



**UNIVERSITI PUTRA MALAYSIA**

**ANALYSIS OF DEMAND AND SUPPLY OF SAWN TIMBER  
IN LAO PEOPLE'S DEMOCRATIC REPUBLIC**

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**ANALYSIS OF DEMAND AND SUPPLY OF SAWN TIMBER  
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**By**

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**Thesis Submitted in Fulfilment of the Requirements  
for the Degree of Master of Science in the  
Faculty of Forestry  
Universiti Putra Malaysia.**

**March 2000**

**DEDICATED TO MY BELOVED  
PARENTS AND WIFE**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia  
in fulfilment of the requirements for the Degree of Master of Science.

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**Faculty : Forestry**

This study was conducted to investigate the main factors affecting supply and demand of sawn timber in Lao PDR. A market model of sawn timber consisting of supply, export and domestic demand equations, and an identity equation was formulated and developed. The partial adjustment framework for supply and demand of sawn timber was developed. Annual data for the period 1978 to 1992 were used in this study. Secondary data obtained from various sources including those published by local and international organisations and the record of relevant wood industries in Lao PDR were also used. The model was estimated using two stage least square technique (2SLS).

The regression and simulation test results indicated that the estimated models were quite satisfactory. All the significant coefficients had the

correct signs. The Root Mean Square Percentage Error and Theil Inequality Coefficient values of the estimated models were low.

The findings indicated that sawn timber price and total revenue, the latter of which was used as a proxy for total area harvested, were important factors influencing the supply of sawn timber. The supply elasticities with respect to these variables were 1.263 and 1.682, respectively. On the domestic demand side, per capita income was an important factor influencing the quantity demanded for sawn timber. The income elasticity with respect to the variable was 1.400. Two main factors that affect the quantity export demand were world per capita income and world sawn timber import price. The elasticity values with respect to these variables were  $-1.741$  and  $2.661$ , respectively.

The findings suggest that policy variables such as annual coupe as estimated do have an impact on quantity of sawn timber supplied. This suggests that the government can influence sawn timber supply by manipulating the annual logging coupe. Demand for sawn timber, however, is more dependent on market forces, particularly by prices of sawn timber and substitute.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk ijazah Master Sains.

**ANALISA KE ATAS PERMINTAAN DAN PENAWARAN KAYU GERGAJI DI  
REPUBLIK DEMOKRATIK RAKYAT LAO**

oleh

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**Fakulti : Perhutanan**

Kajian ini dijalankan untuk mengkaji faktor-faktor penting yang mempengaruhi penawaran dan permintaan kayu gergaji di Lao PDR. Model pasaran kayu gergaji dan persamaan identiti telah ditentukan melalui persamaan-persamaan permintaan penawaran, permintaan eksport dan permintaan tempatan. Rangka kerja penyelarasan separa juga telah diperolehi untuk penawaran dan permintaan kayu gergaji. Data-data tahunan 1978 sehingga 1992 digunakan dalam kajian ini. Data-data dari sumber lain seperti rekod yang diterbitkan oleh organisasi tempatan dan antarabangsa juga digunakan. Model telah dianggarkan dengan menggunakan teknik kuasa dua terkecil dua peringkat (2SLS).

Keputusan persamaan regresi dan ujian simulasi menunjukkan model anggaran adalah agak memuaskan. Kesemua koefisien yang beerti

mempunyai tanda yang betul. Nilai-nilai anggaran Ralat Peratusan Punca Kuasa Dua dan Koefisien Ketidaksamaan Theil adalah rendah.

Keputusan kajian menunjukkan bahawa harga kayu gergaji dan jumlah hasil yang digunakan sebagai pengganti keluasan kawasan yang dituai adalah faktor-faktor penting dalam penentuan penawaran kayu gergaji. Keanjalan penawaran pembolehubah tersebut masing-masing adalah 1.263 dan 1.682. Pendapatan per kapita adalah faktor paling penting yang mempengaruhi kuantiti permintaan kayu gergaji pasaran tempatan. Keanjalan pendapatan ini adalah 1.400. Permintaan kuantiti eksport untuk kayu gergaji dipengaruhi oleh pendapatan per kapita dunia dan harga import kayu gergaji dunia. Nilai keanjalan untuk kedua-dua pembolehubah tersebut masing-masing adalah -1.741 dan 2.661.

Keputusan yang diperolehi menunjukkan bahawa pembolehubah polisi seperti tebang tahunan mempunyai kesan ke atas kuantiti kayu gergaji yang ditawarkan. Ini menunjukkan kerajaan boleh mempengaruhi penawaran kayu gergaji menerusi kawalan ke atas tebang tahunan. Permintaan kayu gergaji adalah dipengaruhi oleh faktor pasaran terutamanya harga kayu gergaji dan barang pengganti.

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## **LIST OF ABBREVIATIONS AND VARIABLES USED IN THE ANALYSIS**

2SLS	Two stage least squares
APEI	Absolute percentage error index
D	Demand
DAFI	Development of agriculture and forestry industry
dbh	Diameter at breast height
FAO	Food and Agriculture Organization
ha	Hectare
Lao PDR	Lao People's Democratic Republic
M	Per capita income
m <sup>3</sup>	Cubic metre
M <sub>w</sub>	World per capita income
OLS	Ordinary least square
P	Price
PA	Partial adjustment
P <sub>EXST</sub>	Export price for sawn timber
P <sub>L</sub>	Costs of log input
PM	Prime Minister
P <sub>PL</sub>	Price of plywood
P <sub>ST</sub>	Price of sawn timber
P <sub>WIST</sub>	World substitute price for softwood sawn timber
Q	Quantity
Q <sub>DST</sub>	Quantity of domestic demand for sawn timber
Q <sub>EXST</sub>	Quantity of export demand for sawn timber
Q <sub>SST</sub>	Quantity of sawn timber supply
R <sup>2</sup>	Coefficient of determination
Rev	Forest revenue
RMSE	Root mean square error
RMSPE	Root mean square percentage error
S	Supply
SPSS	Statistic Package for Social Science
TFAP	Tropical forest action plan
U	Theil inequality coefficient
US\$	US dollars

