

Why do farmers choose to harvest small-sized timber? – A Survey in YenBai Province, Northern Vietnam

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	1
2.0 ANALYTICAL FRAMEWORK	3
3.0 RESEARCH METHODS	4
4.0 THE STUDY AREA	5
4.1 General description	5
4.2 Forest resources	6
4.3 Forest management and use	7
5.0 SURVEY RESULTS AND DISCUSSIONS	8
5.1 The respondents	8
5.2 Tree Farming	9
5.3 Market for forest products in YenBai Province	10
5.3.1 Main timber products	10
5.3.2 Timber end-users	10
5.3.3 Timber value chain	11
5.4 Financial Analysis of Tree Cutting	14
5.5 Factors affecting farmers' decision on tree harvesting	15
5.5.1 Rate of Recovery of Investment	16
5.5.2 Financial status of farmers and credit institutions	16
5.5.3 Market and timber price	17
5.5.4 Silvicultural techniques	18
5.5.5 Prevailing policies	19
5.6 Farmers' perception of low-value versus high-value timber	19
6.0 CONCLUSIONS AND RECOMMENDATIONS	20
REFERENCES	23
APPENDICES	24
LIST OF ACRONYMS	26

LIST OF TABLES

Table 1. Stakeholders and relevant information	5
Table 2. Forest area distribution (ha)	6
Table 3. Basic characteristics of the surveyed households	8
Table 4. Household income structure	9
Table 5. Major tree species in household production forests	9
Table 6. Major timber products	10
Table 7. Consumers of timber products	12
Table 8. Timber sold by the surveyed households, 2004.	13
Table 9. Reasons for decisions on timber cutting	15

LIST OF FIGURES

Figure 1. When to cut forests?	3
Figure 2. Map of YenBai Province.	6
Figure 3. Forest area managed by institutions	7
Figure 4. Plantation timber value chains	12
Figure 5. Financial analysis of growing <i>Acacia mangium</i> in YenBai Province (values in VND thousand)	14

WHY DO FARMERS CHOOSE TO HARVEST SMALL-SIZED TIMBER? – A SURVEY IN YENBAI PROVINCE, NORTHERN VIETNAM

Nguyen Nghia Bien

EXECUTIVE SUMMARY

Market for timber in YenBai province is quite clearly defined with two major products: small timber for pulp and wood-chips and large-sized timber for furniture to be consumed either domestically or internationally. A financial analysis shows the obvious economic advantage of growing large-sized timber over small one. However, most of private forest growers have chosen to grow small timber. The study identifies a number of factors affecting forest growers' decision to cut early their trees which include: faster rate of returns from investment, financial status/needs of forest growers; current credit regulations; active role of timber intermediaries in distributing timber from producers to end users; high demand for small timber; and lack of information on profitability of large-sized timber.

1.0 INTRODUCTION

In recent years, Vietnam's timber market has changed dramatically. The value of timber export reportedly accounts for \$US226 million in 1996, \$US288 million in 2000, \$US391 million in 2001 and \$US410 million in 2002. This value reaches about \$US 1.2 billion in 2004, \$US1.6 billion in 2005 and is expected to reach \$US2.0 billion by the end of 2006. Given that, the target of \$US2.5 billion forest export value by 2010 set by Vietnam's Forestry Development Strategy 2001-2010 (Vietnam Ministry of Agriculture and Rural Development, 2001) will become realistic.

However, about 2.5-3.0 million cubic meters of round timber are needed annually. The raw material timber used for making wood products for export must possess certain physico-mechanical properties such as greater diameter, crook, taper, static and impact rigidity, strength, etc. Moreover, new requirements on the standards and quality of forest products traded in the world market force the domestic producers to use timber from sustainably managed forests with forest certification. The main source of raw material for making export-oriented wood furniture is timber imported from Malaysia, Indonesia, Cambodia, Laos, Myanmar, Russia and New Zealand.

Two factors clearly affect timber supply for Vietnam's wood industry. First, timber supply has declined because of the policy to control logging from natural forest in exporting countries, particularly in Southeast Asian countries. Second, the recent dramatic increases in crude oil prices and the regional political instability since the Iraqi war have also contributed to timber price acceleration. During the first five months of 2004, the price of timber imported into Vietnam had increased for 15-20 percent compared to 2003. As the value of timber raw material in export prices accounts for about 48 percent in 2003 and about 60 percent in 2004, increase in prices of round timber inevitably reduces profit of the wood-processing companies. This trend is likely to continue to affect the performance of Vietnam's wood-processing companies

(Nguyen Nghia Bien 2003a, 2003b, 2004). The government objective is therefore to replace this imported wood with large-sized timber from domestic sources.

The existing domestic timber source accounts for around 30 million cubic meters growing on about two million hectares of plantation forest land (Ministry of Agriculture and Rural development 2001).¹ These plantation forests, with mostly fast growing species such as Eucalypts, Acacia, *Styrax tonkinensis*, and *Manglietia glauca*, are mainly managed by state forest enterprises and private forest owners who, according to recent regulations,² can have the full rights over investing and harvesting their plantation forests. Of course, these forest owners usually make decisions of when to harvest based on their own judgment of various factors including market conditions and profitability. In fact, a majority of 2.5 million cubic meters annually cut in Vietnam's plantation forests is of small-size young timber (7-8 years old) which is used mainly for pulp and paper, pit-prop, construction and wood-chip purposes.

However, cutting young timber may not necessarily make farmers/forest growers better-off. Evidence suggests that at age 7, one cubic meter of *Acacia auriculiformis* timber can only reach a size of less than 30-cm diameter and be sold for VND300,000 (\$US20). This generates a profit of about VND4-6 millions (\$US250-400) per hectare for forest owners for the entire rotation. If the timber is harvested at age 12-15, it can be sold at a price of VND1.2-1.5 million (\$US80-100) per cubic meter which makes a profit of VND12-15 million (\$US800-1,000) per hectare excluding revenue from thinning and non-wood products (Anh Vu 2004).³

If indeed cutting trees at a later stage has potentially large financial returns, then, why it is that farmers/forest growers are making this decision? The situation of timber market in Vietnam seems to be more complicated than being understood with more timber buyers entering into the timber market. Newly established local wood-chip factories seems to dramatically influence the current timber demand and hence timber producers' decision. This pilot study aims to understand farmers' decision making for timber growing in this complex situation. In particular, its research objectives are:

- 1) To identify the main market for farmers' tree products;
- 2) To identify factors that affect the decision to cut tree for particular markets;
- 3) To find out why farmers might choose lower-value tree products over high-value wood; and
- 4) To suggest directions for policy reforms in enhancing competitiveness of domestic wood producers as suppliers of raw materials for wood processing.

¹ According to the Land Law and Forest Protection and Development Act, forest land is used mainly for forestry purposes such as forest plantation and/or natural regeneration rather than other non-forestry uses.

² Decree 02/CP (1994) and its revision – Decree 163/CP (1998) on allocating forests and forest land to state and non-state bodies, organisations and individual households for long-term management.

³ These estimates are quoted to give quick and rough assessment only as many factors and values are missing in their calculations.

