

# Improving livelihoods through market assessment and sustainable development of non-timber forest products (NTFPs) in two selected villages in the northern uplands of Vietnam

**Report**

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**Publication date:**  
2005

**Permanent link:**  
<https://doi.org/10.3929/ethz-a-004999400>

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Zurich, 28 February 2005

Internship report

**Improving livelihoods through  
market assessment and sustainable development  
of non-timber forest products (NTFPs)  
in two selected villages in the northern uplands of  
Vietnam.**

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**Implementation and funding:** HELVETAS Switzerland, Zurich mandated by the Swiss Agency for Development and Cooperation (SDC), Berne

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## Abbreviations and glossary

### Abbreviations:

CBD	Convention on Biodiversity
CIFOR	Centre for International Forestry Research
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPRGS	Comprehensive Poverty Reduction and Growth Strategy
DARD	Department of Agriculture and Rural Development
EMA	East Medicine Association
ETSP	Extension and Training Support for Forestry and Agriculture in the Uplands Project
FFI	Fauna and Flora International
HB	Hoa Binh province
HD	Hai Duong province
HT	Ha Tay province
KFW	In German: Kredit fuer Wiederaufbau (in English: credit for recovery)
Llinc	Limestone landscape improving negotiation for conservation
MARD	Ministry of Agriculture and Rural Development
MMSEA	Montane Mainland South East Asia
MoLISA	Ministry of Labor, Invalid and Social Affairs
NMPPR	Northern Mountain Poverty Reduction Project
NTFP	Non Timber Forest Product
NTFP-RC	Non Timber Forest Product Research Centre
PRA	Participatory Rural Appraisal
PT	Phu Tho province
PTD	Participatory Technology Development
RMA	Rapid Market Appraisal
SDC	Swiss Agency for Development and Cooperation
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
VND	Vietnamese Dong (currency: 1'000 VND = 0.063 \$, 20.10.04)
WHO	World Health Organisation

### Glossary:

Poverty:	MoLISA defines 'poor communes' as the following: 1) poverty rate is higher than 30 %, 2) remoteness, 3) altitude with respect to sea level, 4) distance from the district centre, and 5) difficult conditions for agricultural production. 'Poor' is determined as an income of less than 100'000 VND/ capita/ month for mountainous and remote areas (MoLISA criteria 1999-2003).
Programme 135:	The Hunger Eradication and Poverty Reduction (HEPR) programme was initiated in the early 1990s and formally established in 1998. The target groups are poor households and poor communes.
Programme 661:	The <i>National Five Million Hectares Reforestation Programme 1998-2010</i> is the successor of <i>Programme 327</i> on plantation of protection forest and rehabilitation of special use forests. Objectives, tasks, policies and organisation for implementing Programme 661 were issued in Decision 661/QD-TTg from 29 July 1998 by the Prime Minister.
Tet holiday:	The Vietnamese New Year is celebrated for three days and is considered as the most important celebration of the year. The date corresponds to the lunar calendar.



## Summary

Improved commercialisation of Non-timber forest products (NTFPs) could have two effects on the household situation of the poor: NTFPs could either act as a safety net or as a poverty trap. The aim of this report is to show whether identification and promotion of sustainably used NTFPs with promising commercial value contribute to improved livelihoods of poorer households. Consequently, the **objectives** focus on; 1) identifying economically valuable and sustainably used NTFPs at the research site, 2) analysing the potential of five short-listed NTFPs per studied village, 3) conducting a market chain analysis of these selected NTFPs, 4) evaluating economic and natural conditions for locally added value of these NTFPs, and 5) making suggestions for the improvement of legal and economic regulations for sustainable resource management and NTFP commercialisation for poorer households. The study **location** is in the northern uplands of Vietnam, inhabited by mountain dwellers of different ethnic origin. Among many mountain communities the poverty rate is still high, which is the case for the Muong people, who are the inhabitants of the research site. Both studied villages, Luong Tren and Bo, are in Ngo Luong commune, Tan Lac district, Hoa Binh province. This upland commune is a priority area of the Extension and Training Support Project (ETSP) operated by Helvetas Vietnam, and funded by the Swiss Agency for Development and Cooperation (SDC), which initiated this one-year study in 2004. The **methods** of this study include the approaches of participatory rural appraisal (PRA), rapid market appraisal (RMA) and semi-structured interviews, all of which are applied to collect information at the study site and at the investigated market places. The **results** show that NTFPs contribute around 12 % to the cash incomes of the sixteen studied households in Ngo Luong commune, whereas the contribution in the more remote Bo village is higher than in Luong Tren. Nevertheless, NTFP cash income contributes to around one third of the household cash incomes of one poor and two well-off households. There is no statistically significant relation between household incomes and NTFP contribution. However, a clear relation exists between wealth classes and type of NTFP employed. Poor households usually collect different wild NTFPs, such as ornamental orchids and medicinal plants, whereas wealthier households mostly rely on the products of cultivated bamboo species. The findings of the market survey of nine selected NTFPs reveal different options for the households to benefit from NTFPs. The general **discussion** attempts to associate the household economy strategies previously identified in the literature, to the sixteen studied households. Seven of eight studied households in Bo village tend to adopt a coping strategy due to, in particular, low cash incomes and dependency on different wild NTFPs. On the other hand, seven interviewed households in Luong Tren are wealthier, which mostly results from agriculture, off-farm activities and the regular use of products from cultivated bamboo species. These households seem to represent the diversified strategy. The two households which trade NTFPs show the highest NTFP contribution to their household cash incomes, and could therefore be associated with the specialised strategy. In **conclusion**, useful NTFPs for the mitigation of poverty are identified as bamboo shoots, the rhizome of *Drynaria fortunei* and ornamental orchid species. However this depends on the improvement of production, processing and trade of these products, as well as the development of consistent strategies for poor households. It is crucial, however, that farmers become more familiar with market mechanisms and sustainable resource

management in order to benefit from NTFP activities in the long run. This requires further improvements to the legal framework and its implementation, as well as transparent and purposeful application of state programmes to enhance the livelihoods of the poor and to conserve natural resources.

**Keywords:** Non-timber forest products (NTFPs), livelihood improvement, household cash income, market analysis, bamboo, medicinal plants, ornamental orchids, Vietnam.

## **Acknowledgements**

My first thanks are addressed to Helvetas Switzerland, which provided the opportunity to stay in Vietnam and conduct this study for one year. I would also like to thank the participants of the field survey in Ngo Luong commune and the different market actors in different provinces in northern Vietnam for their helpful and informative collaboration. This was enabled by the authorities at commune, district and provincial level, who actively supported the study. Special thanks to Mr. Nguyen Truong Giang, ETSP Provincial Coordinator, and Mr. Dinh Van Duc, Vice Director of DARD in Hoa Binh, who created favourable conditions to contact all required private and state stakeholders for relevant study issues. Ruedi Lüthi, Technical Advisor of ETSP Hanoi, as supervisor receives thanks for creating a welcome and supporting working environment and for giving constructive feedback and encouraging advice. Equally, I would like to thank Claudia Zingerli and Jean-Pierre Sorg (both ETH Zurich, Switzerland) for providing scientific support during the entire study period. Thanks to Dan Burns, who carefully revised this report. The study was implemented by Helvetas and funded by SDC.

Karin Hilfiker, Zurich, February 2005

# 1 Introduction

## 1.1 Study background

According to the Centre for International Forestry Research (CIFOR), timber and non-timber products account for half of household needs for 350 million people living in tropical forest surroundings, and are responsible for ten percent of employment in developing countries (HARRISON S. R. and HERBOHN J. L., 2001). NEUMANN R. P. and HIRSCH E. (2000) reveal that non-timber forest products (NTFPs) play a crucial role for the total household incomes of rural households across many regions. Compared to case studies in South America and Africa, NTFP markets in Asia tend to be more stable due to intensified management and frequent government interventions (BELCHER B. and KUSTERS K., 2004). A recent study shows that NTFP cash and subsistence incomes can make up to 39 % of the cash and non-cash incomes of households in Lao (FOOPES J. and KETPHANH S., 2004).

In 1978, the predecessor of the current Non-Timber Forest Product Research Centre (NTFP-RC) was founded in Hanoi, Vietnam. The institute aims: 1) to provide scientific and technological information on NTFP plantation, harvesting and processing among other issues, 2) to offer technical training on these topics, and 3) to implement projects in the national and international context. The second phase of the Sub-sector Support Project of NTFP-RC was launched in 2002 with the objective of strengthening capacity building for the Vietnamese government in the field of sustainable NTFP use. As a result, national strategies are developed with the objectives of enhancing the livelihoods of poor people living in the vicinity of forest, supporting social and economic development, and conserving biodiversity.

Various studies on NTFP market assessments and conservation issues have recently been conducted in Vietnam, some of which focus geographically on northern mountain areas: 1) LE THI PHI et al. (2004) identify market constraints of small-scale farmers in Quang Ninh province, 2) BIEN QUANG TU (2000) analyses the market situation of medicinal plant species in Lai Chau province, and 3) WILSON S. (2000) evaluates the potential of identified NTFPs to generate income while contributing to forest conservation in two nature reserves in central and northern Vietnam. Similarly, a study in central Vietnam analyses the ecological and economic prospects of NTFPs and examines the importance of NTFPs for the livelihoods of local producers (WETTERWALD O. et al., 2004).

In order to investigate the impact of NTFP exploitation and marketing for livelihoods in a commune in the northern uplands, the Extension and Training Support for Forestry and Agriculture in the Uplands Project (ETSP), a SDC funded project implemented by Helvetas, initiated a one-year study from January to December, 2004. The survey was conducted in Luong Tren and Bo villages in Ngo Luong commune, Tan Lac district, Hoa Binh province.

## 1.2 Objectives

In order to enhance the livelihoods of poor households in the uplands, home of various ethnic minority groups, the Vietnamese government passed the *Comprehensive Poverty Reduction and Growth Strategy* (2001-2010, CPRGS). As a consequence, ETSP, in collaboration with

the Ministry of Agriculture and Rural Development (MARD), identifies the livelihood improvement of rural people as a main objective for the period 2003-2006.

The daily subsistence of small-scale households is often ensured through NTFPs, which are often under an open access regime due to the ineffective implementation of forest land allocation. According to the results of the *Feasibility Study of the Llinc project* (Limestone landscape improving negotiation for conservation) and the *Pu Luong – Cuc Phuong Limestone Landscape Conservation Project* of Fauna and Flora International (LLINC and FFI, 2003), the Ngoc Son Ngo Luong Nature Reserve is likely to be established in 2005. In consequence, a ban on all exploitation activities in the core zone would come into force.

Different local stakeholders in the potential reserve area consider NTFP activities as unimportant (LLINC and FFI, 2003). This study, however, attempts to provide information on NTFP use, and to reveal the potential of improved NTFP commercialisation for household cash incomes in this area. This could assist compensation claims for the loss of NTFP cash and subsistence income. The principal objective of this study is to identify NTFPs with market potential and to seek strategies to improve NTFP commercialisation with respect to sustainable resource management. The objectives are to:

- 1) Determine NTFPs which are economically interesting and used in a sustainable way at household level in two villages in Ngo Luong commune.
- 2) Assess the access and control over five economically valuable NTFPs per studied village.
- 3) Identify market actors and channels within the product chain of the five identified economically valuable NTFPs per village.
- 4) Evaluate the economic and natural conditions to benefit from locally added value.
- 5) Recommend legal and economic regulations in order to enhance opportunities for sustainable resource management and commercial NTFP marketing, in particular for small-scale producers.

### **1.3 The role of NTFPs in household economy strategies**

According to BELCHER B. and SCHRECKENBERG K. (2003), NTFPs have the potential to enhance incomes and create employment opportunities, particularly for poor and disadvantaged people. The literature identifies three household economy strategies that can be used to describe the NTFP cash and non-cash contribution to household incomes (ANGELSEN A. and WUNDER S., 2003).

**A) Coping strategy:** The characteristics of this strategy are: 1) NTFPs account for less than half of the total household income, and are the main or only cash income source, 2) NTFPs are primarily used for subsistence rather than for trade, and 3) NTFPs can mitigate, but not eliminate poverty (BELCHER B. and KUSTERS D., 2004). The coping strategy is mainly found in remote areas with abundant forest cover and limited transportation infrastructure. The household incomes of these dwellers is lower than the average. A high number of NTFPs are principally collected from forest, which is state owned land under an open access regime. The resources tend to be insufficient, ineffective or unmanaged. In consequence, resources deplete. Cultivation of NTFPs is infrequent and often compensated by off-farm activities (RUIZ-PEREZ M. et al., 2004). NTFPs used in a coping strategy usually show low market

integration as described, for example, for the medicinal plant species *Amomum villosum* (cardamom) in Vietnam (ANGELSEN A. and WUNDER S., 2003)

**B) Diversified strategy:** NTFPs are one of several sources of household cash income, whereas the household cash income accounts for more than 50% (VEDEL P. et al., 2004). The bulk remains agriculture and off-farm activities. NTFPs act as a safety net and do not compete with agricultural products because of distinct harvesting seasons. Producers of NTFPs who live in poor areas tend to be wealthier within a community than households without NTFP activities, which show a household income below the village's average (BELCHER B. and KUSTERS D., 2004). NTFPs used in a diversified strategy are either cultivated in agro-forestry systems or collected from partially managed or unmanaged forests.

