



UNIVERSITI PUTRA MALAYSIA

**STUMPAGE APPRAISAL FOR TIMBER CONCESSIONS IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

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**STUMPAGE APPRAISAL FOR TIMBER CONCESSIONS IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

By

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**Thesis Submitted in Fulfilment of the Requirement for the Degree
of the Master of Science in the Faculty of Forestry,
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LIST OF ABBREVIATIONS

AACs	Annual Allowable Cuts
ANOVA	Analysis of Variance
Compt.	Compartment
CI	Concession Number one
CII	Concession Number two
CIII	Concession Number three
DD	Dry Dipterocarp Forest
DoF	Department of Forestry
dbh	Diameter at Breast Height
FMP	Forest Management and Planning
GoL	Government of Lao
Lao PDR	Lao People's Democratic Republic
LSFP	Lao-Swedish Forestry Programme
MAF	Ministry of Agriculture and Forestry
MD	Mixed Deciduous Forest
NLS	Non-linear Least Squares
NSRM	New System of Resources Management
OLS	Ordinary Least Squares
TVD	Timber Value Distribution



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March 1997

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Forest lands in Lao People's Democratic Republic (Lao PDR) are largely owned and administered by the government. The government allocates forest logging areas to private companies through long-term contracts which defines the rights and other duties of the concessionaires to extract logs from the forest. Concessionaires have to pay timber fee to the provincial government under the agreement for rights to extract the logs. The timber fee collected by the government is the royalty rate, assessed on volume timber extracted and differentiated by species. The royalty collected does not reflect the appropriate stumpage value concessions, most obvious is the loss in revenue which reduces the apparent viability of government investment in forest management.

This study was conducted to estimate stumpage values of various compartments and their capture by the government and concessionaires for three logging concessions in Lao PDR. The objectives of the study were to:



- (i) estimate stumpage values of various compartments and their capture by the government and concessionaires,
- (ii) study the impact of changing economic parameters on stumpage value, and
- (iii) determine the optimal royalty rate using some previously developed microeconomic models.

Three logging concessions, representing the north, central, and south region were selected for study. Data on timber volumes were based on pre-felling inventory carried out by Lao Department of Forestry. Data on log prices were collected from the respective concessionaires. Data on logging costs were obtained from a previous study. These data were combined to calculate stumpage value using a residual value approach. The estimation of stumpage values in the three concessions were made on the following categories: stumpage values by cutting limit, species group, species, diameter classes and main species, commercial species categories, and timber qualities. To determine the optimal royalty rates in Lao PDR, four econometric models were used, viz., uniform royalty, *ad valorem* royalty, premium, and royalty models. Analyses were performed using a simultaneous system of equations to estimate optimal royalty rates for selected logging compartments included in the study.

The results of the analyses indicated that stumpage values for logging compartments in Lao PDR vary substantially, ranging from US\$10,571.6 to US\$42,877.2 per hectare. The stumpage value above cutting limits of all blocks in each compartments ranged from US\$2,365.5 to US\$20,594.2 per hectare while



the stumpage values of individual species also vary from US\$0.7 to US\$8,384.0 per hectare. Sensitivity analyses indicated that stumpage values were positive even though log prices were increased by 10 percent and logging costs were decreased by 10 percent. The optimal royalty rates were found to range from US\$163.51 to US\$256.25 per cubic meter. The *ad valorem* royalty estimate ranged from 0.75 to 0.81 percent of log prices for all compartments. The most appropriate revenue system, the premium model, the rate ranged from US\$2,154.47 to US\$21,675.48 per hectare.

The policy implications of the study are that the government could employ stumpage appraisal to ensure that the Lao government obtain maximum benefits from harvesting its forest. Secondly, the government can determine the use of appropriate revenue systems and optimal rates to ensure sustainable timber production.

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi keperluan untuk mendapatkan Ijazah Master Sains.

**PENILAIAN STUMPEJ UNTUK KONSESI BALAK DI REPUBLIK
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Hutan di Republik Demokratik Rakyat Lao (Lao PDR) sebahagian besarnya dimiliki dan ditadbir oleh kerajaan. Kerajaan mengagihkan kawasan hutan kepada syarikat persendirian dengan mengeluarkan kontrak jangka panjang yang mana menggariskan hak dan tanggung jawab para pembalak untuk mengekstrak balak dari hutan. Para pembalak dikehendaki membayar cukai kepada kerajaan wilayah di bawah perjanjian ini. Cukai yang dikutip oleh kerajaan ialah kadar royalti yang dinilai berasaskan kepada isipadu balak yang diekstrak dan kadarnya berbeza antara spesis. Royalti yang dikutip tidak menggambarkan nilai stumpej konsesi yang sesuai dan mengakibatkan paling kehilangan hasil yang ketara dan mengurangkan kebolehan pelaburan kerajaan dalam pengurusan hutan.