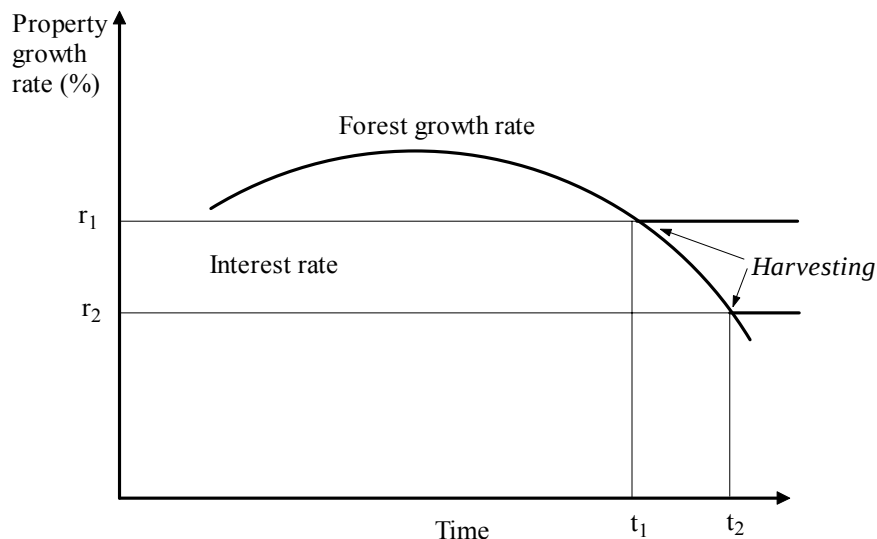
2.0 ANALYTICAL FRAMEWORK

In forestry, forest managers usually apply silvicultural measures in order to modify the natural maturity age of forests for achieving certain management goals. As a result, they can estimate the technological maturity age of a forest stand. However, forest management cannot result in the optimal efficiency if it solely relies on the technical aspect of management. For any forest grower whose behavior is profit-maximizing, the technological maturity age sometimes does not help. Instead, the so-called economic maturity age might be preferred. The economic maturity age – or economic rotation - can be interpreted as a stand age at which the harvesting will generate maximal net revenue per area unit for forest growers. In other words, the optimal rotation will be defined when the net benefits from forest growing on a land approaches a maximum.

The role of interest/discount rates in natural resource management has been stressed in most environmental economics literature. Conceptually, the selected discount rate will decide which part of a resource is used today and which part will be left intact as a “bequest” for future generations. Markandya and Pearce (1988) and Munasinghe (1992) state that high discount rates usually discriminate against future generations as more proportion of a resource is consumed by the present generation means less resource would be left for the future.

In forestry, the business cycle is normally long with costs incurred at early stages and benefits received at later stages. Forestry activities also suffer from the likelihood of occurring risks and uncertainty. The impact of discount (interest) rates on the forestry sector, therefore, appears strongly. According to Varian (1987), a high discount rate in forestry will result in sooner cut of trees without waiting for the maturity age in order to invest in the bank and gets higher interest. Figure 1 shows that the higher discount rate is ($r_1 > r_2$), the sooner the cutting age would be ($t_1 < t_2$). This point is also confirmed by other authors such as Hartwick and Olewiler (1998).

Figure 1. When to cut forests?



Source: After Varian (1987).

Discount/interest rates, therefore, undoubtedly affect farmers' decision-making in timber growing with early incurred costs and late benefits such that high discount rates for may hinder farmers' investment in long-rotation forestry. Rather, farmers' may prefer investing in activities with shorter time and quicker returns such as agriculture and/or short-rotation timber. A low interest/discount rate, from a viewpoint of Vietnamese forest growers/farmers, may be more preferred with regard to long-rotation plantation forests. This leaves a space for government interference.

3.0 RESEARCH METHODS

The study generated the following information on various aspects of timber growing:

Biophysical and socio-economic characteristics of the area such as topography, soil and climatic conditions, population, market access, infrastructure, etc.

Data on factors affecting timber demand to include:

- timber products: small versus large-sized round timber;
- timber consumers: intermediate and end-users
- standard/requirements for raw material and final products
- estimated volume demanded for different type of timber products.
- institutional factors in the timber market, for example, competitive or monopolistic market.
- existing policies that may affect timber production and consumption.

Data on timber supply, based on information such as:

- Distribution of forest resources (both area and volume) according to forest types, forest quality (rich, medium, poor), forest ownership, forest stand age, and others.
- Characteristics of decision makers, for example, socio-economic characteristics, access to capital markets, forestry knowledge, property rights, planting, access to inputs, village characteristics, timber species to grow, production costs, timber prices, etc.
- Reasons why plantation owners are cutting trees at an age earlier than is economically ideal as viewed by both the tree growers and the government.

Conduct of surveys. The survey is conducted on the field using a prepared questionnaire. Besides, *semi-structured interviewing* is also extensively used to collect basic and qualitative information/data. Stakeholders who were involved in this survey included farmers/forest growers, forest enterprises, provincial forestry department, provincial forest protection department, provincial planning and projection agency, intermediate timber traders, timber supply company, wood-processing company, etc. Information relevant from each stakeholder is shown in Table 1.

Data analysis. The collected data, particularly from 50 farmers/forest growers, is processed using Excel spreadsheet. Descriptive statistics is also used in the form of tables, diagrams and graphs to describe the current situation of local timber demand and supply and explain farmers' decision making for timber growing in the area.

Table 1. Stakeholders and relevant information

No	Stakeholders	Relevant information
1	Farmers/forest growers	Timber production, credit, perception, etc.
2	Timber trade companies Private timber traders	Timber value chains, timber price, timber pattern, timber quality/standards, value added, selling procedure, end-users
3	Wood-processing company Wood-chip factory Paper mill	Production capacity Demand on timber types, standards, volume, buying price, main suppliers
4	Provincial forest department	Provincial policies and strategies, on-going forestry program and projects, investment and credit arrangements
5	Provincial forest protection department	Procedure and regulations on timber harvest and use
6	Provincial planning and projection agency	State of forest resources (area, volume and distribution), timber value chains
7	MARD Forest Department	Government policies and initiatives on large-sized timber development, supporting solutions

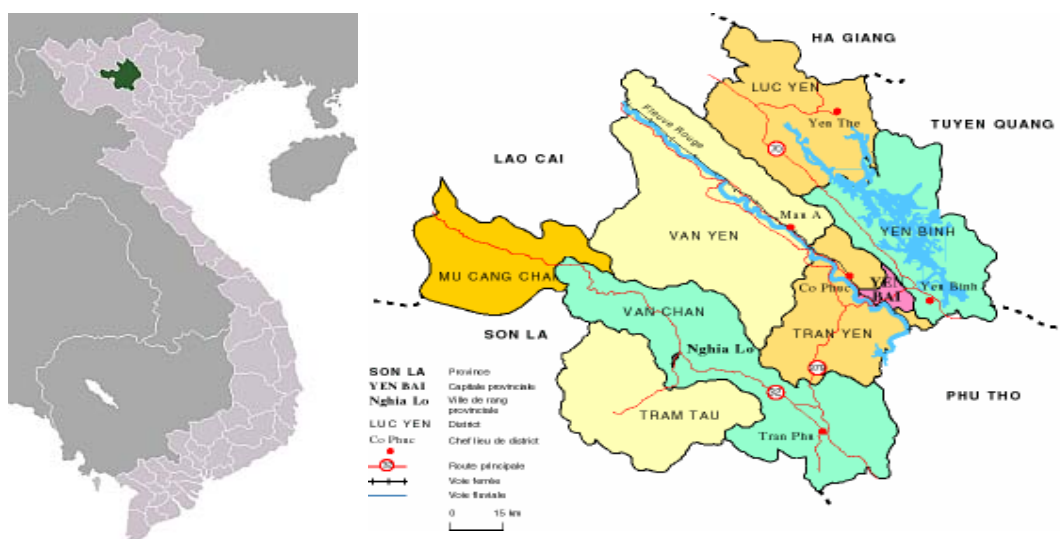
Local workshop is organized to amend lacking information and verify/cross-check collected information on timber growing in YenBai province. The local workshop involves the representatives from a production side (farmers/private forest growers, state forest enterprises), a consumption side (wood-processing factories), state management agencies (Central Department of Forestry, provincial forestry agencies) and educational/research institutions (Vietnam Forestry University) (see Appendix 2).