**C) Specialised strategy:** NTFPs steadily contribute to household incomes and account for more than 50%, a high proportion of which is cash. These households are often the wealthiest in a commune (BELCHER B. and KUSTERS D., 2004). NTFPs are domesticated, cultivated and managed. Particular attributes of these NTFPs are: 1) high economic product value per unit, 2) higher productivity per hectare, and 3) less product adulteration. NTFPs used in the specialised strategy are usually special food items or medicinal plants. Economic characteristics are: 1) stable and mature markets, 2) frequent access to international markets, 3) relatively large local trade areas, and 4) good returns for producers. This strategy is associated with the Asian region in the global context (ANGELSEN A. and WUNDER S., 2003).

In these three strategies, four key dimensions are crucial as documented in ANGELSEN A. and WUNDER S. (2003). These are: 1) degree of management and domestication, 2) subsistence use versus commercialisation, 3) safety net function versus regular income source, and finally 4) low versus high returns regarding labour, land and sometimes capital.

BELCHER B. and RUIZ-PEREZ M. (2001) state that people earning higher cash incomes from NTFPs start to restrict their range of products to those with a high value. An intensification of NTFP production can, however, limit the incomes of poor people, who have less access to credit (BELCHER B. and KUSTERS D., 2004), and therefore fewer opportunities to focus on more profitable species. Therefore, market liberalisation does not always favour the poor, because private monopolies may replace governmental ones (SUNDERLIN W. D. et al., 2003).

Therefore, the question is justified if NTFP promotion may significantly enhance the livelihoods of the poor to overcome poverty. In contrast, if NTFP activities only prevent more severe poverty, this is called 'poverty avoidance/ mitigation' (BELCHER B. and KUSTERS D., 2004). Overall, NTFPs are often essential to ensure income in difficult situations and act therefore as a 'safety net'. On the other hand, NTFP extraction can also represent a poverty trap if infrastructure and market demand are low, and market chains are exploitative (SUNDERLIN W. D. et al., 2003).

This study aims to show whether the identification and promotion of sustainably used NTFPs with promising commercial value contribute to the improvement of livelihoods for poorer households. The three household economy strategies presented above are used to discuss the identified wealth groups and economically valuable NTFPs in Ngo Luong commune. This approach should help to develop opportunities for poorer households to mitigate poverty.

## **2 Materials and Methods**

### **2.1 Study site**

#### **Research villages:**

The study on NTFPs is conducted in two of Ngo Luong commune's six villages, in Tan Lac district, Hoa Binh province, in the northern uplands of Vietnam (see table 1, map 1 and map 2). Luong Tren, with 58 households, is the second largest village and is located at the entrance of a valley, whereas Bo village, with 25 households, is more remote and located towards the end of the valley (direction east). The forest in Bo village is more abundant and less degraded than in Luong Tren. Although the commune is the lowest administrative unit, each village has an appointed village head, vicehead and representatives of mass organisations, such as the Farmer's and Veteran's Associations, and the Women's and Youth Unions.

#### **Topography and climate:**

Ngo Luong commune is one of five highland communes in Tan Lac district and borders Lac Son district to the east. The commune is situated in the Ngoc Son mountain range and inbedded into karst mountains. The commune settlements are located at 600-700 m above sea level in a narrow but long valley (13 km west-east extension). The climate is subtropical and marked by one wetseason occuring from May to October. During this period, precipitation is 84% of the annual mean rainfall of 1750 mm (PHAN HONG HUNG, 2004). The last five 5 km of the 30 km access road from the district town to the commune is in a desolate state. In consequence, the commune headquarters are difficult to access by car during the wetseason. The road is presently under a government improvement road scheme (Programme 135 and NMPPR) and will be completed in the near future.

#### **Minorities and poverty:**

The Muong people live in the northern uplands and belong to the six poorest minorities in Vietnam (VIETNAM DEVELOPMENT REPORT 2004, 2003). According to this development report, northwest Vietnam, which includes Hoa Binh province, showed a poverty rate of 68 % in 2002. However, poverty mitigation is slowly progressing in this area. The poverty incidence in Tan Lac district was 0.64 in 1998/99 (POVERTY MAP OF VIETNAM, 1998/99), and 8 among 24 communes are identified as poor within the district. According to the Ministry of Labour, Invalids and Social Affairs (MoLISA) standard, 13 of 253 households were classified as poor in Ngo Luong commune in October, 2003.

#### **Forest allocation and exploitation:**

Forests in Vietnam are classified into natural and plantation forests with the subgroups; protection forest, special use forest, plantation forest and regenerated forest (forest without trees following slash and burn). The majority of the forested area in Ngo Luong commune isclassified as natural protection forest (see table 2). Bamboo cultivation areas are classified as plantation forest. Almost two thirds of the forest in Ngo Luong commune has been

allocated to households since 1996. The remaining 870 ha is categorised as village or community forest. The ownership of this forest resides with the commune. However, residents of the commune are responsible for its protection. Although the land use right officially refers to the number of household members, implementation did not strictly follow this guideline. As a result, certain households possess a far larger area than other households of an equal size. The reason for this inconsistency is that households that enriched the forest before 1996 had prior rights to that land. Another effect of land allocation was that households were allocated various parcels with unclear boundaries which are scattered in the forest.

Even though the forest land was allocated, NTFPs such as fruits, orchids, mushrooms and medicinal plants, are common property and may be harvested without restriction as long as trees are not irreversibly damaged. Therefore, it is forbidden to cut down trees if epiphytes such as certain orchid species are collected. Another case is the bark extraction of *Cinnamomum burmanami* and *Schefflera octophylla*, which has been forbidden since 1996 and 2002 respectively. The ban was enforced due to complete bark exploitation of the stem, which resulted in the tree dying off. NTFPs of cultivated species in allocated forest land, such as bamboo, belong to the land owner and are subject to traditional rules.

#### Access to credit:

Opportunities to request credit have existed in Ngo Luong commune since the introduction of the fund for the poor in 1996. The Policy and Investment bank in Tan Lac provides credit for farmers in Ngo Luong commune. The loan periods are between six and thirty-six months with a monthly interest rate of 0.45 %. In 2004, 10 % of all households within the commune made use of the scheme, which provided loans of up to VND 7 mio per household. The funds for the remaining poor households are 3-5 mio VND. If a household requires funds of less than 10 mio VND, the guarantee is in form of household items. All credit requests are collected at commune level at the end of the year and approved by the bank. Farmers consider individual credit requests difficult, So group credit seems to be more convenient for farmers and the bank. In theory, villagers are aware of how to request group credit.

**Table 1: General information about the research site**

	Hoa Binh province	Tan Lac district	Ngo Luong commune
<b>Total area</b>	466'250 ha [1]	53'000 ha [2]	3'825 ha [3]
<b>Forest land</b>	200'170 ha [1]	34'000 ha [2]	3'090 ha [3]
<b>Units</b>	11 districts	24 communes, 1 township	6 villages
<b>Population</b>	782'600 [4]	75'700	1461
<b>Ethnic origin</b>	60 % Muong, 31% Kinh, Thai and few Tay, Dao, H'Mong Hoa and Chinese	-	100 % Muong
<b>Income sources</b>	-	Agriculture and forest	Husbandry and agriculture
<b>Access to next bigger unit</b>	2 hours from Hanoi, highway	1 hour from Hoa Binh, transit road	2 hours from Tan Lac, 1 hour from the next commune, motorable road (by lorry, 4 WD)

Sources: [1] BUI VAN CHUC (2003), [2] Meeting with Vice Chairman DPC 26/11/02, [3] NGHIEM HONG SON (2002), [4] GENERAL STATISTICS OFFICE (2003).

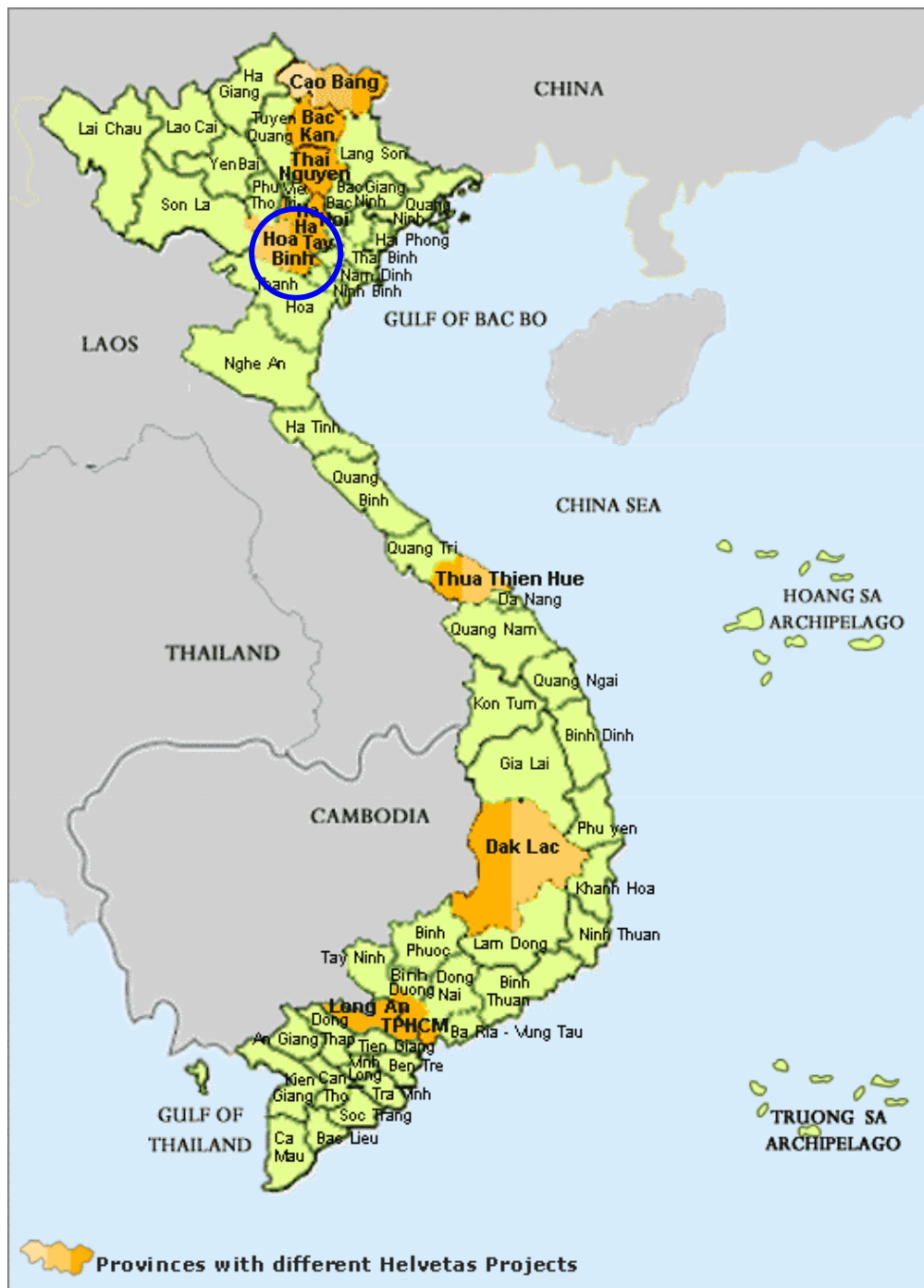


**Table 2: Forest classification in Ngo Luong commune**

Forest classes		Area (ha)	Allocated land (ha)	
			to households	to commune
Natural forest	Production forest	-	-	-
	Protection forest	3010.65	2139.63	871.02
	Special use forest	-	-	-
Plantation forest	Production forest	78.00	78.00	-
	Protection forest	-	-	-
	Special use forest	-	-	-
<b>Total forest land</b>		<b>3088.65</b>	<b>2217.63</b>	<b>871.02</b>

Source: INSTITUTION OF PLANNING AND DEVELOPMENT (2003).

**Map 1: Vietnam**



Remark: The blue circle highlights the location of Hoa Binh province.

Source: World Bank 2002, VN Statistics 2003, modified from website [www.helvetas.org.vn](http://www.helvetas.org.vn).

Map 2: Tan Lac district, including Ngo Luong commune



Remark: Green and dark green areas reflect forest surfaces. The blue circle represents Ngo Luong commune.

## 2.2 Participatory Rural Appraisal (PRA)

### Selection of commune and villages:

Ngo Luong commune is selected as the project and research site based on the following criteria: 1) it has high forest coverage (around 80 %), 2) it is a poor commune according to the MoLISA standard, 3) it is exclusively the home of minority people, and 4) it has strong and supportive commune authorities in terms of livelihood improvement and forestry development (SDC and MARD, 2002). The village and commune development planning process (supported by ETSP in 2003; VDP, 2003), revealed that two of six villages were more concerned about forest development issues, and in particular NTFP exploitation. Therefore, Bo village and Luong Tren were selected as the research site for this NTFP study.

### Selection of households:

The aim was to select eight households in each village to investigate the relation between wealth class and NTFP use. Therefore, households with a high dependency on NTFPs and probable different wealth classes were selected. Selection occurred at a meeting with village authorities and leaders of mass organisations, where a wealth ranking and a NTFP dependency ranking was applied. All households are classified into five wealth groups 'very rich, rich, medium, poor and very poor' based on criteria developed by the participants (see table 3). In order to reduce the amount of households for the NTFP dependency ranking in Luong Tren, half of the households in each wealth class were randomly selected. 29 households in Luong Tren and 25 households in Bo village are ranked and grouped into the four NTFP dependency classes; 'high, medium, low and none'. The criteria are: 1) size of bamboo cultivation area, 2) knowledge of medicinal plants, 3) collection of fruits, mushrooms and orchids, 4) application in processing NTFPs, and 5) estimated NTFP contribution to household incomes. As a result of the wealth and dependency ranking, sixteen households were selected in total.