## **CHAPTER I**

### **INTRODUCTION**

#### **General Background**

Lao People's Democratic Republic (Lao PDR) has a total forest area of 11.2 million hectares or 47 percent of the total land area of the country. The government is responsible for managing forest resources for long term social benefits. This is highlighted in the Fifth Party Congress of the Lao People's Revolutionary Party in 1991:

“Forest is a valuable resource extremely useful to our country's social-economic environment. Our policy in this field aims at preserving and increasing forestry resources, correctly and effectively, using the huge value of the forest.”

The forest area is not evenly distributed in Lao PDR. The pattern of distribution shows that quite substantial valuable forests are located in the central and southern parts whilst the remaining are concentrated at high altitudes and hill tops in the northern part of the country. The commercial forests scattered throughout the country are located mainly in the central and southern parts with an allowable annual cut of approximately 105,000 cubic metres and 140,000 cubic metres, respectively. In the northern region, which is covered by mountains, forests of lower quality are dominant with annual allowable cut of 33,000 cubic metres (Goodlet, 1989).



The forests in Lao PDR consist of numerous tropical plant species occurring in a wide range of geo-ecological locations, offering favourable habitats for flora and a large number of wildlife species. There are more than 150 utility tree species of which only approximately 30 species of these are commercially utilized. The most common commercial species belong to the Dipterocarp group.

For many years, Lao PDR depended on its rich natural forests as a main source of income and foreign exchange. In 1992, timber and wood products constituted over 40 percent of the country's export earning. In 1993, exports of wood products including sawn timber amounted to US\$38.2 million. Meanwhile, export of raw logs generated approximately US\$8.5 million. In 1993, the export value dropped to 22 percent of the total export earnings, but it was still the single most important sector of Lao's economy. The demand for sawn timber increased over the three year period between 1993 to 1995. In 1993, the domestic demand for sawn timber was estimated at 121,000 cubic metres and it increased to 191,000 cubic metres in 1995. The export for sawn timber indicated an increasing trend over the seven year period between 1989 till 1995. This was due to the government policy of imposing strict restrictions on the export of logs. In 1988, sawn timber export was only 35,000 cubic metres, but this increased to 159,000 cubic metres in 1994 (Anon, 1995a).

In future, the demand for forest and forest products, especially for sawn timber, is expected to increase due to increase population and further economic development activities. Neighbouring countries are already facing shortage of timber supply. Thailand for example, requires approximately 6 million cubic metres of timber for her timber industry annually, whilst logging is totally prohibited from the public-owned natural forest (Anon, 1994a). The People's Republic of China is another country with timber shortage and high demand for hardwoods. Thus, impending shortage of timber in neighbouring countries such as Thailand, Taiwan, Japan and increasing demands for sawn timber in Lao PDR will result in an unbalanced demand and supply situation of the sawn timber market in the country.

### **Problem Statement**

There has been an increasing trend of demand for sawn timber over the last few years in Lao PDR. The change in price or other demand factors will affect demand for sawn timber over short as well as long term. If the price elasticity of demand for sawn timber is high, this will have a significant effect on the wood-based industry in Laos. A minor price hike will result in a big decline in log demand by the sawn timber industry, consequently log exports more attractive. On the other hand, if the demand elasticity is low, price hikes may not have a great impact upon the quantity of logs

demand by sawmillers and eventual sawn timber exports. Similarly, supply elasticities too have their impacts to the industry. To a certain extent, demand and supply elasticity coefficients will influence the development of log processing industry in Lao PDR.

### **Justification of Study**

There is very limited information on the economics of demand and supply for sawn timber in Lao PDR. No work has been done on identifying the factors which affect the demand and supply as well as market potential. Furthermore, there has been no studies conducted thus far, on modelling and forecasting of forest-based industries in the country. This study therefore, was conducted to develop models that will forecast the demand and supply of sawn timber. Such models will be very useful for long term planning of forest-based industries in order to maximize socio-economic benefits to the society.

### **Objectives of Study**

The general objective of the study was to examine supply and demand of sawn timber in Lao PDR. Specifically, the objectives of the study were:

- (i) To identify factors affecting supply and demand of sawn timber.

- (ii) To estimate supply and demand elasticities of sawn timber.
- (ii) To develop a model for supply and demand of sawn timber, and to apply this model in predicting the future supply and demand for sawn timber in Lao PDR.

## **CHAPTER II**

### **FORESTS AND FORESTRY IN LAO PDR**

#### **General Background**

Lao People's Democratic Republic (Lao PDR) is located between latitudes 13-14 degrees north and longitudes 100-108 degrees east. It has a land area of 236,800 square kilometres, stretching more than 1,700 km from north to south and between 100 km and 400 km from east to west. The eastern border with the Socialist Republic of Vietnam is 1,957 km long whilst that with Thailand on the west is 1,730 km. In the south, the border with Cambodia stretches 492 km long, the north border with China stretches 416 km, whilst the northern border with the Union of Myanmar, stretches 230 km (Figure 1). Administratively, Lao PDR is divided into eighteen provinces. Table 1 shows the provinces and distribution of the population for 1995 (Anon, 1995b).



Figure 1: Location of Lao PDR and its provinces