4.0 THE STUDY AREA

4.1 General description

YenBai is about 150 km in the northwest of Hanoi – the capital of Vietnam (Figure 2). The total area constitutes 688,292.2 ha, of which mountains and highland occupy more than 70 percent. In-between mountain ranges are low hills and flat lands. Climatic conditions are characterized by two distinctive seasons: a cold, dry season is ranging from November to March of the next year with the average temperature of 20⁰C, and a hot, rainy season lasts from April to October with the average temperature of 25⁰C. The hottest months are June and July with a temperature peak of 37-38⁰C. Annual rainfall is observed as high as 1,500-2,000 mm. Land-use patterns in YenBai is very diverse including forest land, agricultural land, resident area, bare land and water bodies. Given that forestland dominates in the total area, YenBai is considered as a major timber supply area in Northern Vietnam.

Figure 2. Map of Yen Bai Province.



4.2 Forest resources

Forestland area in 2004 constitutes 559,175 ha or 82 percent of the total area (see Table 2). Within forestland, forested area is 328,865 ha (57 percent of forest land) and unforested land (bareland) is 230,310 ha (41.2 percent of forest land). In terms of forest types, special-use forest area occupies 3.6 percent while protection forest and production forest have almost similar share of 49.6 percent and 46.8 percent of forestland area, respectively.

Table 2. Forest area distribution (ha)

Categories	2003	2004	Of which		
			Special use forest	Protection forest	Production forest
Total area	688,292.0	688,292.0			
Forest land	559,175.0	559,175.0	20,150.0	277,587.0	261,437.0
<i>Forested area</i>	310,765.9	328,865.0	11,016.0	166,431.6	151,417.0
- natural forest	206,214.3	214,470.5	11,016.0	120,741.7	82,712.8
- plantation forest	104,551.6	114,394.1	-	45,689.9	68,704.2
<i>Unforested area</i>	248,408.7	230,310.0	9,134.0	111,155.6	110,020.0
Others	129,117.4	129,117.4	-	-	-

Source: Survey data

The things to note in the table are the following:

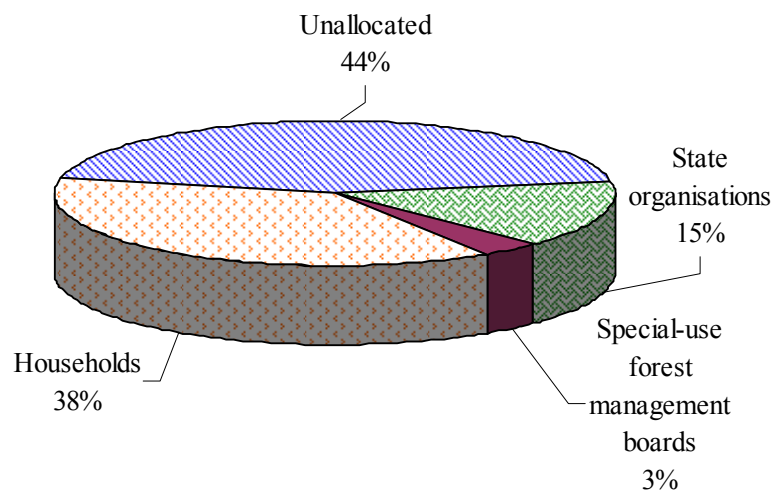
- Special forests refer only to natural forests. Protection and production forests include both natural and plantation forests. The area of natural protection forests is larger than natural production forests but plantation protection forests are smaller in area than plantation production forests.

- While the area of production forests is still smaller than that of protection forests, the increase in plantation forests is greater than in natural forests for the last two years. This shows increasing reliance on forest plantation to meet the current high demand for timber in the area.

4.3 Forest management and use

Figure 3 demonstrates the distribution of forest area by management bodies in YenBai province. Except for the unallocated land area that is still under controversy,⁴ the area under household management accounts for 38 percent - much higher than those under the management of state organizations (15 percent) and special-use forest management boards (3 percent). Given a proportion of plantation production forests in YenBai is high, it is likely that households would play a very important role in timber supply in the region. Within this area, 62,700 hectares are currently managed by 22,220 households holding land use rights certificates, and the remaining 48,000 hectares are managed by 18,820 households whose land right certificates are being issued.

Figure 3. Forest area managed by institutions



Plantation forests are dominated by fast growing tree species such as *Acacia*, *Styrax tonkinensis* and *Manglietia glauca*. These timber plantations have been a main source of raw material to BaiBang Paper Mill, local woodchip units and wood-processing factories. The area, however, has a potential of developing large-sized timber from the existing plantation forests. Large-sized timber is widely used by domestic wood producers to make high-quality wood products for domestic use and export.

Currently, various timber producers and end-users are functioning in YenBai Province, as follows:

⁴ Those areas that are classified by government agencies as “unused land” might in fact have been occupied by local people for years.

- Nine state forest enterprises, one private entrepreneur and 41,040 households (see above) are involved in forest plantation;
- Six other state forest enterprises have a multiple function of managing protection forests, planting commercial forests and producing/processing wood products;
- One state-owned company and more than 200 other units are involved in wood processing.

5.0 SURVEY RESULTS AND DISCUSSIONS

5.1 The respondents

During the field survey, 50 households/forest growers from TranYen and YenBinh districts were interviewed using the prepared questionnaire. Basic information on the sampled households is shown in Table 3.

Table 3. Basic characteristics of the surveyed households

Criteria	Unit	TranYen District	YenBinh District	Sample average
Average age of household head	yrs	54.6	42.2	46.2
Educational level of household head	yrs in school	6.8	8.2	7.8
Total land area	ha/HH	4.57	2.41	3.09
Forest land area	ha/HH	4.01	1.98	2.63
- % of total area	%	87.7	82.3	85.1
Own capital per household	VND mln	4.03	5.15	4.79

Source: Survey data

Survey results show that the average age of the heads of the households involved in forestry is 54.6 in TranYen, 42.2 in YenBinh district and 46.2 for the whole sample. Most of them had not finished secondary school, which might affect the introduction of new technological invention into forestry activities.

Forestland area managed by the sampled households varies at study locations. In TranYen, it accounts for 4.01 ha on average or 87.7 percent of household total land area, while in YenBinh, the figures are 1.98 ha and 82.3 percent, respectively. Although forestland area of the sampled households is relatively small, forestry nonetheless plays a dominating role in household activities. This is confirmed by the figures of household income structure (Table 4).

Table 4. Household income structure

Criteria	TranYen District		YenBinh District		Sample average	
	Quantity (VND mln)	Share (%)	Quantity (VND mln)	Share (%)	Quantity (VND mln)	Share (%)
Agriculture	7.22	37.9	8.74	37.2	8.24	37.4
Forestry	11.22	59.0	11.76	50.0	11.58	52.5
Services	-	-	0.42	1.8	0.29	1.3
Others	0.59	3.1	2.59	11.0	1.94	8.8
Total income	19.03	100.0	23.51	100.0	22.05	100.0

Source: Survey data

Data in Table 4 show that income from forestry activities constitutes a highest share in household total income. For instance, income from forestry for the sampled households in TranYen accounts for VND11.22 million or 59 percent of household total income. Respectively, these figures in YenBinh are VND11.76 million and 50 percent. Clearly, forestry activities contribute dramatically to increase in household income. However, forestry activities are merely limited to low-value raw material trees as will be explained later.