**Table 3: Wealth class criteria developed by participants in Ngo Luong commune**

	<b>Very rich</b>	<b>Rich</b>	<b>Medium</b>	<b>Poor</b>	<b>Very poor</b>
<b>Luong Tren</b>	Households with slightly higher incomes than the rich group	Households with incomes of more than 4 mio. VND/person per year (commune's definition)	All other households which are not classified in one of the four classes	Young households (married for 4-5 years who live separately from their parents)	One of the adults is handicapped
<b>Bo village [1]</b>	> 3.5 mio VND/ person/ year	3-3.5 mio VND/ person/ year	2.6-3 mio VND/ person / year	< 2.6 mio VND/ person / year	-

Source: [1] Based on commune criteria.

### Determination of household and NTFP cash income:

The aim is to analyse the NTFP contribution to the cash income of the eight households in each village. Therefore, the household incomes of sixteen households in 2003 is investigated. Income sources are: 1) animal husbandry, 2) food crops, 3) cash crops, 4) NTFPs, and 5) others. Food crops include nutrition for people and animals. NTFPs are divided into bamboo, medicinal plants, orchids and other products. NTFPs for self-consumption are only indicated if

their economic value is known. Therefore, NTFPs such as some medicinal plants are used as subsistence products (see annex 3). Product prices refer to the interviewee's knowledge and therefore vary slightly among the different studied households.

### **Selection of the ten most important NTFPs at village level:**

The aim is to short-list ten NTFPs which are important in each of the studied villages. NTFPs are defined as '*all plants and mushrooms that are mainly collected from natural or enriched forests and cultivations with the exception of timber. Animals and their products are excluded*'. To structure NTFPs according to their use, they are classified into fibre, food, medicinal, extracted and other products. This classification presented some problems when a species could have been ranked into several product groups. As a result, these species are attributed to the most relevant product group.

The NTFP importance at household level is identified by ranking the NTFPs in the four groups; 'very important, important, less important and unimportant' in terms of cash and subsistence income. Further information on the ten most important NTFPs at household level is obtained by conducting semi-structured interviews. Relevant features are: 1) collected quantity in 2003, 2) sustainable collection in the last ten years, 3) cultivation opportunities, 4) use, and 5) locally added value.

The NTFP importance in each of the studied villages is assessed using a preference matrix applied by all household and authority representatives in a collaborative exercise. Only these NTFPs, which are identified in the interviews and classified as very important and important, are ranked based on the seven following criteria: 1) availability in forest and/ or home garden in the village in 2003, 2) regeneration ability, 3) harvested quantity in forest and/ or home garden in 2003, 4) harvesting restrictions, 5) usefulness for daily life, 6) sale procedure, and 7) selling price. Each criteria contains two to four subclasses, which are marked 1 to 4. The ten NTFPs with the highest score are taken as the most important NTFPs in the two studied villages. The ranking results were agreed by the participants.

### **Selection of the economically most valuable NTFPs in both villages:**

The selection of the five most economically valuable NTFPs per village was used to design the market survey. The short-listed products are those with a high potential to improve the livelihoods in the research area.

To achieve this goal, more detailed information about the ten most important NTFPs per village is collected in collaboration with the selected household representatives and the village authority during group discussions. The following PRA-tools for all ten NTFPs are:

- 1) Species life cycle, with a focus on used parts, product maturity, life span and regeneration ability.
- 2) Seasonal calendar, with a focus on harvesting period, collected and remaining quantity by single farmers.
- 3) NTFP village transect or map, with a focus on species abundance and habitat.
- 4) Market map, with a focus on locally known markets including market days, busiest time, traded short-listed NTFPs, distance, means of transportation and duration.
- 5) Semi-structured interviews in small groups, with a focus on storage, semi-processing and the legal situation, as well as access to credit.

A preference matrix with seven criteria (see table 4), which were developed by the participants themselves in both studied villages, is applied to short-list the five most economically valuable NTFPs per village. These seven criteria are further classified and marked 1 to 4. The five NTFPs with the highest score are selected for market analysis.

**Table 4: Criteria for the preference matrix to short-list the five economically most valuable NTFPs in both studied villages**

Luong Tren	Bo village
	1) Availability in forest and/ or home garden
	2) Transportation inconveniences
	3) Number of first buyers
	4) Selling price
5) Opportunity to cultivate	5) Harvesting methods in the forest
6) Regeneration ability	6) Methods and processing requirements
7) Diseases	7) Price stability in the last ten years

### 2.3 Species identification

Species are identified according to the following procedure and criteria. Mostly vegetative parts of medicinal plants and bamboo species are collected, named in the Muong language, sun-dried and stored. Bamboo species are identified on the basis of leaves, sheaths, culm parts and pictures of shoots and clusters. Plant determination manuals by PHAM HOANG HO (2000), TRIEU VAN HUNG (2000) and WONG K. M. (1995), are used by the expert informants (see annex 1). The collected species are listed with local, popular Vietnamese and Latin names, as well as used parts, purpose of use, availability at the study site and knowledge of cultivation in annex 3. The Latin genus name of 24 of 81 species could not be identified.

### 2.4 Rapid Market Appraisal (RMA)

#### NTFPs for market analysis:

As five different economically valuable NTFPs are identified by the participants of the two studied villages, eight NTFPs are short-listed in Ngo Luong commune (see table 5). Among these eight NTFPs, the two bamboo species *Dendrocalamus asper* and *Indosasa angustata*, are both represented by two products; shoots and culms of *D. asper*, and culms and sheaths of *I. angustata*.

After assessing the market situation in the surroundings of Ngo Luong commune, four short-listed NTFPs are replaced with three other NTFPs. The reasons for excluding and adding NTFPs are summarised in tables 6 and 7. The newly added NTFPs are all classified among the ten most important NTFPs at village level. This study finally focuses on the product chain of nine NTFPs (see table 8). Moreover, ten medicinal plant species are added to the three short-listed medicinal plant species in order to gain an impression of the market potential of medicinal plants at national level. These species are selected based on availability at the study site, product value, cultivation potential and danger of resource depletion at national level. The collected information on these ten medicinal plants is not documented in this report.

**Table 5: Procedure to select economically valuable NTFPs**

Step	Objective	Procedure	Actors	Results
1	Selection of the five most economically valuable NTFPs per village	Group discussion and preference matrix	Participants and informants in the two villages	The five economically most valuable NTFPs in each village (see table 11).
2	Comparison of the results in both villages	Analysis	Research team	Eight short listed NTFPs for both studied villages in Ngo Luong commune.
3	Market assessment of eight NTFPs in the surroundings of Ngo Luong commune	Semi-structured interviews, product chain, and triangulation	Market actors	Overview of the local market situation of the eight NTFPs and potential NTFPs.
4	Evaluation of market assessment and revision of short-listed NTFPs for further investigation	Data analysis and comparison of product chains	Research team	Four NTFPs are eliminated, three 'new' NTFPs are added. In total, seven species with nine products.
5	Intensification of the market assessment of nine NTFPs at district, provincial and partly at national level	Semi-structured interviews, product chain, triangulation	Market actors	Nine product chains (see table 8).

**Table 6: Reasons for excluding short-listed NTFPs at the study site for market analysis**

NTFP (species)	Reasons
Mushroom ( <i>Auricularia polytricha</i> )	<ul style="list-style-type: none"> <li>- Competition with cultivated product.</li> <li>- Product in Ngo Luong commune requires dead wood.</li> <li>- Lower product value than other Asian mushroom species in the international context (FREEDMAN L. and FREEDMAN W., 2000).</li> </ul>
Cinnamon bark ( <i>Cinnamomum burmanami</i> )	<ul style="list-style-type: none"> <li>- <i>Cinnamomum cassia</i> provides bark of higher quality.</li> <li>- High availability of <i>C. cassia</i> at national level thanks to Programme 327 and 661 (618.2 km<sup>2</sup> in Vietnam in 1998 according to VU VAN DUNG et al., 2002).</li> <li>- Low availability of <i>C. cassia</i> at study site.</li> <li>- Fluctuations of price and export volume of <i>C. cassia</i> at national level over several years (GENERAL STATISTICS OFFICE, 2003).</li> </ul>
Medicinal plant ( <i>Ixora henryi</i> )	<ul style="list-style-type: none"> <li>- Familial trade around the district centre and at local markets.</li> <li>- No indication for trade on a larger scale.</li> </ul>
Culm and shoot ( <i>Indosasa parvifolia</i> )	<ul style="list-style-type: none"> <li>- Weak market demand at district level for semi-processed culms.</li> <li>- No indication for shoot trade outside the district.</li> </ul>

**Table 7: Reasons for adding NTFPs for market analysis**

NTFP (species)	Reasons
Culm ( <i>Bambusa textilis</i> , <i>B. blumeana</i> )	<ul style="list-style-type: none"> <li>- High market demand for handicraft and construction.</li> <li>- Medium availability in Ngo Luong commune.</li> <li>- Opportunity to cultivate.</li> </ul>
Medicinal plant ( <i>Drynaria fortunei</i> )	<ul style="list-style-type: none"> <li>- High product value (5'000-8'000 VND/ kg dry).</li> <li>- Potential to add value locally.</li> <li>- Possibility of cultivation (TRAN VAN ON, 2004).</li> <li>- Threatened species according to the Vietnamese Red Book.</li> </ul>
Medicinal plant ( <i>Anoectochilus setaceus</i> )	<ul style="list-style-type: none"> <li>- Highest encountered product value (100-150'000 VND/ kg dry to China).</li> <li>- No knowledge of cultivation.</li> <li>- Strictly forbidden plant species (Group IA of national Decree 48/2002/ND-CP).</li> </ul>

**Table 8: The nine short-listed NTFPs for market analysis**

<b>Species</b>	<b>Product</b>
<i>Dendrocalamus asper</i>	Shoot Culm
<i>Bambusa textilis/ B. blumeana</i>	Culm
<i>Indosasa angustata</i>	Culm Sheath
<i>Aerides odorata</i>	Ornamental orchid
<i>Drynaria fortunei</i>	Rhizome for East and North Traditional Medicine
<i>Nervilia fordii</i>	Leaf for North Traditional Medicine
<i>Anoectochilus setaceus</i>	Entire plant for North Traditional Medicine

**Data collection:**

The approach of rapid market appraisal (RMA) described in JOSS S. et al. (2004) is used to understand the market system from the view of market actors. Semi-structured interviews and direct observations are applied to obtain information on the 4-P's (place, product, price and promotion). Triangulation and cross-checking are achieved by contacting sellers and buyers as far as possible, and comparing information collected at different places. Between early June and mid-September 2004, the study team contacted around 60 actors of bamboo products, 50 of medicinal plant products and 15 of ornamental orchid products, all at different places, mostly in Hoa Binh and Ha Tay provinces. Ten informants, for legal and tax issues, were met at the commune, district and provincial level.

**Data documentation:**

Semi-structured interviews were saved in electronic form and transformed in an excel database to conveniently compare the collected information of relevant NTFPs. This NTFP database contains per row issues to product quality, traded quantity, storage and semi-processing, buying and selling price, provider and customer, and transportation. The database can be accessed at the ETSP office in Hanoi.

**2.5 Data analysis****Household income:**

All sixteen studied households are classified into four wealth classes according to their identified cash-income, and compared with secondary data of household surveys in Ngo Luong commune conducted by NGHIEM HONG SON (2002), IMA (2003) and PHAN HONG HUNG (2004). According to the MoLISA income standard for the poor in the mountainous area of 100'000 VND/ person, the average cash income for a household with six members is calculated as 7.2 mio VND/ year. This reference value is taken for the poor households in Ngo Luong commune. The wealth classes for an annual income of an average six person household in Ngo Luong commune are the following: 1) poor < 7.2 mio VND, 2) medium = 7.2-25 mio VND, 3) well-off = 25-40 mio VND, and 4) rich > 40 mio VND.

**Correlation between household income and wealth class:**

In order to test the relation between household incomes and NTFP contribution of the sixteen interviewed households, a Spearman correlation test is applied. The household incomes and

the NTFP contribution are checked for deviations from the standard normal distribution (Kolmogorov-Smirnov test).

### **Village income:**

The cash income of both villages, Luong Tren and Bo village, is used to evaluate the cash income contribution of the nine NTFPs surveyed at the markets (see section below). The cash income of Bo village is calculated on the basis of household number (25) and average household cash income (14.08 mio VND). As the interviewed households in Luong Tren belong to the more wealthier households based on the village average, the village income is calculated based on the household number of a specific wealth group and its corresponding average household income (id est: 5 rich households with an average cash income of 46.45 mio VND, 12 well-off with 37.47 mio VND, and 41 medium with 18.1 mio VND). As a result, the extrapolated cash income of both villages was 1'775.9 mio VND in 2003.

### **Cash income contribution of the nine NTFPs:**

A hypothetical cash income of seven of the nine NTFPs surveyed at the markets is calculated on the basis of the traded quantity out of Luong Tren and Bo villages, and the product price at the forest gate in 2003. The sum of these seven NTFP cash incomes (around 100 mio VND) is compared with the cash income of both villages (see above). These seven NTFPs contribute around 5.8 % to the cash income of both villages. Due to transportation inconvenience, the remaining two NTFPs are rarely traded. Therefore, the traded quantity cannot be indicated. Both NTFPs, however, show a high market demand, and at least one NTFP has a relatively high product value.

