

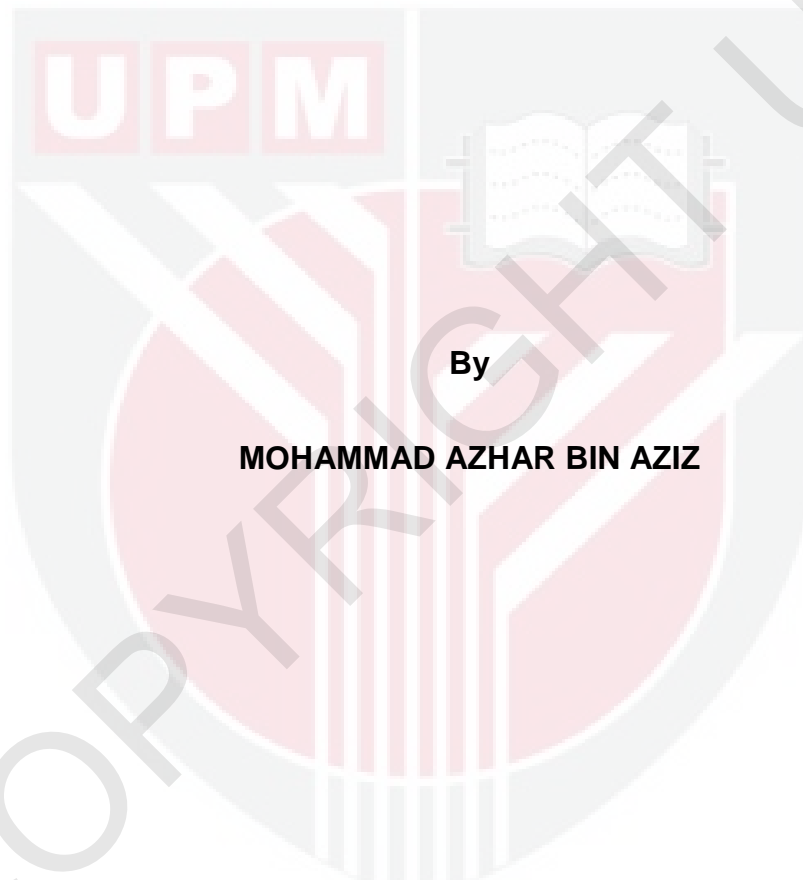


***OPERATIONAL EFFICIENCY OF TIMBER LOADING AND UNLOADING IN
SAPULUT, SABAH***

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**OPERATIONAL EFFICIENCY OF TIMBER LOADING AND UNLOADING IN
SAPULUT, SABAH**



By

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A Project Report Submitted in Partial Fulfillment of the Requirements

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2019

DEDICATION

For my beloved family:

Aziz bin Lazim

Sommy binti Jumat

Also, my siblings.

Mohammad Azmi Aziz, Mohammad Syafiq Aziz

Nazhatul Syahirah Aziz

My supervisor

Associate Professor Dr Seca Gandaseca

To all my best friends,

My team at Sapulut Sabah.

Thank you for your encouragements supports

And the sacrifices that you have given.

Thank you for everything. May Allah bless all of us.

ABSTRACT

Good transportation and integrated infrastructure are required to realize adequate economic return to make processing a diverse log supply feasible (John et al., 2004). Loading and unloading is one of the important components in forest transportation. Loading process is a mechanism that connects between skidding and hauling operation. The main issues is regarding to low productivity by loader log grapple that may cause delay in harvesting process. The objective of this study was to measure time and volume of tree carry loader tractor operation in forest. Second, to analyze the relationship between time, volume and distance of carry loader tractor operation and third, to determine the efficiency loading and unloading by loader tractor in Sapulut Forest Reserve, Tibow, Sabah. The study was conducted in forest undergo harvesting operation in Sapulut Tibow, Sabah. Data collected based on distance and time, time and productivity, and last but not least data on distance and productivity. Productivity is the main target that should achieve in a certain harvesting process. To get the optimum rate of productivity, time and volume of log carried by loader log grapple should be considered. Volume of log per trip for both process of loading and unloading should be maintain between 54 m^3 to 56 m^3 and the total time at 0.8 to 0.9 hours that will come out the highest rate of productivity which between 55 to 57. In this study, the result shows the process of loading handled by loader log grapple take the total time 3.13 hours to complete 5 trips per day. The capability of experienced driver can conduct about 8 to 10 trips or more in one day which is equivalent to 400 m^3 to 500 m^3 . While for unloading process an experienced driver can conduct about 11 to 15 trips or more in one day which is equivalent to 400 m^3 to 500 m^3 . Furthermore, total distance for loading and unloading process from log pond to lorry influenced the effectiveness of time and productivity even slightly different on distance. The relationship between time, volume and productivity had been discussed in this study. The result from this study can be used for improvement on environment disturbance and economical value for harvesting process in the future.