5.2 Tree Farming

Major forest species growing in the sampled households' production forests are fast-growing species such as Eucalypts, Acacia, Styrax, etc. (Table 5). Survey data show that Styrax dominates in production forests of 93.8 percent of the sampled households in TranYen. Meanwhile, Eucalypts dominates in production forests of 97.1 percent of the sampled households in YenBinh district. In fact, the timber of these fast-growing species brings considerable income for forest growers. Moreover, it also plays a big role in meeting the increasing demand for timber determined by pulp and wood-chip factories.

Table 5. Major tree species in household production forests

(in percentage of the surveyed households)

Criteria	TranYen District	YenBinh District	Sample average
Protection forest area (ha)	4.01	1.98	2.63
Share of major tree species (%):			
- <i>Eucalypts</i>	68.8	97.1	88.0
- <i>Acacia</i>	6.3	38.2	28.0
- <i>Styrax</i>	93.8	11.8	38.0
- <i>Cinnamon</i>	87.5	-	28.0

Source: Survey data

5.3 Market for forest products in YenBai Province

5.3.1 Main timber products

Two types of timber are currently predominant in YenBai: small timber used for making wood-chip, pulp and construction work; and large-sized timber used for making exported products. Requirements for and use purposes of different types of timber are shown in **Error! Not a valid bookmark self-reference.** While wood-processing factories require that timber must reach a certain age diameter, pulp and wood-chips factories accept timber of any species with a diameter larger than 6 cm. This results in a strong competition between pulp/woodchip factories and export-oriented wood-processing factories for timber raw material in the region.

Table 6. Major timber products

Timber categories	Use purposes	Requirements/standards
Small-sized timber	Pulp making	Diameter $\geq$ 6 cm of any species
	Wood-chip	Diameter $\geq$ 6 cm of any species
	Construction	Diameter $\geq$ 10 cm of any species
Large-sized timber	Furniture making	Timber age at least 7-8 years
	Veneer	Diameter $\geq$ 15 cm
	Chopstick	Diameter $\geq$ 15 cm
	Sawn timber	Diameter $\geq$ 15 cm

Source: Survey data

5.3.2 Timber end-users

End-users of timber produced in YenBai Province are those that are located both within and outside the province. They include:

- *local small-scale wood-processing units* located in YenBai province. These units produce dining chopsticks and ritual papers for exporting to Japan and Taiwan.⁵ They consume about 13,000 m³ of timber annually.
- *wood-processing factories*. Their production of timber products for export consumes about 15,000 m³ of timber annually, mainly large-sized timber.
- *wood-chip factories*. These factories make either woodchip or unfinished wood-based panels for further processing.
- *local carpenters*. These producers make home furniture mainly for domestic consumption.

⁵ In Asian countries like China, Japan and Vietnam, people believe that the ghost of the dead relatives is still hang around and needs to be treated like alive people. This paper is used to make fake money which is burned in hope that the dead could live on it in the other world.

- *constructing companies*. These also consume a considerable amount of timber in concrete work.
- *BaiBang Paper Mill*. This used to be a monopolistic buyer of timber in the region until the other buyers have entered the market.
- *CauDuong Match factory*. It is located in Hanoi but consumes mostly softwood such as *Styrax* timber for making matches.

As mentioned above, these timber end-users are currently competing with each other for timber, resulting in timber shortage in the area. Given that, even small timber is highly demanded and this may affect farmers' decision on timber growing (see below).

5.3.3 Timber value chain

Major actors involved in this timber value chain include:

- *Forest owners/timber growers*. These can be individual households growing timber on the land allocated according Decree 02/CP and Decree 163/CP, or those who participated in forest plantation jointly ventured with state forest enterprises. Forest owners can also be collectives and/or state forest enterprises.
- *Timber collectors*. These intermediaries can function because farmers/timber growers prefer selling stand forest and/or selling logs at roadside to avoid high cost of transportation.⁶ They also make the timber into assortments according to requirements/ standard from subsequent users before selling to them.
- *Timber wholesalers*. These are also intermediaries in timber trading but their scale is much bigger than that of timber collectors. They can also buy timber from the previous ones. Like timber collectors, they also make assortments before selling to next users.
- *Licensed timber trade individuals/organizations*. They can be forest enterprises and entrepreneurs who are permitted to trade plantation timber. Like the previous timber traders, these entrepreneurs assort timber before selling to end users. They can also make sawn timber or produce timber products like wood-processing factories/units.
- *Wood-processing factories/units*. These bodies, either state-owned or privately owned, use timber from plantation forests as raw material for producing different products for domestic consumption and export. These entrepreneurs can be wood-furniture factories, paper mill, wood-chip factories, wood-based panel factories, private carpenters, etc.

⁶ In many case, these traders pay in-advance for timber in early years to farmers, particularly the poor one, as a loan. They then come back and harvest later.

Table 7. Consumers of timber products

(in percentage of the surveyed households)

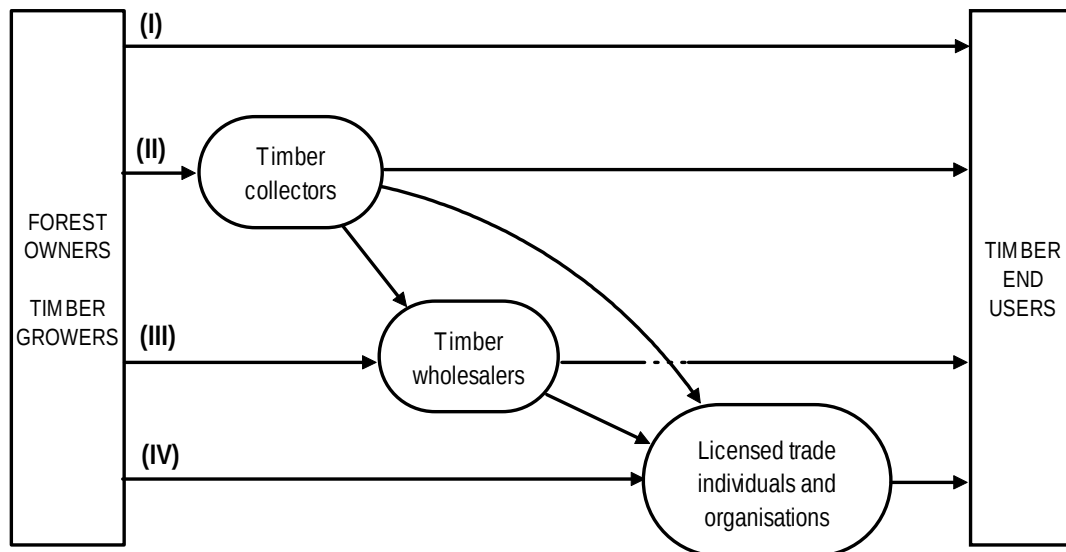
Consumers	TranYen District	YenBinh District	Sample average
Timber collectors	93.8	100.0	97.9
Wood-processing factories	18.8	-	6.3
Wood carpenters	6.3	-	2.1
Timber trading companies	12.5	-	4.2

Source: Survey data

Table 7 shows the major timber buyers at the survey area. Most forest growers (93.8 percent of the surveyed households in TranYen District and 100 percent of the surveyed households in YenBinh District) sold their timber to timber collectors. The percentage of the surveyed households selling timber to other traders/users is negligible with only 6.3 percent of households sold timber to wood-processing factories, 4.2 percent of households sold to timber trading companies and 2.1 percent of households sold timber to wood carpenters.