### **Market chain:**

Place, position and number of market actors, price and sometimes quantity are represented with an illustrated market chain, which starts at the study site and ends with end customers or possible destinations. Information of other market places taken into account for triangulation, however, is mostly excluded in the figure.



### 3 Results

#### 3.1 Socio economic importance of NTFPs in Ngo Luong commune

##### NTFP dependency and wealth class ranking at village level:

NTFPs in Bo village play a more significant role for daily life than in Luong Tren (see table 9). Four fifths of the 25 households in Bo village consider NTFPs as of high and medium importance. In contrast, four fifths of all pre-selected households in Luong Tren only slightly depend on NTFPs.

According to the wealth classes, rather richer households depend highly and moderately on NTFPs. Poorer households in both villages tend to show zero or a low NTFP dependency.

**Table 9: Relationship between wealth classes and NTFP dependency in both studied villages**

Wealth	Luong Tren					Bo village				
	HHs Total	NTFP dependency				HHs Total	NTFP dependency			
		High	Medium	Low	None		High	Medium	Low	None
<b>Very rich</b>	5 (3)	-	3	-	-	5	2	1	2	-
<b>Rich</b>	12 (6)	-	2	4	-	8	3	5	-	-
<b>Medium</b>	35 (17)	-	1	16	-	9	5	3	1	-
<b>Poor</b>	4 (2)	-	-	2	-	3	1	-	1	1
<b>Very poor</b>	2 (1)	-	-	1	-	-	-	-	-	-
<b>Total HHs</b>	58 (29)	-	6	23	-	25	11	9	4	1

Explanation: Number in parenthesis indicates the number of households used for the NTFP dependency ranking.

##### NTFP income contribution of studied households:

Table 10 and figure 1 show that NTFPs maximally contribute one third to household incomes. The average NTFP contribution is 9.8 % for Luong Tren, 16.3 % for Bo village, and 12.46% for both villages. In comparison, the mean NTFP dependency of Luong Duoi, as the village housing the commune head quarters, was 2.3 % in 2003 (IMA, 2003). Interestingly, the real average NTFP income of the eight households in Luong Tren is 3.45 mio VND, higher than in Bo village, which is 2.73 mio VND. This could be related to the distinct wealth class distributions in the two studied villages. Rather rich and well-off households are studied in Luong Tren, whereas medium and poor households are investigated in Bo village.

The main income sources are still farm activities, such as animal husbandry and agriculture. In this study, off-farm activities in the form of state employment are an attribute of well-off and rich, rather than of poor households. Off-farm activities are frequently the main income of poorer households in particular (AMBORSE-OJI B., 2003). In this study, however, off-farm activities contribute 20-44% to the livelihoods of the wealthier households (see figure 1). This result corresponds to surveys in remote areas in Asia, where off-farm employment accounts for 26-36% of household cash incomes, when rural towns are added to the research sample (LANJOUW P. and FEDER G., 2001).

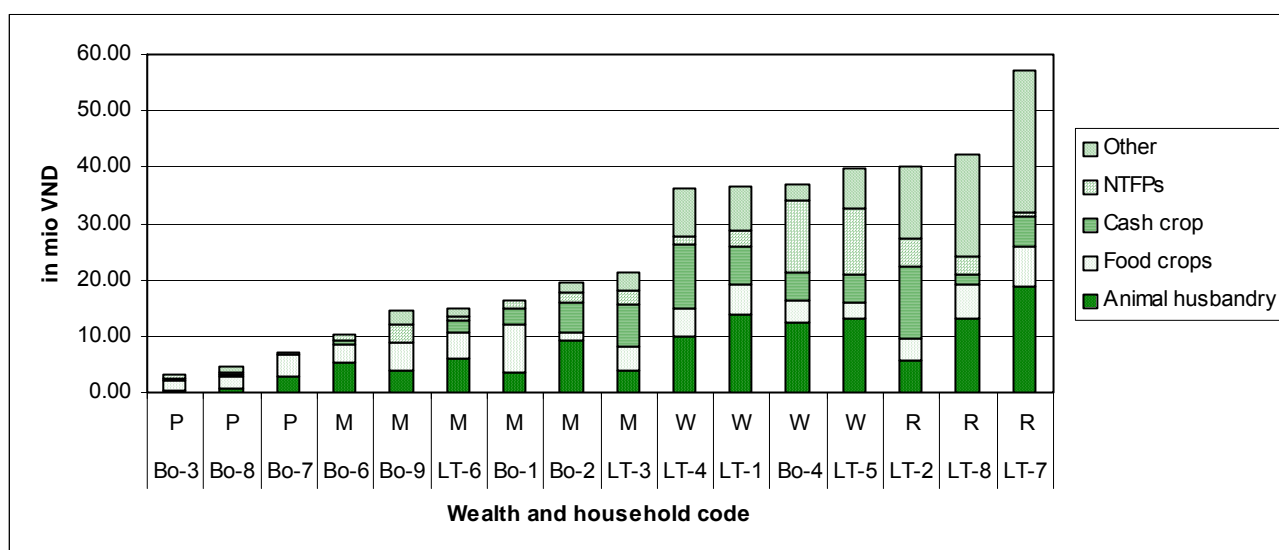
Apart from off-farm income, cash income from NTFPs helps to significantly raise livelihoods, as shown for the two wealthier households in Ngo Luong commune (Bo-4 and LT-5). Both households occasionally semi-process and trade NTFPs in the commune.

**Table 10: Overview of NTFP cash income in 2003 differentiated between location and wealth class**

	Number of households (HH)	Average household cash income (mio VND)	NTFP cash income (mio VND)		Share of NTFP cash income to household cash income (%)	
			Range	Average	Range	Average
Luong Tren	8	35.99	0.7-11.7	3.45	1.6-29.4	9.84
Bo village	8	14.08	0.4-12.8	2.73	5.6-34.5	16.30
More wealthier HH (W+R)	7	36.09	0.9-12.8	5.37	1.6-34.5	13.83
Less wealthier HH (P+M)	9	16.44	0.4-3.0	1.37	4.3-30.1	12.48

Remarks: Further information on household income composition is listed in annex 2. Wealth groups P, M, W and R are explained in figure 1. NGHIEM HONG SON (2002) investigated an annual average income of a six person household in Ngo Luong commune of 14.26 mio VND. PHAN HONG HUNG (2004) described the annual household cash incomes concerning wealth classes with: 16.73 mio VND for wealthier, 9.83 mio VND for medium wealth, and 6.7 mio VND for poor households.

**Figure 1: Household incomes of the 16 studied households in 2003**

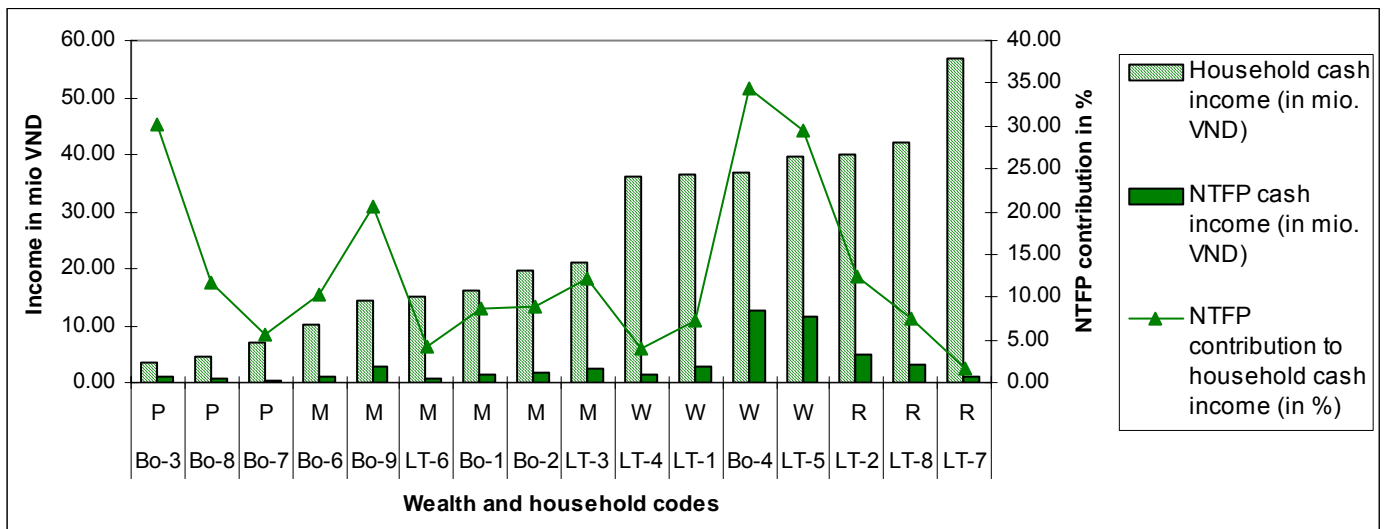


Explanation: LT = Luong Tren, Bo = Bo village, P = Poor < 7.2 mio. VND, M = medium: 7.2-25 mio. VND, W = well-off: 25-40 mio. VND, and R = rich > 40 mio VND.

**Correlation of NTFP contribution and wealth class of selected households:**

The findings of the sixteen household interviews underline those of the previous NTFP dependency ranking, that poorer households usually depend less on NTFPs than wealthier households (see figure 2). The average NTFP contribution to the household cash incomes of seven wealthier households is 13.83 %, and 12.48 % for the nine poorer households (see table 10). The regression coefficient of the Spearman correlation test is -0.162 and statistically not significant (p = 0.549). Therefore, no correlation between household cash income and NTFP dependency exists.

**Figure 2: Correlation between NTFP income and wealth class of the studied households in 2003**

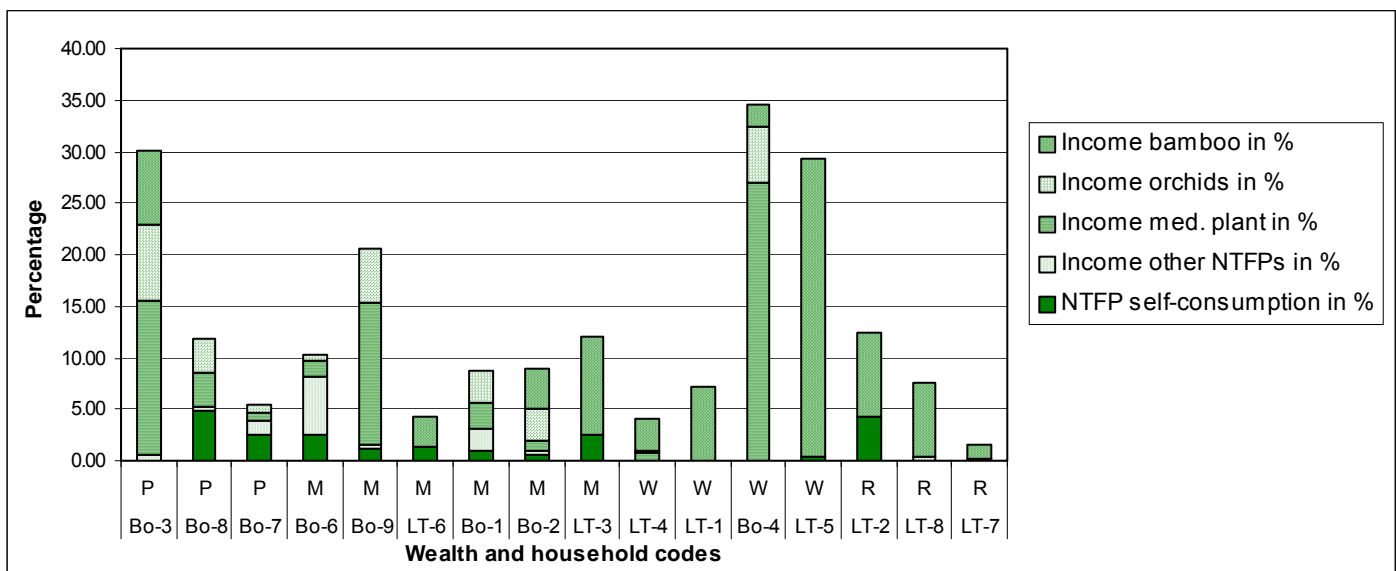


Explanation: LT = Luong Tren, Bo = Bo village, P = Poor < 7.2 mio. VND, M = medium: 7.2-25 mio. VND, W = well-off: 25-40 mio. VND, and R = rich > 40 mio VND.

**Type of NTFPs and wealth class:**

More wealthier households mainly trade bamboo products with the exception of one household, which is involved in medicinal plant and orchid activities (see figure 3). In contrast, poorer households have three or four NTFP income sources, which are mostly from the natural forest. Four of six poor households that live in Bo village receive no benefit from bamboo products.

**Figure 3: Percentage and type of NTFPs used by the studied households in 2003**



Explanation: LT = Luong Tren, Bo = Bo village, P = Poor < 7.2 mio. VND, M = medium: 7.2-25 mio. VND, W = well-off: 25-40 mio. VND, and R = rich > 40 mio VND. The columns reflect the NTFP percentage of household incomes. The column is divided into the different NTFP types, such as bamboo (including shoots, culms and sheaths), ornamental and medicinal orchids, medicinal plants, other NTFPs (mushrooms and fruits) and NTFPs for self-use to which a monetary value was attributed on the informant's awareness.

