance. Loading time had shown the longest time (28%), hauling with load (23%), return (20%), and unloading (19%). However, hauling performance and productivity were slightly affected by the factor delays that occurred during the operation. The main delay was caused by personal delay (10%), which was the least in time consumption.

ABSTRAK

Hutan Bakau Matang diurus secara mampan untuk tujuan pengeluaran kayu. Operasi penuaian di hutan bakau ini mencabar kerana keadaan persekitaran topografi dan kerja. Tanah berlumpur dan keperluan untuk memelihara ekosistem yang kaya di hutan bakau membuat proses penarikan kayu balak secara mekanikal tidak sesuai digunakan semasa proses penuaian. Secara konsisten, peningkatan terhadap permintaan pengeluaran arang telah memaksa pemilik kilang untuk mencari jalan untuk memperbaiki sistem pengangkutan kayu mereka. Penolakan balak secara manual adalah satu-satunya kaedah yang sesuai untuk mengeluarkan kayu ke kawasan pengumpulan balak di hutan paya bakau. Kajian ini dijalankan untuk mengetahui produktiviti pengeluaran kayu dan masa proses pemindahan serta prestasi operasi penolakan menggunakan kereta sorong. Data masa perjalanan dari sepuluh perjalanan kitaran penolakan telah direkodkan. Kaedah penolakan manual terdiri daripada empat elemen kerja utama iaitu kembali, pengisian, perjalanan dengan muatan, dan pemunggahan. Faktor-faktor kelewatan juga telah direkodkan. Analisis regresi juga telah dilaksanakan bagi mengetahui hubungan di antara masa dan produktiviti pengeluaran kayu. Keputusan sistem penolakan manual menunjukkan jumlah kayu balak yang efektif adalah lapan, dengan jarak penolakan yang efisien adalah 123 meter. Masa pengisian telah menunjukkan masa terpanjang (28%), perjalanan bersama beban (23%), kembali (20%), dan pemunggahan (19%). Walau bagaimanapun, prestasi dan produktiviti penolakan kayu balak sedikit terjejas oleh faktor kelewatan yang berlaku semasa operasi. Kelewatan utama disebabkan oleh faktor kelewatan individu (10%), iaitu paling pendek dalam penggunaan masa.

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May Almighty Allah bless you all. Thank you.

APPROVAL SHEET

I certify that this research project report entitled “Hauling Efficiency in Matang Mangrove Forest Reserve” by Muhammad Hisyam bin Nordin has been examined and approved as a partial fulfillment of the requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, University Putra Malaysia.

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LIST OF ABBREVIATIONS

MMFR	Matang Mangrove Forest Reserve
RIL	Reduce Impact Logging
FAO	Food and Agriculture Organization
NGO	Non-Government Organization
OSHA	Occupational Health and Safety
EHS	Environmental Health and Safety Guidelines
MNFP	Malaysian National Forestry Policy
RM	Ringgit Malaysia
R ²	Coefficient of determination
NASA	National Aeronautics and Space Administration
Std. Dev.	Standard Deviation
SPSS	Statistical Package for the Social Sciences

CHAPTER 1

INTRODUCTION

1.1 General Background

Mangrove forest is known widely as a home for many diversified animal species and it acts as a shelter for them. The source of food for aquatic animal, mammals and reptiles can be located in the mangrove forest. Ellison proves that mangroves play a critical role in the ecology and the economy of coastal communities (Din *et al.*, 2008). The ecological, environmental and socio-economic importance of mangrove forests are now widely accepted by international agencies, governments, NGOs, scientists and tropical coastal communities alike. In Malaysia as well as elsewhere in the world, anthropogenic disturbances increase the dysfunction of these coastal ecosystems. Unlike other countries with coastal ecosystems, Matang Mangrove Forest Reserved (MMFR) known as one of the most sustainable management system around the world especially in forestry resources and have an important role in supplying constant yield of forest product (Jusoff, 2008). These include management for logging, buffer zone, tourism, aquatic and wildlife, and coastal protection. Focusing on timber and plant products, mangrove wood is resistant to rot and insects making it extremely valuable. Recently, the forests have also been commercially harvested for pulp, wood chip, and charcoal production (Albert *et al.*, 2017). The MMFR located in the West Coast of Peninsular Malaysia, widely regarded as the best managed

mangrove forest in the world, has been sustainably utilized for timber since the 1920s (Hamid, 2004).