Given the involvement of various actors, plantation timber value chains seem to be diverse and can be summarized in Figure 4.

Figure 4. Plantation timber value chains



- **Chain (I).** Forest owners/timber growers realize timber themselves by transporting timber to the gates of wood-processing factories/ entrepreneurs. However, this value chain is currently limited due to: i) high cost of transportation if organized individually; and ii) competition amongst forest traders means that forest growers can even sell standing forest easily.

- **Chain (II).** Forest owners, mostly farmers, sell plantation timber to timber collectors. The latter then either sells the timber to wood-processing factories/entrepreneurs or to larger timber traders or licensed timber trade individuals/ organizations. This value chain works mostly with forest growers who are farmers.
- **Chain (III).** Forest owners sell timber directly to large-scale timber traders. The latter further sell it to wood-processing factories/ entrepreneurs or licensed timber trade individuals/organizations. This value chain involves timber traders who have enough transportation means (vehicles) for buying timber from forest plantation farms and small-scale traders.
- **Chain (IV).** Forest owners sell timber directly to licensed timber trade individuals/organizations. The latter also collect timber from different timber traders and then sell to wood-processing factories/entrepreneurs. This value chain functions with big companies who mainly buy timber from state forest enterprises in the region.

The price of timber sold to wood-processing factories/ entrepreneurs is formulated from the price paid to forest owners added up by transportation/realization costs and a profit. Given the current competitive market for plantation timber, forest owners usually accept the highest price amongst those offered by different buyers. However, forest growers, particularly those who are living in remote area, lack of market information and therefore have to accept the price offered by the buyers.

Table 8. Timber sold by the surveyed households, 2004.⁷

(averaged per household)

Timber species	TranYen District		YenBinh District		Sample average	
	Volume (m ³)	Price (VND/m ³)	Volume (m ³)	Price (VND/m ³)	Volume (m ³)	Price (VND/m ³)
<i>Eucalypt</i>	-	-	17.1	329,800	17.1	329,800
<i>Acacia</i>	-	-	158.6	315,500	158.6	315,500
<i>Styrax</i>	55.5	201,200	26.7	208,800	39.8	205,300
<i>Cinnamon</i>	117.4	82,500	-	-	117.4	82,500

Source: Survey data.

Results of the survey 50 households/farmers show that main timber species growing in their production forests are Eucalypts, Acacia, Styrax in YenBinh District and Styrax and Cinnamon in TranYen District. Amongst these species, eucalypt timber has a highest price. Less valuable are Acacia and Styrax timber and least valuable is Cinnamon timber (see Table 8). In 2004, average timber stumpage price per cubic meter at study sites constituted VND329.8 thousand for Eucalypt timber, VND315.5 thousand for Acacia timber, VND205.3 thousand for Styrax and VND82.5 thousand for

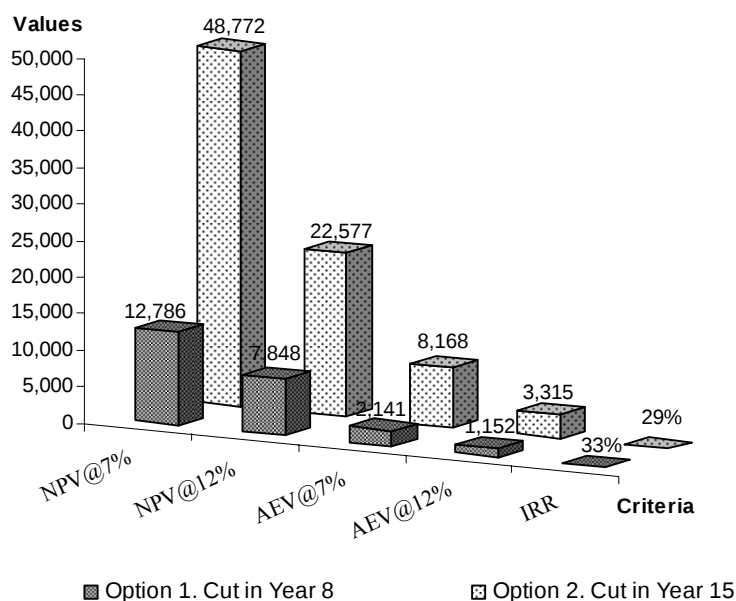
⁷ In general, most of this timber is small-sized. However, timber traders can assort some proportions of this as large-sized timber before selling to end-users.

Cinnamon timber.⁸ Consumption demand also varies amongst these species. Acacia and Eucalypts timber is currently highly demanded.

5.4 Financial Analysis of Tree Cutting

A financial analysis of two timber growing options is conducted using the data and information collected at the study sites (Appendix 1). Option 1 refers to the case when forest growers decide to cut forest in Year 8 and Option 2 – cut in Year 15. Three criteria including net present value (NPV), annual equivalent value (AEV) and internal rate of return (IRR) are employed to compare these two options.⁹ Moreover, two currently applied interest rates of 7 and 12 percent are also used to test the sensitivity of the estimation results. Figure 5 shows that while the two options are relatively indifferent in terms of IRR, they are strongly divergent in the size of NPV and AEV. Compared to the small-sized timber option, the large-size timber option has a NPV (and AEV) four and three times higher at interest rates of 7% and 12%, respectively. Roughly, the analysis shows that growing large-sized timber is more financially profitable than small-sized one.

Figure 5. Financial analysis of growing *Acacia mangium* in Yen Bai Province (values in VND thousand)



Source: Based on Appendix 1.

⁸ Basically, timber collectors paid these prices as prices for small-sized timber to forest growers for the whole woodlot. The timber collectors can get paid much higher prices from the end-users for assorted timber.

⁹ AEV combines all costs and returns into a single sum that is equivalent to all cash flows during an analysis period, spread uniformly over the period. It can be viewed as the amount of an annual payment that will just payoff the NPV of a project during its life. This is a rather useful project evaluation tool when we are faced with projects of unequal life spans. The “classical” use of this tool is for comparing agriculture with forestry. AEV can be estimated using the formula: $AEV = NPV [i(1+i)^n] / [(1+i)^n - 1]$, where: i – interest rate and n – rotation in years. The decision rule is similar to that of NPV (Schlosser and Blatner, 2001).

5.5 Factors affecting farmers' decision on tree harvesting

The survey results show that most species growing in the production forest area in YenBai Province are 4-5 years old and classified as raw material for pulp. This kind of timber can be sold for about VND300,000 per tine. If it is left for about another 5-6 years, the trees can reach a 22-centimeter diameter and sold for VND700,000 per cubic meter. The financial analysis supports the finding that waiting some years longer will generate much higher financial yield to farmers.

However, most of households still decide to sell their timber as pulp raw material, skipping a chance of letting timber grow further to become a large-sized timber. The reasons why timber growing households do not prefer large-sized timber are various can be summarized in Table 9.

Table 9. Reasons for decisions on timber cutting

(in percentage of the surveyed households)

Reasons	TranYen District	YenBinh District	Sample average
Everyday basic needs	68.8	25.8	40.4
Lack of investment capital	43.8	32.3	36.2
High demand on timber	25.0	3.2	10.6
Low quality of tree seedlings	6.3	16.1	12.8
Poor quality of standing timber	6.3	22.6	17.0
Bank's loan term	12.5	9.7	10.6

Source: Survey data.