### NTFP diversity in the study site:

In both villages, 81 plant species are listed for daily or occasional use, such as collecting a medicinal plant to cure a particular illness (see annex 3). The villagers harvest 61 medicinal plant species, including six medicinal orchid species for trade or self-consumption. Ten bamboo species provide fibre products, four of which produce additional food products (shoots). Additional food products are two mushroom species. Seeds and fruits are extracted from three species. Apart from three ornamental orchid species, the remaining two species are ranked as other products. As a result of the market survey, two medicinal plants and three ornamental orchids were later added to the NTFP sample (see annex 3, species marked with P).

PRA participants in Luong Tren identified 33 species in total, including 22 medicinal plant species, whereas those in Bo village determined 66 species, among them 45 medicinal plant species. The ten most important NTFPs, as well as the five economically most valuable NTFPs for each village, are shown in table 11.

**Table 11: Overview of the ten most important NTFPs as well as the five economically most valuable NTFPs for the participants in the two studied villages**

Latin name	Local name	Used part	LT	Bo
<i>Indosasa angustata</i>	Lành hanh	Culm, sheath, shoot	E	E
<i>Dendrocalamus asper</i>	Buróng đền	Culm, shoot	E	E
<i>Indosasa parvifolia</i>	Măng đắng	Culm, shoot	E	-
<i>Bambusa textilis</i>	Tre hóp	Culm, shoot	I	-
<i>Auricularia polytricha</i>	Mộc nhĩ	Mushroom	-	E
<i>Canarium album</i>	Trám	Fruit	-	I
<i>Ixora henryi</i>	Khăng ké	Shrub for medicinal use	E	I
<i>Glochidion gamblet</i>	Cùn đái dây	String for medicinal use	I	-
<i>Nervilia fordii</i>	Củ 1 lá	Leaf for medicinal use	E	-
<i>Desmodium Laxum subsp</i>	Cây tan	Shrub for medicinal use	I	-
<i>Anoectochilus setaceus</i>	Cỏ sên	Entire plant for medicinal use	I	-
<i>Drynaria fortunei</i>	Bện bà	Rhizome for medicinal use	-	I
<i>Vernicia montana</i>	Trầu	Seed for extraction	I	I
<i>Cinnamomum burmanami</i>	Quế rừng	Bark for medicinal use	-	E
<i>Phrynium placentarium</i>	Lá dong	Leaf as packing material	-	I
<i>Aerides odorata</i>	Lan quế	Ornamental orchid	-	E

Explanation: Species are selected as most important (I) or as economically most valuable (E) NTFPs in Luong Tren (LT) and Bo village (Bo). The Latin name *Desmodium Laxum* refers to Tan trong, which is one of the three mentioned subtypes of Cây tan.

### The economically most valuable NTFPs:

The species short-listed by the PRA participants for the market analysis are the three **fibre products** *Indosasa angustata*, *I. parvifolia* and *Dendrocalamus asper*, which are cultivated in home gardens (see chapter 3.2 case studies A, BA, BB, BC and C).

These bamboo species are additionally used as **food products**. A further short-listed food product is the mushroom *Auricularia polytricha*. This species naturally occurs on fallen soft timber after heavy rainfall. The mushroom is dried and often used in emergency situations for cash income. The current market value for the highest quality is 20'000-25'000 VND/ kg dry at local markets.

As a **medicinal product**, the leaves and branches of *Ixora henryi* are frequently used for daily tea, either pure or mixed with other medicinal plant species. The availability is higher

compared to other medicinal plant species in Ngo Luong commune. The potential daily collection efficiency was 40-50 kg raw material per person, and in total around 1.5 ton raw material for the two studied villages in 2003. The species is commercially exploited by one single woman in the adjacent settlement of Bo village, who has regular customers in the vicinity and at local markets (see annex 4). The forest gate value is 1'000 VND/ bunch, whereas the price at local markets is 2'000 VND/ bunch. One bunch can be used to make two pots of tea. In contrast, the second medicinal plant species, *Nervilia fordii*, is traded to China. It has a high market value but low availability (see chapter 3.2 case study EB).

The bark quality of *Cinnamomum burmanami* as an **extracted product** is lower than of *C. cassia*, which had a market value of 80'000 VND/ kg dry for medicinal use in 1995. However, the introduction of the forest protection law in 1996 banned bark extraction.

The last short-listed product is the orchid *Aerides odorata* as an **ornamental product** which has seen a strong resource decrease since customer demand started to increase in 2000 (see chapter 3.2 case study D).

## 3.2 Case studies of selected NTFPs

### A Case study of bamboo shoots of *Dendrocalamus asper*

The results of the field survey (PRA), market analysis (RMA) and literature review of *Dendrocalamus asper* are presented in this case study. A short overview is given in the SWOT table A1. Conclusions and recommendations can be found in chapter A4.

**SWOT table A 1: Shoots of *Dendrocalamus asper***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- High availability and potential for cultivation (-&gt; A1.3)</li> <li>- Relatively high product value at forest gate (-&gt; A1.4)</li> <li>- Well established trade net (-&gt; A2.1)</li> <li>- Nutrient rich and healthy diet product (-&gt; A3.4)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Incomplete legal regulations of shoot exploitation and trade (-&gt; A3.5)</li> <li>- Income contribution mainly for medium wealth and richer households (-&gt; A1.4)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- High national and international market demand (-&gt; A2.3)</li> <li>- Product value triples/ quadruples from producer to end customer (-&gt; A2.3)</li> <li>- Price fluctuation (aimed market access; -&gt; A2.3)</li> <li>- Locally added value at forest gate (salt water storage, shoot drying; -&gt; A2.1) and at provincial level (processing and packaging units; -&gt; A3.3)</li> <li>- Year-round shoot production (-&gt; A3.3)</li> <li>- Programme 661 (national reforestation programme; -&gt; A3.2)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Bamboo pests (fungi/ borer species; -&gt; A1.3)</li> <li>- Monoculture instead of intercropping (-&gt; A3.2)</li> </ul>



**Picture A 1: *Dendrocalamus asper* cluster with recently sprouted shoots in Ngo Luong commune**

<b>Species names</b>	
<b>Local Vietnamese name:</b>	Bương đèn
<b>Popular Vietnamese name:</b>	Bương
<b>Latin name:</b>	<i>Dendrocalamus asper</i>
<b>English name:</b>	-

## **A 1 Availability and cultivation/collection practices for bamboo shoots of *Dendrocalamus asper* in Ngo Luong commune**

### **A 1.1 Product characteristics and growth habitat**

*Dendrocalamus asper* belongs to the wooden subtribe *Bambusineae* of the family of *Poaceae*. The species forms clusters which are vegetatively reproduced by shoots (QUISHENG Z. et al., 2003). The best growth condition is guaranteed in rich and heavy soils in humid regions up to 1500 m a.s. In Ngo Luong commune, the species occurs at the edge of forested areas in the valley and on hills. Shoots can achieve a weight of 3-5 kg (YUMING Y. et al., 1998).

### **A 1.2 Local knowledge and practices**

Shoots are first exploited when the cluster has an age of three to five years. Then, mostly small shoots are harvested while bigger shoots are left to form culms (PHAN HONG HUNG, 2004). Shoots are mainly collected in the cluster's centre to enlarge the cluster. The shoots are mostly collected by women from June to August. The daily harvesting capacity per person can reach 400 kg shoots on average.

Farmers need to remove the covering leaves and boil the shoots in order to store and sell shoots of *Dendrocalamus asper*. Further information on storage and shoot drying is listed in table A2 and A3.

Cultivation areas that are marked with a stick and an attached hand-made bamboo star are banned for shoot collection and cattle grazing. If disregarded, farmers are fined from 1'000-10'000 VND/ shoot.

### **A 1.3 Availability and quantity traded out of Ngo Luong commune**

*Dendrocalamus asper*, with eleven hectares, is quite widely distributed in the commune (see table A5). In general, a cluster forms 20 shoots in a season and one third of the shoots are left to widen the cluster. The annual shoot potential is around 3500 kg/ ha with a density of 2700 culms/ ha in Ngo Luong commune (PHAN HONG HUNG, 2004). The literature indicates 20 tons/ ha with a density of 400 clusters/ ha (PROSEA 1995; from DO VAN BAN, 2004). The clusters have either been cultivated over a long period, or on the other hand, for the past two or three years due to the beginning of customer demand for shoots. In general, after forest land allocation in 1996, more bamboo areas have been cultivated.

A bamboo disease is apparent by the coloration of the leaves. This phenomenon appears clustered at different places in Ngo Luong commune. It could be caused by the fungi *Aciculosporium take*. Farmers, however, are unaware of the cause and appropriate prevention measures. In addition, borer species attack and irreversibly damage culms.

The estimated traded quantity for six first buyers in Ngo Luong commune is 8 tons of boiled shoots in 2003. The traded quantity is higher in Luong Tren than in the more remote Bo village. Regarding the increasing productivity of younger stumps, the traded quantity could rise in the near future. Dried shoots are rarely traded because of weak demand at local markets.

### A 1.4 Economics for villagers

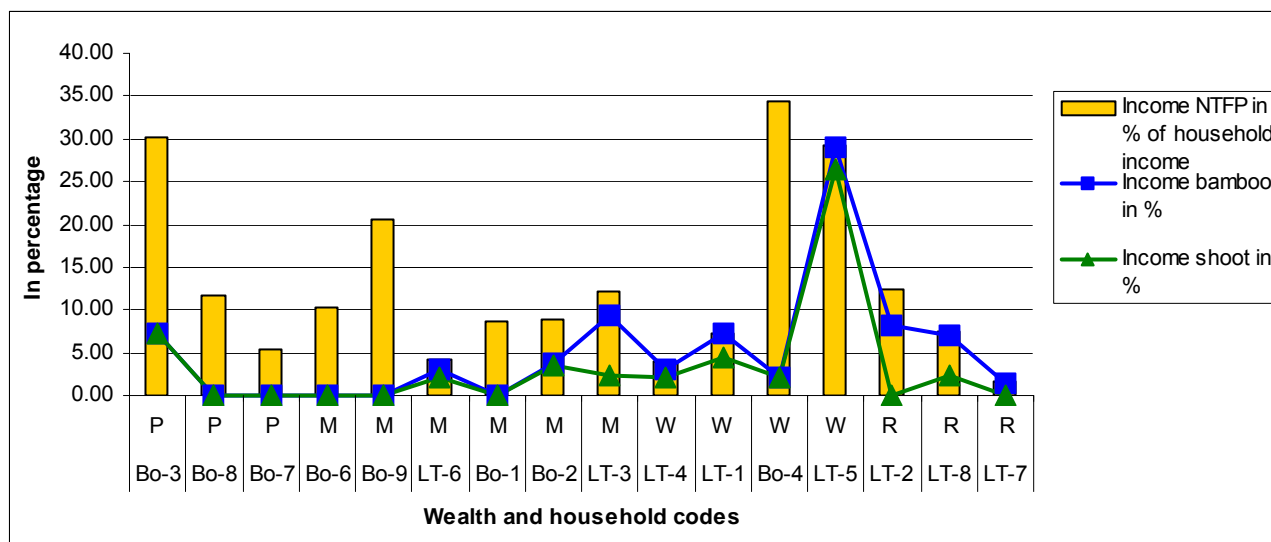
The sixteen interviewed households sell shoots of the species *Dendrocalamus asper*, *Indosasa angustata*, *I. parvifolia* and occasionally *Bambusa textilis*.

In figure A1, seven households do not sell shoot products. Two of them are rich, live in Luong Tren and receive cash income from other bamboo products. The other five households are medium wealthy or poor, live in Bo village and show no cash income from other bamboo products. The explanation for this is that they self-consume shoots, or do not yet have cultivated or mature areas.

Four of the nine remaining households represent a shoot contribution of more than 3 % to household cash incomes. Therefore, shoots are the single bamboo product for two households (Bo-2 and Bo-3). These two households have a shoot cash income of less than 15 % of the NTFP cash income. On the other hand, shoots account for more than half of the NTFP cash income for the two other households (LT-1 and LT-5). These are well-off families. In one case, it is the household which mostly buys shoots from other farmers and sells them on.

The forest gate value for *D. asper* shoots is 1'200-2'000 VND/ kg boiled in 2004. First buyers at the commune sell for 2'000-2'500 VND/ kg boiled to wholesalers in Tan Lac. According to PHAN HONG HUNG (2004) the annual shoot production potential is 38.5 tons for Ngo Luong commune, and the hypothetical shoot income for the commune is estimated at around 70 mio VND. This is equivalent to 47'900 VND/ inhabitant per year.

**Figure A 1: Contribution of shoot products in relation to bamboo products as a whole to household cash incomes in 2003**



Explanation: LT = Luong Tren, Bo = Bo village. Household wealth with P = poor (< 7.2 mio VND/ year), M = medium (7.2-25 mio VND/ year), W = well-off (25-40 mio VND/ year) and R = rich (> 40 mio VND/ year).

### A 1.5 Similar products or substitutes in Ngo Luong commune

The species *Dendrocalamus asper*, *D. barbatus*, *Indosasa angustata*, *I. parvifolia* and *Bambusa textilis* are cultivated and provide edible shoots (see table A5). Shoots of *D. barbatus* and *B. textilis* are not traded because of the very low current availability for the former, and no market demand for the latter. The shoots of both *Indosasa* species are



commercially exploited. The reason is the bitter taste, which is highly appreciated by customers around Tan Lac.