Kajian ini bertujuan untuk menganggarkan nilai stumpej beberapa kompartmen serta hasil yang dikutip oleh kerajaan dan pembalak bagi tiga konsesi balak di Lao PDR. Objektif kajian ini adalah untuk:



- (i) menganggarkan nilai stumpej beberapa kompartmen dan hasil stumpej yang dikutip oleh kerajaan dan pembalak,
- (ii) untuk mengkaji kesan perubahan parameter ekonomi ke atas nilai stumpej, dan
- (iii) untuk menentukan kadar royalti optima menggunakan beberapa model mikroekonomi yang telah dibentuk sebelum ini.

Tiga konsesi balak telah dipilih bagi mewakili kawasan, utara, tengah dan selatan. Data isipadu balak yang digunakan adalah berdasarkan kepada inventori sebelum tebangan yang dijalankan oleh Jabatan Perhutanan Lao digunakan dalam kajian ini. Data harga balak pula diperolehi daripada pembalak yang (bertanggung) jawab dalam mengekstrak balak manakala data kos pembalakan diperolehi berdasarkan kajian yang lepas. Kesemua data tersebut digunakan untuk mengira nilai stumpej dengan menggunakan pendekatan nilai baki. Penganggaran nilai stumpej dalam tiga konsesi dibuat mengikut kategori-kategori seperti: nilai stumpej mengikut had tebangan, kumpulan spesis, spesis, kelas diameter dan spesis utama, kategori spesis komersil dan kualiti balak. Empat model makroekonomi (royalti setara, royalti *ad valorem*, premium dan model royalti) telah digunakan bagi menentukan kadar royalti optima di Lao PDR. Analisis menggunakan sistem persamaan serentak telah dijalankan bagi menganggarkan kadar royalti optima untuk kompartmen pembalakan terpilih dalam kajian ini.

Keputusan analisis menunjukkan nilai stumpej bagi kompartmen pembalakan di Lao PDR adalah berbeza, (berjulat antara US\$10,571.6 hingga US\$42,877.2 se

hektar). Nilai stumpej di atas had tebangan untuk kesemua blok dalam setiap kompartmen didapati berjulat antara US\$2,365.5 hingga US\$20,594.2 se hektar. Nilai stumpej untuk setiap spesis juga didapati berbeza antara US\$0.7 hingga US\$8,384.0 se hektar. Dari analisis kepekaan yang dijalankan, nilai stumpej didapati memberi bacaan yang positif walaupun harga balak telah meningkat sebanyak 10 peratus dan kos pembalakan menurun pada kadar yang sama. Kadar royalti optima pula didapati berjulat antara US\$163.51 hingga US\$256.25 se meter padu. Royalti *ad valorem* pula dianggarkan terletak antara 0.75 dan 0.81 peratus untuk kesemua kompartmen yang terlibat. Dari keputusan kajian, didapati sistem hasil yang paling sesuai terletak antara US\$2,154.47 dan US\$21,675.48 se hektar yang ditunjukkan oleh model premium.

Keputusan kajian ini menunjukkan penilaian stumpej dapat memastikan kerajaan Lao memperolehi faedah yang maksima dari pembalakan hutan di Lao PDR. Kerajaan juga boleh menentukan sistem hasil dan kadar optima yang sesuai untuk memastikan aktiviti pembalakan yang berkekalan.

CHAPTER I

INTRODUCTION

General Background

The forest resource of Lao People's Democratic Republic (Lao PDR) has been declining significantly over the past two decades. The natural forest estate is regarded as the most valuable among other resources in the country. Forestry is the major land use system in Lao PDR. Unfortunately, the actual amount of land under forest is difficult to estimate. During the old regime (before independence in 1975) about 700,000 cubic metres of trees with good economic value were logged each year. Although the annual deforestation had been considerable, Lao PDR still maintains a high forest cover total land ratio where about 1.2 million hectares or 47 percent of total land area is under forest (Mats and Khamphay, 1992). Deforestation varies from year to year because of the Lao government's policy of striking a balance between harvesting and conserving the country's valuable forest resource. For example, between 1975 and 1981 the average annual deforestation rate was estimated at 122,000 hectares per year compared to 67,000 hectares from 1982 to 1989 (Department of Forestry, 1994).



To reduce deforestation, log exports were banned in 1989 and the resource's tax increased. Export taxes were also imposed on forest products to make large volumes of logs available for domestic processing. This, however, resulted in a dramatic fall in logging because of lower profits. Generally, there are still good commercial forest stands scattered throughout the country where more are found in the central and southern parts. These remaining forests are and will be important to the national economy because of the reliance of the government's economic policy framework on forests as an important contributor to growth and development.

Lao PDR does not have the option of locking up its forest resources because 85 percent of the population's livelihood depends on it. In addition, forest also contributes towards foreign exchange earnings, employment and economic growth. In 1989, wood products accounted for some 40 percent of official exports, while the share of forestry in GDP was estimated at about 15 percent. Moreover, some 80 percent of domestic energy consumption is wood-based. The forests also provide much minor non wood products, foodstuffs and medicine that are critical to the well-being of the village communities.