Table 9 lists a number of reasons that influence on the way local farmers make cutting decisions. These include *everyday basic needs* (food, schooling fee, etc.), *lack of investment capital* for agricultural and forestry activities, *high demand on timber* from various end-users, *low quality of tree seedlings* that give a low return, *poor quality of standing timber* which can mainly be used for pulp and woodchips, and *bank's loan term* that is usually shorter than tree rotation. Among these reasons, meeting basic needs and lack of investment capital are the two most significant factors. This is understandable as local people depend mostly on forestry for living without other additional sources of income. The situation usually results in a contract arrangement with timber traders as elaborated below.

The information obtained through interviewing other stakeholders such as state forest enterprises, timber traders, wood-processing factories and from the local workshop shows more factors which also affect decisions on timber harvesting in YenBai Province. The results of analyzing this information indicate that the main factors affecting farmers' decision on when to cut trees include *faster rate of capital recovery*, *financial status*, *market and timber price*, *cultivation techniques*, and *prevailing policies*.

5.5.1 Rate of Recovery of Investment

According to farmers/forest growers, growing small timber is preferred as they can get quicker return and invest it in the next rotation (let's say 6-8 years long) to get another cumulative income instead of getting only one-off income if trees are left to grow up to large-sized timber. Moreover, cutting early and leaving forest for coppices are also perceived by forest growers as more productive than waiting for large-sized timber. This perception unfortunately is divergent from that of ThacBa State Forest Enterprise. The latter has a large plantation forest area including large-sized timber which brings the SFE a revenue of more than VND100 million (about US\$ 6,000) per hectare. This divergence in perceiving economic efficiency amongst farmers/forest growers and state forest enterprises is probably due to economies of scale, but needs to be further quantitatively explored.

The effect of price, although varies according to different timber sizes, is neglected by forest growers. In fact, forest growers make decision on harvesting based on their own experience. Many of them even state that they themselves are not so sure whether they chose a right moment to cut trees and/or when they can get most benefit from forest. None of them has been trained in methods for financial analysis of forest investment. Without such a calculation, some forest enterprises also state that the marginal annual value of timber due to a delayed cut cannot be large enough to capture annual interest rate to be paid to the bank.

Clearly, there has been a divergence amongst forest growers (particularly farmers, forest enterprises and forest specialists) in understanding and calculating profitability of timber growing. This is considered as the most important constraint to farmers' decisions on the appropriate forest harvesting rotation.

5.5.2 Financial status of farmers and credit institutions

Financial status is a primary concern of forest growers. They need financial resources not only for investing in forest planting, but also to cover everyday basic needs. Since most forest growers are poor, shortage of financial resources strongly affects their cutting decision.

In terms of investing in commercial timber plantation, forest growers need VND8-10 million (USD500-625) per hectare. However, forest growers usually face the following problems:

- Access to bank loan is very limited. The state bank gives only 50 percent of the amount requested if it is larger than VND10 million. This loan undoubtedly cannot meet the need of those who have more than one hectare of forest land. while access to state bank loan is limited, loan from commercial/private banks is available.
- Loan term is always shorter than forest rotation. For instance, the bank gives a loan for 3 years while forest trees need at least 5-6 years to be good enough for wood-chip and pulp making.
- Interest rates are still high; particularly at commercial/private banks regardless long or short-term loan is given.

This situation leads to the fact that forest growers are forced to cut their timber as soon as it meets requirements for wood-chip and pulp in order to either pay back the bank or private lenders. In many cases, financial shortage is sold by “selling young forest” to timber collectors. This actually is another form of informal loan by which forest collectors give loan to forest growers and get it back by harvesting timber. By doing it, forest growers indeed sold their ownership rights over forest to timber collectors and sacrifice any benefits from their forestland until timber is harvested and land is handed back to them.

As forest rotation is quite long compared to other activities, forest growers have to wait many years until they have income from forest. However, they cannot live without expenses in the meantime. The longer they have to wait, the more financial difficulty they suffer. According to them, waiting for another 5-6 years to cut trees is not easy for those who are poor and they certainly do not want to lengthen the time to cut forest because they cannot find other alternative sources of living.

According to the survey results (Table 9), 68.8 percent of the surveyed households state that the most important factor affecting farmers’ decision on forest harvesting in TranYen district is meeting everyday basic needs. Meanwhile, 43.8 percent of the surveyed households explain the reason for cutting forest early in terms of lacking investment capital for forest growing. In YenBinh district, the situation appears relatively different as 32.3 percent of the surveyed households are facing investment capital shortage and 25.8 percent are suffering from inadequate basic needs.

Clearly, most forest growers are less advantaged and financially shorted. This is the main reason why they choose to grow short-rotation small timber rather than longer-rotation large-sized timber. However, this reason is insufficient to explain farmers’ decision on forest cutting. Another revealed factor is *market* and *timber price*.

5.5.3 Market and timber price

Another factor that strongly affects farmers’ decision on timber growing is market information and timber price. Market for timber can influence on whether forest growers keep their forest or replace it with other more efficient. For the last few years, the monopsonist buyer – BaiBang Paper Mill – had almost controlled the demand side of the timber market by determining the consumed volume, timber standard and timber price. Many farmers could not sell their timber due to low prices, sometimes even lower than production costs. In order to sell timber, forest growers either had to transport it to the Mill’s gates to get a more reasonable price than sold it to timber collectors.

In recent years, the timber market has changed substantially with many more new timber consumers (private wood-processing entrepreneurs) have entered the market. These new timber consumers use both small and large-sized timber to keep operating. The entry of new timber consumers means that BaiBang Paper Mill is no longer a monopolistic buyer and controller of timber market. The timber market becomes more competitive, with many producers and various consumers. Moreover, this market also becomes imbalanced, with excess demand for timber.

Although the situation changes from a monopsonist buyer to a multiple-buyer market, it does not mean that market for timber growing in YenBai is stable, according to forest growers. The demand for timber depends on whether the end-users – paper mill, wood-chip factories and wood-processing companies – can still sell their product. As a result of international economic integration, cheaper timber products (such as pulp, wood-based panels and furniture) can be imported into Vietnam and strongly compete with domestic products. This then can affect domestic factories and indirectly affect the market for forest growers' timber. On the other hand, new (environmental) standards and requirements for timber products consumed in international markets may force domestic wood-processing factories renew their technology, which may not be suitable for domestic timber. The market for timber therefore is uncertain in a long run.

Due to strong competition for timber, the price of timber has increased and has put forest growers more in an advantage.¹⁰ The price of a particular timber species however very much depends on what the market for finished timber products will be. According to the representatives of wood-processing companies, the taste and requirements for timber products also changes everyday. Sometimes, these companies have to refuse large orders from international dealers because the latter require that timber products must be made from those timber species that are hardly found in local forests or elsewhere. This means the price for timber can also vary according to demand for certain products at a particular moment.

In addition, information on large-sized timber seems to affect farmers' decision. Although the problem of large-sized timber shortage has repeatedly been addressed on mass media, many forest growers have not been aware of it. The survey results show that 51.6 percent of the surveyed households in YenBinh district and 25 percent of surveyed in TranYen district did not know that large-sized timber is highly demanded in Vietnam. This issue is confirmed by forest growers participating in the workshop in YenBai (see Appendix 2). Having perceived that there only a market for small timber exists, local forest growers have played their role in terms of small-timber producers.