## A 2 Market assessment

### A 2.1 Market place

#### *Market actors:*

The shoot trade is a female dominated activity and business. The trade period is from late April until early October, which corresponds to the shoot sprouting season. Therefore the shoot sellers carry on a seasonal trade, with the exception of the contacted trader at the market in Hanoi. Table A1 summarises relevant characteristics of different shoot traders, and figure A2 represents the market chain.

#### *Transportation:*

Boiled shoots are carried in air tight nylon bags of 50-70 kg, which also contain a little water. Motorbikes and lorries are common means of transportation. Public transport is used less. Wholesale traders in Dong Phuong Yen receive their commodities from Hoa Binh province by lorry. The drivers stop at the main road at Dong Phuong Yen to unload shoots while other goods are carried on to Hanoi.

The commodities are distributed from Mai Linh and Dong Phuong Yen to retail sellers at local markets, or to Hanoi by motorbikes with a transport capacity of 200-300 kg. Transfers to neighbouring provinces like Hai Phong are conducted by lorries with a loading capacity of 5 tons on average.

#### *Storage:*

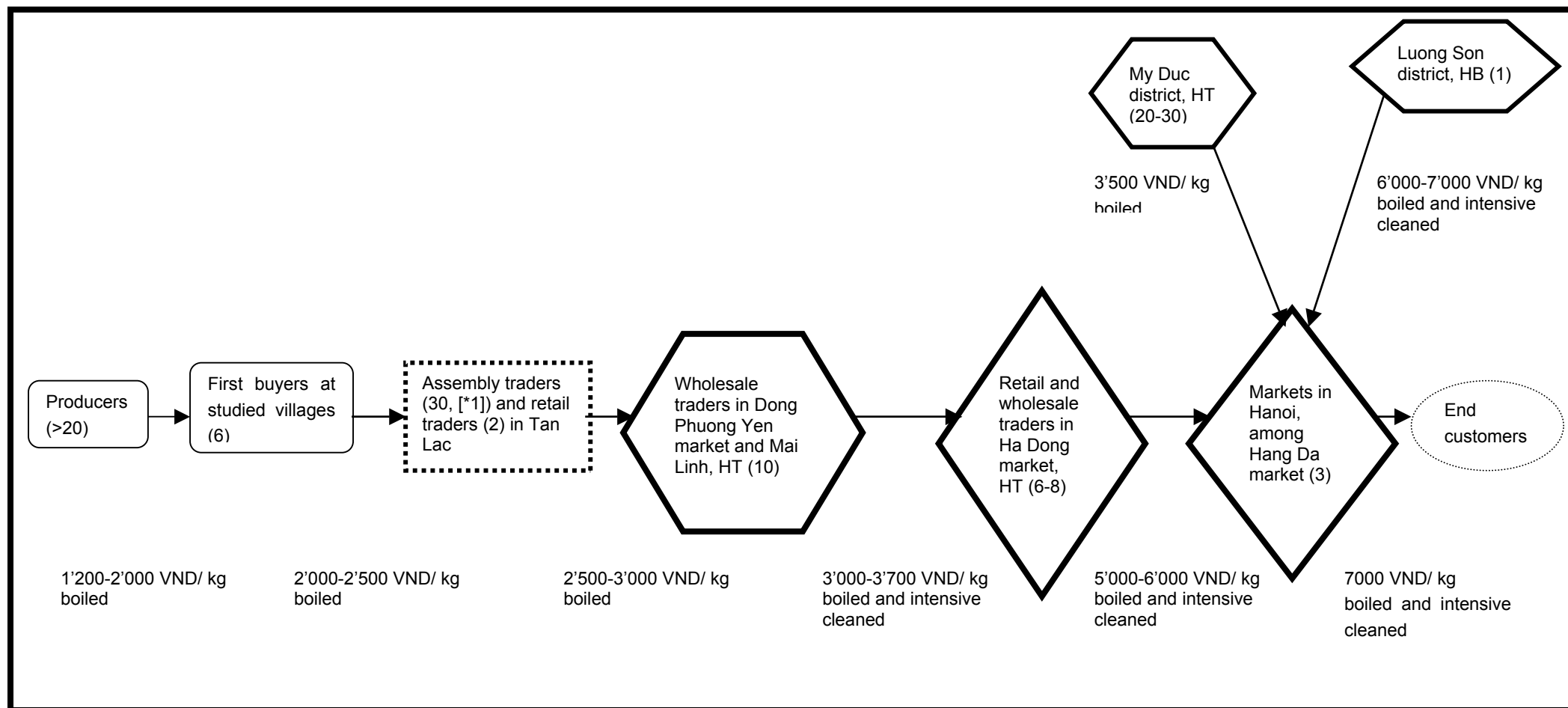
Information on water and salt water storage methods, as well as shoot drying, is presented in tables A2 and A3 respectively.

**Table A 1: Characteristics of market actors**

Actor (number)	Location	Product quality	Traded quantity/ day/ actor	Special feature
First buyer (6)	Ngo Luong commune, HB	Boiled	0.2-0.3 tons [*1]	None
First middlemen (wholesaler, ~30)	Tan Lac and surroundings, HB	Boiled	0.15 tons [*1]	None
Second middlemen (wholesaler, ~10)	Dong Phuong Yen and Mai Linh, HT	Boiled, intensively cleaned and classified	0.5-1.5 tons [*1], 5-7 tons [*2]	<ul style="list-style-type: none"> <li>- Supplied by middlemen from Mai Chau and Da Bac district, HB.</li> <li>- Capacity of intensive shoot cleaning is 500-600 kg per day.</li> <li>- Weight reduction after proper cleaning can reach 20-30 %.</li> <li>- Salt water storage.</li> <li>- A trade net exists and partially includes relatives.</li> <li>- No binding agreements.</li> <li>- No competition. Each trader has own clients.</li> </ul>
Third middlemen (retail seller)	Market in Hanoi	As 2 <sup>nd</sup> middlemen	0.5-0.7 tons [*1], 5-6 tons [*2]	Regular large-scale customers buy each 2 <sup>nd</sup> or 3 <sup>rd</sup> day 200-500 kg.

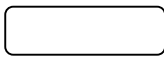
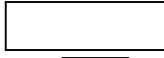
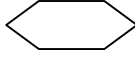
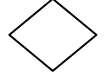

Explanation: [\*1] refers to the period from late April to early October. [\*2] only refers to the period from June to July (trading and providing peak).

Figure A 2: Product chain of *Dendrocalamus asper* (field work, summer 2004)



Explanation: The selling price refers to the middle of the trade season in 2004, when the price is generally the lowest. The number in parenthesis indicates the size of stakeholders. The legend A1 explains the signs. [\*1] Based TRAN THI NHAN et al. (2004).

### Legend A 1: Explanation for figure A2

Sign	Signification	Line intensity	Signification
	Producer and first buyers at forest gate	.....	Information from secondary data, not personally contacted market places.
	First middlemen	—————	Traded quantity: < 100 tons/year
	Second middlemen	—————	Traded quantity: < 300 tons/year
	Third middlemen	—————	Traded quantity: > 500 tons/year
	End customer	—————	Traded quantity: > 1000 tons/year

#### A 2.2 Product

##### *Quality, appearance and size:*

Information on the favourite shoot commodity is given in table A4.

##### *Packing and branding:*

Shoots for small-scale end customers are neither packed nor branded.

##### *Substitutes:*

The majority of the informants trade more shoots of *Dendrocalamus barbatus* than of *D. asper*. Both are the same price, are of equal taste and are used for shoot drying. An alternative species with a high demand is *Schizostachyum pseudolima* for autumn shoot production (see table A5).

Shoot traders in the urban centres of Ha Dong and Hanoi seldom trade with *Indosasa angustata*. Based on TRAN NGOC HAI (1999) the protein content of this species is higher than that of *Dendrocalamus asper* and *D. barbatus*. The fat value is 0.11 % for *I. angustata* compared to 0.16 % for *D. asper*.

**Table A 2: Methods of water and salt water storage at the forest gate and market places**

Place	Method
Ngo Luong commune, HB	– Water storage: Shoots are put in pots with water with an air tight seal. After 4-5 days shoots taste sour.
Luong Son (HB), Phuc Lam (HT), Dong Phuong Yen (HT), Linh Mai (HT), Ha Dong (HT) and Hanoi	– Water storage: Shoots are kept in nylon bags. The duration varies among stakeholders from 1-4 weeks. – Salt water storage: A 200 litre barrel contains 160 kg boiled shoots and 4-5 kg salt. Shoots are stored for 3-5 months, mostly until the Tet holiday. The shoots taste sour afterwards and need to be boiled twice before they are consumed. The resource persons store 2-20 tons per season.

**Table A 3: Methods of shoot drying and locally added value applied at different places**

Actor (number)	Place	Ratio boiled : dried	Procedure	Quantity/actor	Remarks
Producer (> 50)	Ngo Luong commune, HB	10 : 1	<ul style="list-style-type: none"> <li>- Cut in 3-5 stripes.</li> <li>- Mostly sun-dried or sometimes dried above the fire place.</li> </ul>	-	See picture A2.
First middlemen (1)	Tan Lac, HB	16 : 1	<ul style="list-style-type: none"> <li>- Cut into stripes.</li> <li>- Sun-dried for one month (oven-dried only in response to rain or low sun intensity because of discolouration).</li> </ul>	16 tons	<ul style="list-style-type: none"> <li>- Mainly <i>Dendrocalamus asper</i> is used.</li> <li>- Local customers, and customers from Hoa Binh town.</li> </ul>
First middlemen (20-30)	Phuc Lam, My Duc district, HT	8-10 : 1	<ul style="list-style-type: none"> <li>- Commodities formed like pig tongues (higher customer acceptance than stripes) results from entire, round-shaped and medium sized shoots (~0.7-0.8 kg).</li> <li>- Sun-dried on straw.</li> </ul>	0.4-0.5 tons	<ul style="list-style-type: none"> <li>- Shoots of <i>Schizostachyum pseudolima</i> have a ratio of 14-20 : 1.</li> <li>- Residents have been drying shoots for 12 years.</li> <li>- See picture A3.</li> </ul>

**Table A 4: Favourite shoot commodity**

<b>Appearance and size</b>	<ul style="list-style-type: none"> <li>- Young, entire, round shaped, bright yellow coloured and soft shoots. Boiling is essential to keep edible.</li> <li>- The degree of cleaned boiled shoots rises from the first buyer to the end consumer.</li> <li>- Customers prefer entire shoots as an indicator of freshness. Therefore shoots stripes are accepted less.</li> </ul>
<b>Species</b>	<ul style="list-style-type: none"> <li>- There is no taste difference between <i>Dendrocalamus asper</i> and <i>D. barbatus</i> shoots.</li> </ul>
<b>Quality control</b>	<ul style="list-style-type: none"> <li>- Wholesalers randomly selects nylon bags and slits them at different positions.</li> </ul>



**Picture A 2: Shoot drying in Luong Tren, Hoa Binh province**



**Picture A 3: Shoot drying in Phuc Lam, Ha Tay province**

**Table A 5: Information on different substitutes for bamboo species used as food products**

Popular Vietnamese name	Latin name	Availability and trend in Ngo Luong	Harvesting season	Sold quantity in Ngo Luong in 2003	Selling price in Ngo Luong in 2004	Highest selling price at customer places in 2004	Customer demand	Species characteristic
Bương	<i>Dendrocalamus asper</i>	Very high, 11 ha [*1]; stable	Late April to August	~ 8 tons	1'200-2'000 and 2'500-3'000 VND/ kg boiled	Hanoi market: 10'000 VND/ kg boiled shoot off-season	High, stable	Preferred as prior species for shoot drying
Luồng Thanh Hoá	<i>Dendrocalamus barbatus</i>	Very low, 1 ha [*1]; slowly increasing	Late April to August	-	-	Hanoi market: 10'000 VND/ kg boiled shoot off-season	High, stable	Preferred for shoot drying
Vầu đắng	<i>Indosasa angustata</i>	High, 49 ha [*1]; increasing	Late February - April	~ 2 tons	1'000-3'000 VND/ kg raw	12'000-13'000 VND/ kg raw in Lo Son, near Tan Lac [*2]	High at local upland markets	Bitter taste, highly appreciated
Mãng đắng [*4]	<i>Indosasa parvifolia</i>	Medium, 8 ha [*1]; depend on market demand	Late February - April	~ 2 tons	2'000-5'000 VND/ kg raw	12'000-13'000 VND/ kg raw in Lo Son, near Tan Lac [*2]	High at local upland markets	Bitter taste, highly appreciated
Hóp	<i>Bambusa textilis</i>	Medium, 4 ha [*1]; stable	July	Very low	1'500 VND/ kg	5'000 VND/ kg in Luong Son	Low [*3]	In Ngo Luong eaten with fish, storage improves taste (more sour) Transported separately from other shoots so as not to break the shoots
Nửa	<i>Schizostachyum pseudolima</i>	Not mentioned	July to October	-	-	7'000 VND/ kg boiled in Ha Dong market in main saison	High (easier to cook, dish by itself)	

Explanation: Trends are based on the intention to cultivate the species or amount of already cultivated, but not yet mature area. [\*1] The indication refers to PHAN HONG HUNG (2004). [\*2] Informants do not distinguish between the species. [\*3] Study team did not especially focus on that species. [\*4] Local Vietnamese name (Muong language).