Log hauling is one of the elements in mangrove forest harvesting. While forest harvesting refers as the overall process involving cutting trees and delivering them to sawmills, pulp mills and other wood-processing plants. Log hauling only focuses on the process after felling, bucking and debarking where the log is transported from temporary to main log yard near the riverbank. No machine is used and logs were manually hauled using a wheelbarrow. This is to ensure minimal disturbance on surrounding vegetation. A trail is established along during felling process and usually made up of wood plank. This manual extraction method is still being practiced in MMFR, though the movement of logs by a human labour is increasingly rare, except on farms where it persists even in industrialized countries. The timbers were basically harvested for coal production purpose. Logging system is based on water transportation system where a boat is needed to deliver all logs to coal factory. All work is done manually by a human during operations. Except for the use of Chainsaw for felling and Barge boat to transfer the log through river to the coal factory. All these harvesting operations take place in MMFR with hauling operation as main key indicating performance of whole logging process.

1.2 Problem statement

Each forest operation has different types of the system they used depends on the area of the operation done. Mangrove forests are not the same as hill and lowland dipterocarp forest in term of logging. Logging in mangrove forest requires timber to be harvested through manpower while in dipterocarp forest, machinery use is much more efficient as compared to the traditional way (Lihai *et al.*, 1996). The use of crawler tractor in hill and lowland dipterocarp forest in Malaysia is for the purpose of skids log from felling sites to skids trails and continued by transporting the log to roadside landings by winch lorry (Rahim *et al.*, 2009). Several limitations were identified related to the condition in the mangrove forest. Muddy soil, rich ecosystem, flora and fauna habitat are main causes why heavy machine is not suitable to be used during harvesting process. Therefore, water transportation is the best way to cope with this problem. But the productivity and time efficiency are the most important factor above all since it greatly affects an increase in economy and fuel wood production. Korkmaz proves that productivity measurements are essentials for the forest technicians and the logging companies (Maesano *et al.*, 2013).

Hauling operation is one of the contributing factors affecting the performance of whole mangrove harvesting operation, similar to ground skidding by the use of crawler tractor on conventional logging or Rimbaka timber harvester through Reduced Impact Logging (RIL) program. “Logfisher” also known as Rimbaka timber harvester was invented to retrieve logs in challenging earth

condition replacing Skyline, Mobile Tower Yarder, and Helicopter in the middle of 1999 (Rahim *et al.*, 2009). Both of this method has their own benefit in terms of wood extraction. Only that application of machineries has higher impact towards environment than manpower resources. Concisely, it is found that manual skidding using draught animal is an economically attractive choice in many areas, sometimes even in industrialized countries. As compared with ground-skidding equipment, the use of draught animals, such as elephants, water buffaloes, oxen, horses and mules, has been shown to reduce soil disturbance, soil compaction and damage to residual trees significantly (Cermak & Lloyd, 1962).

Through time, much research was done to determine the operational efficiency of skidding on different topography for heavy machinery thus reducing damage on residual stand. The research helps a lot for many agencies to improve their work operations. But determination on the efficiency of hauling by manpower in mangrove forest logging is lesser to be evaluated. The changing tide condition also affects the operation hour. Due to this limitation, evaluation of work operation may help in obtaining efficient forest operation system. This study was conducted to find the relationship between productivity and time for manual hauling operation along with the determination of its efficiency in MMFR.

1.3 Objectives

The objectives of this study are:

1. To analyze the relationship between elements of logs hauling based on cycle in Matang Mangroves forest.
2. To determine the efficiency of hauling operation in Matang Mangroves Forest.



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