5.5.4 Silvicultural techniques

Technical issues are also a big concern amongst forest growers. The first concern is the quality of species used. The low quality of seedlings and inappropriate species introduced result in a bad performance of plantation forests.¹¹ According to forest growers, the yield of 7-8 year old forests in YenBai varies from 80 to 100 m³ per hectare only, resulting in a low income per hectare-year. In fact, species such as *Acacia hybrid* is neither suitable to local conditions nor developing into large-sized timber as it usually is vulnerable to insect, easy to be broken in half at age 4-5 and empty at core. From farmers' point of view, this species is invaluable even for use as firewood. Unfortunately, a large area of *Acacia hybrid* has been planted a few years ago based on recommendations from local authority.

¹⁰ In fact, timber prices could also fall. However, world prices of timber tend to go up due to a diminishing supply from timber exporting countries as a result of their policy on banning log export, and of increase in oil price and insurance fee that contribute to international transportation costs.

¹¹ The existing species are called "inappropriate" because they have not matched the climatic and site conditions. However they are introduced in a large area because their timber is highly demanded and their seedlings are highly available.

Techniques of planting and tending are another concern. Most farmers/forest growers plant forests according to their own experience since technical support from local authority is limited. It is likely that most forest growers, under pressure of timber demand, harvest trees when they get a highest growth rate (i.e. at a premature age). They blame it for lack of knowledge and understanding of how to develop timber, particularly how to protect older forest from insect and diseases, how to make timber meet standard of large-sized timber from timber end-users.

5.5.5 Prevailing policies

In relation to forestry development, the government and local authority have promulgated a number of policies. The extent to which these policies affect the forestry sector can be seen with a help of the information obtained through the field survey and local workshop.

The policy that influences the most farmers' decision is the one on banking credit. As mentioned earlier, most private forest growers either do not have access or have a limited access to credit. In current banking arrangements, interest rates are still high and loan term is far too short. All these conditions do not encourage local farmers invest in forest plantation, particularly to wait for large-sized timber.

The policy on timber harvesting is also unclear, fluctuating from one extreme to another. The previous regulations on forest harvesting (Decision 04) affirmed the overall state control in harvesting and consuming timber including plantation forest invested by farmers themselves. In order to harvest a small plot, farmers/forest growers have to ask permission from the provincial authority. Strict regulations on timber harvesting forced farmers to delay their harvest. That is why in the past, more large-sized timber might exist in the area than the present time. The current regulations (Decision 40), on the other hand, allow forest growers more flexibility in terms of cutting and selling their timber. Given a current high demand for small timber, forest growers can easily make decision on cutting trees. Nevertheless, strict regulations are still imposed on harvesting indigenous tree species that are planted on the allocated land and simultaneously growing in natural forests. This is because the authority is unable to control which one comes from plantation and which one comes from natural forests.

Although the government has initiated a large-sized timber development strategy, little efforts have been made to bring this initiative into reality. Most financial grants to state forest enterprises still focus on growing timber for pulp and wood-chip, i.e. small timber. There is no policy on supporting forest growers for delaying harvest in order to develop forest into large-sized timber or even assisting them to overcome the financial problem caused by the current credit arrangements.

5.6 Farmers' perception of low-value versus high-value timber

The fact of timber growing in YenBai shows farmers' choice of small timber instead of large-sized timber. This takes place not because large-sized timber is less demanded compared to small timber. To understand why farmers/forest growers still prefer growing small timber, it is necessary to examine this issue from different angles.

The first explanation is embedded the concept of “*large-sized timber*” which was raised by forest growers during the local workshop. Traditionally, forest growers have perceived large-sized timber as precious, indigenous trees at 40-50 year age with a big diameter. According to them, development of such trees is unrealistic as they take too long time to grow while their future market is uncertain. However, the end-users (wood-processing factories) define large-sized timber as those trees that satisfy their requirements for wood quality and dimensions for making particular timber products. If it is held, those trees whose diameter reaches at least 15 cm might be called “large-sized”. In fact, perceptions of both timber producers and consumers have not been reconciled hence seem to constrain the development of large-sized timber in YenBai province.

The next explanation is rooted in recent credit arrangements (see above). A short loan term, usually with a 3-year payback forces forest growers to concern about small timber with a 5-6 year rotation rather than large-sized timber with a rotation of 10-12 years. In this case, cutting timber at a young age can bring forest growers a certain income which is essential for dealing with the bank loan and guarantees their use rights over forest land for the next rotation.¹² In addition, a number of forest growers also feel uncertain about the income from large-sized timber, which according to them may not guarantee their financial ability to pay back to the bank.

Another explanation emerges from the current status of local forest management. Most forest growers face difficulty in protecting their forest, particularly when it reaches a commercial size. Intruders usually choose big tree to chop down, leaving small ones intact. Recent forest legislation has not been adequately enforced in order to stop illegal logging forests of both state forest enterprises and private forest growers. In this context, the bigger the trees, the more the forest growers lose. As a result, cutting young trees is the best solution for forest growers to guarantee their benefits from the forest.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study in timber growing in YenBai province has revealed a number of findings and conclusions which may be served as a basis for formulating policies on local large-sized timber development and for designing further study in this issue.

The market for timber in YenBai province is quite clearly defined with two major products: small timber for pulp and wood-chips and large-sized timber for furniture to be consumed either domestically or internationally. The high demand for small-sized timber, resulted from the entry of more timber consumers into the current timber market, changes it from a monopsonist into a competitive market. Small timber of many tree species, however, can also become large-sized simply by delaying their harvest and letting them grow for few more years. Although lack of information on large-sized timber makes forest growers unaware of its demand, this market has high potential.

¹² In most cases, forest growers have to entrust their land use certificates as a mortgage for obtaining a bank loan. If the loan would not be paid back in time, forest growers might lose their rights over the allocated land.

The study shows some divergence in economic efficiency of timber growing in the region. While most private forest growers consider that growing timber appears more economically efficient if being cut young rather than being left intact for more years, the results of a financial analysis growing *Acacia mangium* show that large-sized timber with a longer rotation seems much more efficient. Although the estimation employed inadequate information, it can be served as a preliminary basis for the next research steps.

Financial status of forest growers can influence on their decision on cutting trees in order to get revenue for overcoming their financial problem. Unfortunately, forest growers, particularly the poor ones, have almost had no alternative source of living that can prevent them to cut forest early, even when trees are still at a premature age. In addition, the accompanied current regulations on credit also contribute to affect their cutting decision. High interest rates, short loan term and complicated conditions for getting loan all together force forest growers to cut forest much earlier than even its technological and/or economic maturity age.

In relation to financial issues of forest growers, an active role of timber intermediaries in distributing timber from producers to end-users also affects forest growers' cutting decision. Particularly, in-advance payment has been used by timber intermediaries as a means for engaging in final harvest of growers' forests.

The study also offered possible solutions to address some of the problems confronting forest growers. First, the lack of information on large-sized timber market (demand), its prices and profitability which has been affecting forest growers' cutting decision can be solved through functioning a regularly updated market information system from a central to local levels. Given a poorly organized system of information on timber and forest products in Vietnam, and limited access to the information on timber market by forest growers/local farmers, the improvement of such an information system is vital. Clearly, this information system should be backed up by the Vietnamese Government in terms of institutional and financial support. Moreover, a number of extensive researches on economic efficiency of growing different tree species need to be carried out to give forest growers a clear picture of what species and how (short or long rotation) to grow as well as how profitable they are. Based on this information, farmers/forest growers can make decision themselves.

Second, as financial conditions strongly affect forest growers' decision, the government should formulate financial support to growers to promote large-sized timber development in the country. Particularly, interest rates need to be lowered and loan terms need to be lengthened for such long-term activities as forestry. Low interest rates will encourage forest growers to borrow and invest more in forest growing. Low interest rates also mean that forest growers/borrowers have to pay less interest to the bank than before. Besides, lengthened bank's loan terms could guarantee farmers' delaying harvest for large-sized timber forest as they do not have to cut young forest just for a purpose of paying the bank back. In this context, the State Bank for the Poor and State Bank for Agriculture and Rural development should play a major role.