### A 2.3 Price

#### *Demand and supply:*

The demand for bamboo shoots is high throughout the year at domestic level. The international market is rapidly growing (see A3.4). Shoots of *Dendrocalamus asper* have the highest supply from late May to July. This is the peak of the production season when the product value is lowest (see figure A3). In this period the shoot price triples or quadruples from the forest gate to potential end customers in Hanoi, as shown in figure A2 and table A6.

The selling price of the first middlemen varies from 2'200-2'700 VND/ kg to 3'000-5'000 VND/ kg for boiled shoots. The former price is offered in Tan Lac, Mai Chau

and Da Bac district, and the latter in Kim Boi district. The price difference could be explained by the different transport distances between suppliers and customers.

The market situation of the dried commodity is represented in table A7.

*Fluctuations:*

The product price fluctuates throughout the production season, and affects all market levels. The product value in the first two weeks of the harvesting season (late April/early May) is principally 20-30 % higher than in the main season (see figure A3). At the end of the shoot season the value rises again. It is, however, not to the same extent as at the beginning of the season. The highest product value is reached in the shoot off-season. Around Tet holiday the shoots are sold for 8'000-10'000 VND/ kg boiled to end customers in urban centres such as Ha Dong and Hanoi. Those shoots are processed at the peak production season and stored in salt water until the product prices are at their highest.

Examples of the market situation in the past are listed in outlook A1.

*Marketing costs and profits:*

The average gross margin of boiled and dried shoot products at different market levels in 2004 is represented in tables A8 and A9.

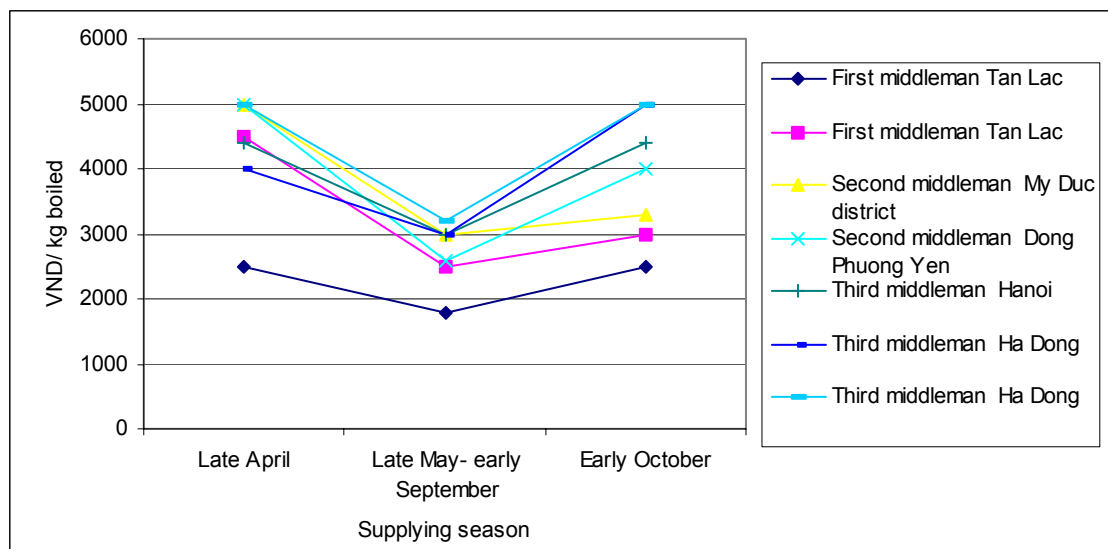
**Table A 6: General overview of the selling price at different places in 2004**

Market actors	Location	Selling price from June to July (trade peak) in VND/ kg boiled
Producer	Forest gate, Ngo Luong commune, HB	2'000-2'500
Wholesaler	Tan Lac district, HB	2'500-3'000
Wholesaler	Dong Phuong Yen, HT	3'000-3'700
Wholesaler	Ha Dong, HT	5'000-6'000
Retail seller	Hanoi	7'000

**Table A 7: Market situation for dry shoots at different places**

Place	Selling price in 2004	Quality	Customer demand
Tan Lac, HB	– 25'000-50'000 VND/ kg to local customers; – 55'000 VND/ kg to customers from Hoa Binh town	Dried shoot stripes. Dark colored shoots (oven-dried without soot-filter) achieve lower prices.	Low around Tan Lac because of the high product price.
Phuc Lam, My Duc district, HT	50'000 VND/ kg	Entire shoot (like a pig tongue after processing)	Medium-high

**Figure A 3: Buying prices of *Dendrocalamus asper* shoots for different actors and places in 2004**



Remarks: The start of the season is in late April. Then, the prices are the highest within the first two weeks. The end season refers to late September and early October.

**Outlook A 1: Selling prices of boiled and dried shoots in the last decade**

The product value has been generally stable for the last five years. In one case, the buying price was 3'000 VND/ kg boiled in 1994 compared to 5'000 VND/ kg boiled in 2004. The value of salt water stored shoots in 1994 was half of that in 2004. According to RAKE C. et al. (1993) shoots in 1993 were sold for 1'000-1'100 VND/ kg boiled at local markets in Hoa Binh province, for 1'700-2'000 VND/ kg boiled to wholesalers in Hoa Binh and for 2'500-3'000 VND/ kg boiled to retail sellers in lowland centres.

Dried shoots were sold for 12'000-15'000 VND/ kg in Hoa Binh and for 17'000-35'000 VND/ kg to retail sellers in the lowland centres in 1993 (RAKE C. et al., 1993). Processors in Phuc Lam, My Duc district, Ha Tay province, sold the commodity for 60'000-70'000 VND/ kg in the years before 2001. Afterwards, the price fluctuated between 45'000-60'000 VND/ kg.

Effects of inflation are not surveyed or taken into consideration within this study. The inflation rate of the consumer price varied and was estimated at 4% in 1999 (HELVETAS, 2002). However, the inflation rate has been higher in recent years.

**Table A 8: Average benefit of boiled shoots for stakeholders at different market levels**

Actor	Benefit in June-July (VND/ kg)	Benefit in early May and similarly from September to October [*1] (VND/ kg)	Remarks
1 <sup>st</sup> and 2 <sup>nd</sup> middlemen	500-800	1'500-2'000	The benefit includes 200 VND/ kg boiled shoot transportation costs between Tan Lac and Dong Phuong Yen/ Mai Linh, HT.
3 <sup>rd</sup> and 4 <sup>th</sup> middlemen	1'500-3'500	3'500-5'000	The benefit excludes storage expenses and rent.

Explanation: [\*1] As the selling prices from September to October are lower, the benefit should be lower than in early May.

**Table A 9: Average benefit of dry shoots with different water ratios**

Actor	Place	Benefit (VND/ kg)	Waterratio boiled : dry
1 <sup>st</sup> middlemen	Tan Lac, HB	1'000	16 : 1
1 <sup>st</sup> middlemen	Phuc Lam, My Duc district, HT	2'500	8-10 : 1

Remark: The benefit for both actors is calculated with the equal buying price of 2'500 VND/ kg boiled, and a selling price of 50'000 VND/ kg dry. This selling price represents the highest quality for the processor in Tan Lac (see table A10).

#### *Commissions, taxes and informal rules:*

There are no tax fees for shoot trade at the local tax stations in Tan Lac district. This is because traded quantities are low, and the absence of trade permission letters. So far, there is no indication of a minimum traded tax-free quantity. In theory, the resource tax is 10%, according to the resource persons at different communal tax stations, of the current product value of 3500 VND/ kg boiled for *Dendrocalamus asper* (Provincial People's Committee Hoa Binh, No. 1024/QD-UB from 9 July 2003). According to the *Law on Value Added Tax* from 1 January 1999, the value added tax for bamboo shoots is 10 % (VU VAN DUNG et al., 2002).

The legal situation of the shoot trade is unclear at different stakeholder levels. First middlemen carry only a low quantity by lorry each time (less than 500 kg) from Ngo Luong commune because of inexistent transportation certificates and the fear of punishment. All resource persons trade without permission forms, except one shoot wholesale trader. This trader possesses all relevant papers from the authorities of the communes at the edge of the Hoa Binh dam. Some stakeholders believe that shoot trade is legal for commodities from cultivated areas. Others equate shoots to vegetables and therefore see no problems with the forest protection authority.

According to the informant at the forest protection station in Luong Son district, illegal shoot trade is fined. For example, if shoots are transferred by public means, the owner has to pay 90 % of the economic value. In addition, a bus driver is fined from 11-15 mio. VND for illegal transportation independent of the effective product value.

### **A 3 Influencing factors**

#### A 3.1 Social and cultural

The preferred use of shoots is as to intensify the taste in oriental cooking. The dish called *chan gio ninh mang* (stewed pig trotters with bamboo shoots) is part of the traditional Tet menu in Vietnam (website A). Shoot soup is consumed after the first day of Tet festival.

As part of the spiritual world, in earlier times Vietnamese people imbued with Taoist spirit compared the life of a bamboo shoot with human life. It was therefore a custom to become married at an early age, such as 13 for girls and 16 for boys (website B). Therefore shoots can also be regarded as signs of fecundity.



### A 3.2 Economic frame

#### *Development of bamboo processing activities:*

Shoot exploitation became an efficient instrument to reduce poverty and to develop a new industry in China (see outlook A2). For example, the yield of bamboo shoots is 4.5 tons/ ha compared to 2 tons/ ha for rice (BISWAS S. and SRIKANTH G., 2003).

As far as it is known, there are currently no enterprises that exclusively process bamboo shoots in Vietnam. Some fruit, vegetable and agricultural product companies have an affiliated branch for shoot processing. In order to meet the increasing demand of the shoot processing industry, VU VAN DUNG et al. (2002) recommend to further develop land-use planning and to expand bamboo cultivation areas.

#### *Promotion of relevant species:*

According to DO VAN BAN (2004) species for shoot production in Vietnam are *Dendrocalamus giganteus*, *D. sp.*, *D. barbatus*, *Phyllostachis pubescens*, *Bambusa procera* and *B. blumeana*. However, species are propagated for protection forest and/ or culm exploitation, but not explicitly for shoot production. Exotic species producing edible shoots have been introduced since 1997. These are *Dendrocalamus latifolius*, *D.sp.* and *Bambusa oldhamii*. A further option is to promote shoot production throughout the year with the appropriate species (see outlook A3).

The Forestry Department and MARD initiated a forestry extension programme in 2003 to promote commercial shoot exploitation (DO VAN BAN, 2004). According to the forestry extension programme, exotic bamboo species such as *Dendrocalamus latiflorus*, *D. sp.* and *Bambusa oldhamii* are cultivated on 1461 ha in cooperation with a Vietnamese company for import and export of processed agro-forestry products.

In the lowlands of Tan Lac district, the species *Dendrocalamus sp.2* (popular Vietnamese name is Bat Do), was propagated for shoot production in early 2004. The species productivity is 3-8 kg/ shoot. It is reached under good soil conditions after the first year of propagation. Cultivation is not applied in upland areas like Ngo Luong commune because of poor soils.

#### **Outlook A 2: Shoot production for livelihood improvement**

In Lin An County (3'126 km<sup>2</sup>) in Southeast China, the bamboo area for shoot production has grown ten times to 20'000 ha in a decade (ZHAOHUA Z. and YANG E., 2003). One positive impact on shoot production is an increased valuation of 296.9 mio \$ regarding the exploitation quantity of 107'150 tons in 2002. Furthermore, bamboo species prevent erosion 1.5 times better than *Pinus massoniana*. The conifer is listed in Vietnam's Programme 661. The reasons that bamboo shoots became the main income source in Lin An County, are: 1) land allocation in the 1980s, 2) subsidies of 2.7\$/ ha for growing shoot bamboo species with a focus on *Phyllostachys* species, 3) extension training, and 4) an effective enterprise management model.

Customer demand for fresh shoots is high and trade channels to mainly North China, South Korea and Hongkong have been established.

Indicated side-effects are: 1) fluctuating shoot productivity due to weather conditions, 2) steady decline of the product value due to the quick development of the shoot industry, 3) small-scale managed cultivation areas, and 4) a focus on the production of few species.

As a consequence, a diversification of bamboo species for all-season shoot production and for risk reduction should be aspired to. In addition, market development needs to be carefully monitored.

<b>Outlook A 3: Year-round shoot production</b>		
In Yunnan, year-round shoot production including endemic species is conducted with the following species (YANG YUMING et al., 1998).		
Season	Species applied in Yunnan	Species available in Vietnam
Winter and spring	<i>Phyllostachys pubescens</i>	Priority in Programme 661 [*2] Displacement to Hoa Binh province [*3]
Spring	<i>P. nigra</i> var. <i>henonis</i> , <i>Qiongzhueae tumidinoda</i> [*1] and <i>Indosasa crassiflora</i>	Rare species [*4] - Available in North Vietnam, commercially important [*5]
Summer	<i>Dendrocalamus brandisii</i> , <i>D. semiscandens</i> [*1], <i>D. membranaceus</i> , <i>Schizostachyum funghomii</i> [*1] and <i>Chimonocalamus ssp.</i>	Available [*5] - Priority in Programme 661 [*2] Priority in Programme 661 [*2]
Autumn	<i>Fargesia yunnanensis</i> [*1] and <i>Chimonobambusa yunnanensis</i> [*1]	- - Rare species [*4]
Explanation: [*1] Species provide high quality edible shoots. Selection criteria based on biological, ecological, nutritional and taste characteristics as well as the yield capacity. [*2] According to VU VAN DUNG (2004) suggestions. [*3] According to a study of the NTFP-Research Centre (website L). [*4] Species are collected at Cau Hai Silviculture Experimental Research Centre (NGUYEN VAN THO, 2004). [*5] NGO THI MINH DUYEN (1998). - = no information.		