In 1990, revenue from the export of timber and forest products amounted to US\$20.6¹ million. Total export value of wood products including lumber and finished wood processing amounted to US\$38.2 million in 1993. Total export value

¹ Current equivalents: Kip 750 = US\$1.00 (National Bank of Lao PDR, 1994)

of raw logs contributed US\$8.5 million for the same year. Together, they accounted for 22 percent of the total export earnings (Amin, 1994).

Under the Lao PDR constitution, all existing forest lands are properties of the community represented by the provincial government (Prime Minister's Office, 1993). Individuals, collectives or juridical entities may hold tenure and use of any forest land authorized by the Ministry of Agriculture and Forestry. Any tree, planted and maintained by these parties using own labour or capital can be legally transferred or inherited through notification with the Ministry of Agriculture and Forestry. The government also recognizes the rights to use of the forests in accordance with the villagers customs, such as, for fuelwood and gathering of certain timber and non-timber products.

Use of the forest by industries, such as for hydropower development and mining will also continue for economic growth. Pressure to expand the forest based-industries beyond sustainable level will continue. Long-term forest management planning is crucial to maintain the livelihood of many of the rural and forest dwellers, especially in the uplands. Non-wood forest products are important sources income for the local population. Examples are sticlac, cardamom, bamboo, rattan, and pine resin. Small amounts of these products are also exported to neighbouring countries. In addition, about one hundred of other products harvested from the forest are important to the local rural households.

In 1994, import and export duties accounted for 29.2 percent of the gross domestic products (GDP), while timber royalties contributed 27.4 percent, followed by turnover taxes, 16.6 percent. Total forest revenue collected by provincial forestry sections in Lao PDR amounted to US\$ 4.5 million in the same year (Department of Forestry, 1993). Further development of the wood-based industries in Lao PDR is important to maintain its current position as the major income earner in the country. To ensure permanent supply of forest products, environment stability in the form of soil conservation, watershed protection, and wildlife are important considerations. Equally, education and research will be important to meet future needs.

Problem Statement

In Lao PDR, forest lands are largely owned and administered by the government. Forests are harvested under concession agreements between the government and private company referred to as timber concessionaires. Timber concessionaires are given the right to harvest and extract logs from the forest. Concessionaires pay timber fees to the provincial government under the agreement. Logs are in turn sold to concessionaires through fixed charges established by the government, not market forces. This timber fee, or royalty, is assessed based on volume of actual logs extracted from the forest. The royalty is uniform across sites and differentiated by species groups. Thus, it does not reflect variations in timber quality and extraction costs.

Royalties paid by concessionaires to the government could be fall short of stumpage values which may result in low timber revenue capture by the government (Sulaiman, 1977; Gillis, 1988; Vincent, 1990). Problems surface from this could be underpricing. The most obvious could be the loss in revenue which reduces the apparent viability of government investment in forest management. Failure to capture the potential stumpage value may also reduce public sector forestry investment and future returns from this investment. Stumpage values not captured by the government instead could be benefitted concessionaires. In addition, concessionaires would likely to harvest more timber beyond the allowable cut because concession contracts are short and insecure.

A study on stumpage appraisal for timber concession in Lao PDR is therefore timely and urgently needed. It would provide decision makers alternative revenue systems for improved stumpage value capture thus enabling the government to maximize benefits from forest harvesting.

Objectives of the Study

The general objective of the study was to estimate the stumpage value of some concession compartments in Lao PDR. Specifically, the objectives of the study were:

- (i) to estimate stumpage values of various compartments and their capture by government and concessionaires,
- (ii) to study the impact of changing economic parameters on stumpage value, and
- (iii) to determine the optimal royalty using previously developed microeconomic models.

Organization of the Thesis

This thesis is organized into six chapters. Chapter II highlights the forest management, allocation and revenue systems in Lao PDR. The materials presented provide a general framework for the basis of this study. Chapter III presents a review of the literature on stumpage value conducted in tropical countries. The methods used in this study is described in Chapter IV. Chapter V presents the results and discussion while Chapter VI concludes on policy implementation and recommendations of the study.

CHAPTER II

FOREST MANAGEMENT IN LAO PDR

General Background

Lao PDR has a land area of 236,800 sq km covering over 1,700 km from north to south and between 100 km and 400 km from east to west. The eastern border with Vietnam is 1,957 km long while that with the kingdom of Thailand in the west is 1,730 km. In the south, the border with Cambodia covers 492 km while the north border with China stretched 416 km and Myanmar, 230 km (Figure 1). Administratively, Lao PDR is divided into eighteen provinces.

Although, Lao PDR has no direct access to the sea, it has an abundance of rivers, including a 1,865 km stretch of Mekong River (Nam Khong), which borders Myanmar and Thailand. Most of the Mekong and its tributaries are navigable. They also transport alluvial deposits for some of the fertile plains. Most of the areas of Lao PDR are mountainous and situated in the moist tropical region, rising from 200 to 2,820 metres. The mountains pose difficulties in transportation and communication although they present vast potential for hydro power. Located in the tropics, the climate is affected by monsoon rains from May to September.