Third, the above-addressed problems of low-quality seedlings, inadequate silvicultural techniques and management can also be overcome with technical and information supports to forest growers through the existing agriculture-forestry extension system. For instance, tree seedlings need to be made from certified seeds and

their standards should be supervised by the Department of Forestry in order to ensure high-yield forests. Silvicultural techniques for particular species should also be developed and disseminated to forest growers by extension workers through demonstration models, multimedia, training courses, etc. Knowledge, skills and experience in forest management are also essential for tree growers as most of them have not yet been trained for managing their household-level forestry entrepreneurs. In this context, the agriculture-forestry extension system needs to be enhanced in terms of its functions and human and financial resources.

REFERENCES

- Anh Vu, 2004. Five-million-hectare Program and economic problem, VietnamNet, 04 August 2004, <http://www.vnn.vn/kinhte/thegioi/2004/08/222992/>.
- Australian Department of Finance, 1991. *Handbook of Cost-Benefit Analysis*, AGPS Press, Canberra.
- Department of Science, Technology and Product Quality, 2003. *Inventory data of commercial forest plantations for 14 major forest tree species*, Sectoral Standards 04-TCN-66-2003, MARD, Hanoi.
- Hartwick, J.M. and Olewiler, N.D., 1998. *The Economics of Natural Resource Use*, Addison-Wesley Educational Publishers, Inc., Massachusetts.
- International Tropical Timber Organisation (ITTO), 2003. *Tropical Timber Market Reports 2003-2004*, ITTO, Yokohama.
- Leushner, W.A., 1984. *Introduction to forest resource management*, John Wiley & Sons, New York.
- Markandya, A. and Pearce, D., 1988. 'Natural Environment and the Social Rate of Discount', *Project Appraisal*, 3(1):2-12.
- Ministry of Agriculture and Rural Development, 2001. *Report on the results of the 1999 national forest inventory*, MARD, Hanoi.
- Munasinghe, M., 1992. 'Biodiversity protection policy: environmental valuation and distribution issues', *AMBIO*, 21(3):227-36.
- Nguyen Nghia Bien, 2003a. *Overview Report on Vietnam's Forest Products*, MISPA Project, Ministry of Agriculture and Rural Development, Hanoi.
- Nguyen Nghia Bien, 2003b. *Quarterly Reports on Vietnam's Forest Products*, MISPA Project, Ministry of Agriculture and Rural Development, Hanoi.
- Nguyen Nghia Bien, 2004. *Quarterly Reports on Vietnam's Forest Products*, MISPA Project, Ministry of Agriculture and Rural Development, Hanoi.
- Schlosser, W.E. and Blatner, K.A., 2001. 'Using NPV in Forestry', *Pacific Rim Creations, Inc.*, <http://www.my-forest.com/finance/decision-criteria.htm>.
- Sedjo, R.A., 1983. *The Comparative Economics of Plantation Forestry: a global assessment*, Resources for the Future, Washington DC.
- Terborgh, J., 1992. *Tropical Deforestation*, Carolina Biological Supply Company, North Carolina.
- Varian, H.R., 1987. *Intermediate Microeconomics: a modern approach*, 1st edn, W.W. Norton & Company, London.
- Vietnam Ministry of Agriculture and Rural Development, 2001. *Forestry Development Strategy 2001-2010*, Hanoi.
- World Wide Fund for Nature, 1990. *Economic Analysis of Conservation Initiatives*, WWF-UK, London.

APPENDICES

Appendix 1. Results of a rough cost-benefit analysis of timber growing in YenBai Province: *Acacia mangium* (VND thousand)

No	Items	Year														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	Costs	2,465.5	1,552.5	464	240	240	240	240	240	240	240	240	240	240	240	240
1	Labour cost	2,128	960	464	240	240	240	240	240	240	240	240	240	240	240	240
	- planting cost	960														
	no. of labour-days	60														
	Unit price	16														
	- tending cost	928	720	224												
	no. of labour-days	58	45	14												
	Unit price	16	16	16												
	- protection cost	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
	no. of labour-days	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	Unit price	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
2	Material inputs	337.5	592.5													
	- planting	337.5														
	- tending		592.5													
Option 1: Cut @Year 8																
B	Revenues								30,288							
	- volume (m ³)								96							
	- stumpage price								315.5							
C	Cash flows	-2,465.5	-1,552.5	-464	-240	-240	-240	-240	30,048							
	IRR = 33%															
	NPV@7% = 12,786															
	NPV@12% = 7,848															
	AEV@7% = 2,141															
	AEV@12% = 1,152															
Option 2: Cut @Year 15																
B	Revenues															150,000
	- volume (m ³)															150
	- stumpage price															1,000
C	Cash flows	-2,465.5	-1,552.5	-464	-240	-240	-240	-240	-240	-240	-240	-240	-240	-240	-240	149,760
	IRR = 29%															
	NPV@7% = 48,772															
	NPV@12% = 22,577															
	AEV@7% = 8,168															
	AEV@12% = 3,315															

Appendix 2. Participants involved in the workshop in YenBai, 12/11/2005

No	Name	Position/Title	Organisations
1	Bui Chinh Nghia	Expert	MARD Department of Forestry
2	Tran The Hung	Chairman	VanYen District People's Committee
3	Kieu Tu Giang	Head	YenBai Forestry Sub-department
4	Tran Van Dao	Duputy head	YenBai Forestry Sub-department
5	Le Trong Huong	Specialist	YenBai Forestry Sub-department
6	Tran Tuan Cuong	Deputy Director	YenBai Institute for Agricultural and Forestry Planning
7	Nguyen Thi Mai	Head of the technical section	YenBai Wood-processing Company
8	Tran Ngoc Hien	Head of the planning section	YenBai Wood-processing Company
9	Dao Xuan Hien	Forest grower	HoaCuong Commune, TranYen District
10	Phung Van Tuan	Forest grower	PhucLoi Commune, LucYen District
11	Trieu Ngoc Tham	Forest grower	Ngoi A Commune, VanYen District
12	Nguyen Thi Nam	Forest grower	DongQuan Commune, LucYen District
13	Vu Van Nham	Forest grower	CamNhan Commune, YenBinh District
14	Pham Van Mang	Forest grower	LuongThinh Commune, TranYen District
15	Nguyen Thi Van	Deputy Director	ThacBa State Forest Enterprise
16	Nguyen Van Nghien	Deputy Director	LucYen State Forest Enterprise
17	Dao Xuan Quang	Deputy Head	TranYen Forest Protection Division
18	Prof. Vu Tien Hinh	Vice-Rector	Vietnam Forestry University
19	Dr. Nguyen Van Tuan	Head of the training division	Vietnam Forestry University
20	Dr. Nguyen Nghia Bien	Research team leader	Vietnam Forestry University
21	Tran Thu Ha	Researcher	Vietnam Forestry University
22	Trinh Quang Thoai	Researcher	Vietnam Forestry University
23	Trinh Nhan Huy	Faculty secretary	Vietnam Forestry University

LIST OF ACRONYMS

%	percent
m ³	Cubic meter
ha	hectare
HH	Household
MARD	Ministry of Agriculture and Rural development
mln	million
NPV	Net present value
NTFP	Non-timber forest product
NTV	Non-timber value
\$US	US dollar
VND	Vietnamese dong