ABSTRAK

Pengangkutan yang baik dan infrastruktur bersepadu diperlukan untuk mencapai pulangan ekonomi yang mencukupi untuk membuat pemrosesan bekalan kayu yang pelbagai (John et al., 2004). Menaikkan balak dan penurunan balak merupakan salah satu komponen penting didalam pengangkutan hutan. Proses menaikkan balak adalah mekanisma yang menghubungkan diantara operasi skidding dan hauling. Isu utama adalah berkaitan dengan kurangnya produktiviti yang disebabkan oleh traktor yang menyebabkan kelewatan dalam proses penuaian hutan. Objektif kajian ini adalah untuk mengukur masa dan jumlah operasi traktor pengangkut kayu di hutan. Kedua, untuk menganalisis hubungan antara waktu, isipadu dan jarak pengendali traktor pengangkut dan ketiga, untuk menentukan keberkesanan proses menaikkan dan menurunkan balak oleh traktor pengangkut kayu di Hutan Simpan Sapulut, Tibow, Sabah. Tempat kajian ini, dilakukan di Hutan Simpan Sapulut Tibow, Sabah. Data yang diambil adalah berdasarkan jarak dan masa, masa dan produktiviti, serta jarak dan produktiviti. Produktiviti adalah sasaran utama yang harus dicapai dalam proses penuaian tertentu. Bagi mencapai kadar produktiviti yang optimum, masa dan isipadu balak yang dibawa oleh traktor pengangkut kayu harus dipertimbangkan. Jumlah isipadu balak bagi setiap perjalanan untuk kedua dua proses menaikkan dan menurunkan balak perlu di selaraskan di antara 54 hingga 56 m³ dan jumlah masa diantara 0.9 hingga 0.9 jam bagi mencapai tahap produktiviti yang optimum iaitu pada kadar 55 – 57. Dalam kajjian ini, keputusan menunjukkan bahawa tractor pengangkut kayu mengambil jumlah masa 3.13 jam untuk melengkapkan 5 perjalanan dalam sehari. Pemandu yang berpengalaman dapat menyelesaikan 8 hingga 10 perjalanan atau lebih yg boleh mencapai jumlah isipadu antara 400 hingga 500 m³. Manakala pemandu yang berpengalaman bagi proses menurunkan dapat menyelesaikan 11 hingga 15 perjalanan atau lebih dalam sehari yang boleh mencapai jumlah isipadu diantara 400 hingga 500 m³. Tambahan pula, jarak diantara lori dengan matau juga menyebabkan keberkesanan masa dan produktiviti terjejas walaupun perbezaan jarak yang sedikit. Hubungan antara masa, isipadu dan produktiviti telah dibincangkan dalam kajian ini. Hasil daripada kajian ini boleh digunakan untuk penambahbaikan terhadap gangguan persekitaran dan nilai ekonomi untuk proses penuaian pada masa akan datang.

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APPROVAL SHEET

I certify that this research project report entitled “Operational Efficiency Of Timber Loading and Unloading In Sapulut Sabah” by Mohammad Azhar bin Aziz 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, Universiti Putra Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 General Background

Timber harvesting is one part of forest operation management. Timber harvesting operation is a process removed the trees from the stump for log production. The operation consists of three main activities and they are tree cutting, log extraction and transportation.

Forest transportation is a process of transferring the log to the log landing and to final destination for end products. It is the most important part in making the timber products available from forest to the mill. Common transportation types used in timber harvesting operation are through land, water and in some operation practicing reduce impact logging (RIL), helicopter are employed. In Malaysia forest harvesting by Heli-logging was done in Sabah in June 2014, helicopter logging was carried out for the first time in Sabah. The logging was carried out with the sky crane helicopter, a Sikorsky S64E in the concession of Yayasan Sabah in the Kalabakan Forest Reserve (Sabah Forestry Department, 2014). Trucks with specified horsepower are the main vehicle used for land transportation. In the old days, animal such as elephant, ox and horse were used to transport the log from forest to the exit point or log landing. Before the World War II ended in Peninsular Malaysia, animal is the main transportation system used in making the timber products available (Norizah et al., 2011). In the case for water transportation, trucks are used at initial to take the logs to the water point. The bunch of logs, floating are attached to the boat and hauled to the final destination then.

To date, timber harvesting operation in Peninsular Malaysia has focused to the forest areas elevated above 350m. At this area, land transportation using truck is important. The transportation activities can be described as off road transportation and on road transportation. Winch lorry is used to move logs from harvesting area to the main log landing through feeder road and secondary road. This is called off road transportation. Transportation under paved road with specified licensed truck moving the logs from main log landing to the final destination is called on road transportation.

Transportation is the most costly operation in timber harvesting. As such, a sound road network need to be planned and designed prior the timber harvesting taking place to provide access and allow the log moved efficiently to its destination (Frisk et al., 2010 and Epstein et al., 2007). Tradeoff between the fixed and variable coat of road construction and log transportation has been the focus of transportation planning research since decades (Ghaffariyan et al., 2010 and Chung et al., 2008). Fixed cost is associated with road construction, and transportation with variable log volume at one cycle presents the variable cost. Understanding the elemental work and working pattern of log transportation gives an idea to how much the maximum road cost need to be constructed (Ghaffariyan et al., 2010).

Log transportation consists of three elemental works that are loading, proper transport and unloading (Antoniade et al., 2012). Each elemental works occupy different time and this variance may influenced by log volume, machine horse power, operator, road access and delay. Delay can be mechanical,

personal and operational delay. Mechanical delay can be simplified as the delay that related to the mechanical problem such as break down or under maintenance. While personal delay is the delay that is occur because of the operator like lunch and smoking. The operational delay it can occurs because of the two delays type that effect to the scheduled of the operation. Time spend for transportation activities with associated independent variables are measured in productive machine hour (m^3/PMH), and in schedule machine hour (m^3/SMH) if delay is included for productivity estimation (Norizah et al., 2012). Besides that, as operational cost of fixed and variable are calculated for transportation activities, the operational efficiency ($\$/m^3$) is derived.

The components of loading and unloading have the most prominent affect on log movement between the landing and the end-use point. Log loading is an element in logging system since it is the means by which forest products-tree-length stems, logs, or bolts are relocate from the ground to some form of conveyance which will complete the transportation cycle (Steve, 1982). When loading is slower than hauling, for instance, than truck lose time waiting. If loading capacity is greater than hauling capacity, than the loader and crew are idle until an empty truck arrives. Good transportation and integrated infrastructure are required to realize adequate economic return to make processing a diverse log supply feasible (as cited in John et al., 2004).

1.2 Problem Statement

Forest operations are related to the forest management and development. Forest operation is the physical actions which change the forest, altering structure, composition, condition, or value in order to meet the demand from mills. Forest operations are the source of both the benefits of management. It generates value for society through improved forest conditions and product outputs. Log transportation is a major operational segment in forest harvesting process.

In forest harvesting operation, all activities conducted are being evaluated at operational level. Operational planning is the most essential function to be performed in a forest harvesting operation. For loading and unloading activities, log loader grapple is a common machine used. There is still lack of study regarding time study and relationship of loader with productivity in Forest Reserve Sapulut Tibow, Sabah.

The low productivity by loader may caused delay on hauling process. The landing element interfaces with truck loading because of this interrelationship, loading should always be considered when building log decks. Landing should be levelled, well drained, and large enough to accommodate, if necessary, skidder activity, truck loading, log storage and sorting (Mousavi, 2013). For efficient operation the number of trucks must be balanced with the loader capacity to avoid delay waiting to load.

1.3 Objective

The objectives this study were:-

1. To measure time and log volume for loading and unloading activity.
2. To analyze the relationship between time, volume and distance for loading and unloading activity.
3. To determine the efficiency of loading and unloading in timber harvesting operation at Sapulut Forest Reserve, Tibow, Sabah.



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