### A 3.3 Technological improvements

To improve the value of boiled shoots they need to be processed and packaged under the correct hygienic conditions (BISWAS S. and SRIKANTH G., 2003). With a packing temperature of 1°C, the product keeps its natural appearance for at least one month (MIDMORE D. J. and KLEINHENZ V., 2001). Already existing fruit and vegetable factories can add production units for bamboo shoots with minor effort.

Besides technological support, marketing and stable supply are essential. Direct cooperation with the producers at the forest gate is therefore an advantage. A processing unit with 80% capacity shows an input of 5'300 tons raw and an output of 960 tons of processed shoots. The annual net profit can reach 0.22 mio \$ (BISWAS S. and SRIKANTH G., 2003) and would require a production area of around 1500 ha for *Dendrocalamus asper* based on the shoot production potential indicated by PHAN HONG HUNG (2004).

### A 3.4 Customer movement

Bamboo shoots are rich in vitamins, cellulose, amino acids and trace elements, and have the same nutritional value as an onion. Shoots comprise of 90 % water, 0.3 % fat, 1.8 % protein and 2 % carbohydrates (BISWAS S. and SRIKANTH G., 2003). In addition, shoots may prevent cancer and decrease blood pressure and cholesterol. Shoots are therefore good for a healthy diet (YUMING Y. et al., 1998). A famous Chinese poem even says that, 'it is quite possible not to eat meat, but not to be without bamboo' (FU MAOYI and AN VAN BAY, 2004).

The international market rapidly increases at almost 25% (BISWAS S. and SRIKANTH G., 2003). Shoots of *Dendrocalamus asper* and *Thyrsostachys siamensis*, which also occur in Vietnam (NGO THI MINH DUYEN, 1998), are the main export items of India. Market demand for mostly boiled (90%), deep-frozen, dry, and in the near future fresh shoots, exists in China, Singapore, Malaysia, Vietnam,

the USA, Canada and Europe. Japan is the main market for boiled shoots of *D. asper*.

In order to favourably meet the shoot demand, the Technology Information, Forecasting and Assessment Council (TIFAC) in India, created guidelines for business plans (BISWAS S. and SRIKANTH G., 2003).

### A 3.5 Legal conditions

Information about the existing legal framework for shoot exploitation is listed in table A10. Table A11 shows how members of the forest protection departments implement the law.

**Table A 10: Indications of the legal situation on bamboo shoot exploitation and trade**

Legal framework	Content
Stipulation on the bio-forest technical solutions applicable to bamboo supplying forest (QPN 14-92) attached to <i>Decision 200-QD/KT</i> of 31 March 1993	Harvesting period: bamboo shoots may be harvested at the end of the shoot-bearing period 1993. (VU VAN DUNG et al., 2002)
<i>Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products</i> , article 9, clause 2 (issued with <i>Decision 47/1999/QD-BNN-KL</i> of 12 March 1999).	Transportation certificate: the commercial trade of forest products requires the certificate of the nearest ranger agency and the sale receipt. Bamboo is listed as a forest product (article 1, clause 6).
<i>Decision 178/2001/QD-TTg</i> of 12 November 2001, article 9, clause 3	Exploitation permission: the cultivator is authorised to determine the exploitation aim by himself if households invest their own money to afforest waste land zoned as forest land.
<i>Decision 178/2001/QD-TTg</i> of 12 November 2001, article 5, clause 4	Harvesting quantity: protective natural bamboo forests, which have reached a minimum cover of 80%, can be maximally exploited to 30 %. This includes shoot harvesting (VU VAN DUNG et al., 2002).

**Table A 11: Legal application from the point of view of the forest protection authority**

Administrative level	Legal application by forest protection members
Provincial level	<ul style="list-style-type: none"> <li>- Harvesting quantity: at the beginning and the end of the shoot production season, one third of the annual shoot productivity is exploitable.</li> <li>- Harvesting period: in the main shoot season, harvesting activities in home gardens and forest land are principally forbidden. Shoots which sprout out at this moment produce culms of highest quality.</li> <li>- State strategy: the legal regulation for shoot exploitation remains tricky as bamboo species are prior cultivated to regreen the country and to protect the soil against erosion. Any unmanaged exploitation activities endanger the national objective to increase the forested area.</li> </ul>
District level	<ul style="list-style-type: none"> <li>- Property rights: cultivated shoots belong to the cultivator, and this is so for forest state enterprises. In one case, local people harvested shoots illegally from such areas to meet their needs.</li> <li>- Exploitation permission: the reason and silvicultural aim for exploiting a bamboo stand needs to be presented at the local forest protection station to receive exploitation permission.</li> </ul>

## A 4 Conclusion and recommendations

### A 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

Edible shoots can be exploited on around 0.02% of the commune area with the available 11 ha of *Dendrocalamus asper* for summer shoots and a further 57 ha of *Indosasa angustata* and *I. parvifolia* for spring shoots. In comparison, 0.06% of the area in Lin An county in China is cultivated with bamboo species to favourably improve livelihoods (see outlook A2). Other studies show that cultivation of bamboo species reduces soil erosion and contributes to the re-greening of bare hills.

Bamboo diseases occur in the form of fungi, which affect shoot and entire clusters, and an unidentified borer insect, which attacks and irreversibly damages culms.

#### *Economic conditions:*

If the current area of *Dendrocalamus asper* (11ha) were equally allocated among the households, the potential return could be around 263'000 VND/ year for each household with an average of 5-6 members in Ngo Luong commune. Compared to the exploited quantity of 8 tons in 2003, the benefit for each household is 79'000 VND/ kg. If the two *Indosasa* species are included, the income contribution for each household could easily be 5 times higher due to larger cultivation areas and higher selling prices at the forest gate. As customer demand in urban centres of the lowlands is particularly high and all-season, year-round shoot production would assure a regular side income for producers. However, shoot production could support already wealthy households rather than poor households.

The potential of dried shoots is not fully explored. It is associated with low local market demand and quality. If shoots are entirely sun dried according to the applied method in Phuc Lam village and sold to wholesalers in urban centres with a benefit of 4'000 VND/ kg boiled (including transportation costs and resource tax), the annual benefit could be around 608'700 VND for every household with respect to the potential available quantity of 38'500 kg boiled shoots in Ngo Luong commune.

As national and international customer demand is increasing, an expansion of the bamboo cultivation area does not bear a high risk for market failure. Provided the processing industry adapts its technology and marketing strategy, the shoot business might positively affect the livelihoods of upland producers. Processing and storing shoots with simple technology at local level is possible and shows a potential to add value, labour and income to farmers of Ngo Luong commune.

#### *Legal conditions:*

There are only a few regulations which treat issues of bamboo shoot exploitation and trade, and these are weak (see table A10). There is no clear stipulation on the following points: 1) the maximum allowed shoot harvesting quantity per hectare

according to species and population age, 2) the time of shoot exploitation, and 3) the silvicultural aim, such as culm or shoot production at household level. As long as these points are unclear, producers might be reluctant to sell shoots in higher quantities, which is necessary to reduce marketing costs and increase benefit.

Another point is that the local tax station cannot collect the resource and value added tax when transportation permission is absent. In addition, the tax department, according to the tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB from 9 July 2003*), does not explicitly demand tax for dried shoots. This would animate to rather trade with processed products. If shoots are traded as fresh or boiled products, it depends on the species. In the case of *Dendrocalamus asper*, the commodity needs to be boiled. The only difference is made between shoots of *D. asper* and *Schizostachyum pseudolima*.

#### A 4.2 Recommendations

Bamboo shoots are a valuable product to improve income, particularly of wealthier households. Farmers in Ngo Luong commune can broaden the shoot trade while trying to access the well-established inter-provincial markets, and invest in salt water storing and/ or drying after the method of Phuc Lam. It requires, however, an adaption of the legal situation, which should facilitate a commercial shoot trade. This calls for a strong collaboration between producers, traders and authorities.

The following recommendations are presented to initiate a profitable commercial shoot trade in the long run, which should also support poorer households to become involved in shoot commercialisation activities.

##### *At village level:*

- Farmers and first middlemen (shoot transporters) should try to gain earlier access to the markets of wholesalers in Dong Phuong Yen, Mai Linh and Ha Dong with *Indosasa angustata* and *I. parvifolia* as spring producing shoot species. The same stakeholders as for *Dendrocalamus asper* and *D. barbatus* need to be contacted.
- Household groups should evaluate the possibility of locally added value, such as storing shoots in salt water and drying shoots according to the method applied in Phuc Lam.
- Farmers should try to achieve higher product prices for boiled shoots while storing in salt water and selling them towards the end of the shoot production season and for the Tet holiday.
- Household groups should try to arrange commodity transfers on a larger scale to local and inter-provincial markets.
- Farmers should try to share labour, risk and benefit throughout the year, while cultivating bamboo species with different shoot sprouting seasons.

*At commune level:*

- The commune authority should support poorer households who are willing to cultivate different bamboo species with technical knowhow and/ or link to investment capital.
- Farmers and the local forest rangers should determine together the silvicultural aim and the yearly allowed exploitation quantity for shoots and culms regarding species, population age and area.
- The bamboo growing area should be increased, especially on steep and erosion prone slopes, which are presently cultivated with maize. Intercropping with short term crops in the initial phase of establishment might be encouraged.
- The commune authority should become actively involved in programmes which support cultivation and poverty mitigation, like Programme 661.

*At district level:*

- Shoot trade at a larger scale requires production planning. It includes the establishment of inventories of bamboo species at commune level. Possible features are age of bamboo population, area in ha, density in cluster/ ha, silvicultural aim/ area, and annual potential quantity in terms of legal shoot exploitation within the commune.
- District authorities ought to create a favourable environment for shoot traders and processors to stimulate investment and production of bamboo shoots and locally added value within the district.
- Shoot trade should be legalised, and administrative procedures related to transportation certificates and tax payments should be minimised and facilitated.
- A platform should be created to begin dialogue between traders, processors, producers and members of local banks.

*At provincial level:*

- The forest protection department and other relevant departments at provincial level should clarify the legal situation on shoot exploitation and trade among districts and provinces.
- The relevant service providers, such as the extension centre and seed and seedling centre, ought to conduct research and experimental implementations for bamboo species, which enable an all-season shoot production in Hoa Binh province.
- The responsible department should acquire the knowledge of processing and packaging shoots and evaluate the opportunity for establishing such enterprises in Hoa Binh province. Similarly, already existing fruit and vegetable processing companies might be interested in affiliating a shoot processing branch.
- The forest development department should continue to plan bamboo cultivation areas and to attribute the economic aim for exploitation. This could facilitate the commercial trade for all bamboo products among producers and customers.
- The tax department should identify the minimal allowed tax free shoot quantity and introduce a resource tax for dried shoots.

*At national level:*

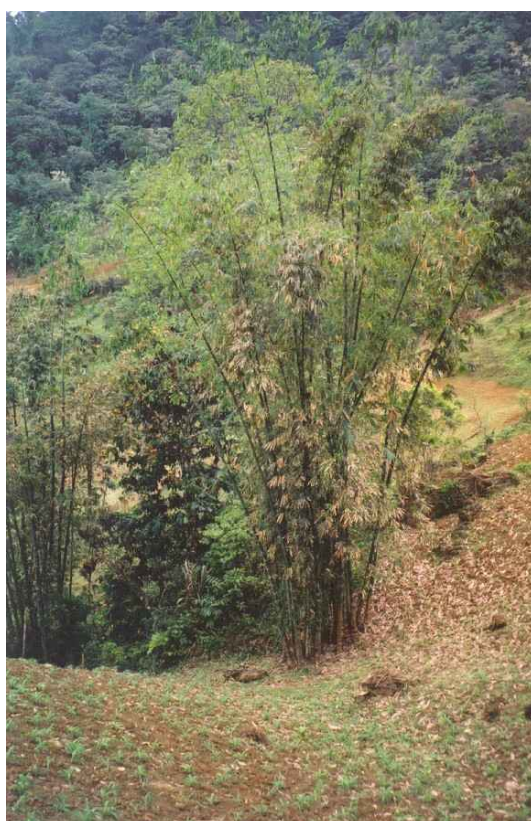
- The relevant ministries, such as education or health, should promote the advantages of consuming bamboo shoots. It supports a more balanced diet, which should positively stimulate customer demand.
- Private and/ or state enterprises should collaborate with neighbouring countries, such as India and China, to improve know-how on processing technologies regarding suitable packing, labelling and market promotion.
- The relevant ministries should create favourable conditions for ensured export markets, commodity trends and new processing technologies.

## BA Case study of bamboo culms of *Dendrocalamus asper* for paper making

The results of the field survey (PRA), market analysis (RMA) and literature review of *Dendrocalamus asper* are presented in this case study. A short overview is given in the SWOT table BA1. Conclusions and recommendations can be found in chapter BA4.

**SWOT table BA 1: Culms of *Dendrocalamus asper***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- Characteristics of bamboo are convenient for paper production (-&gt; BA1.1)</li> <li>- High availability and potential for cultivation in Ngo Luong commune (-&gt; BA1.3)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Producers are unable to transport the commodity by themselves (-&gt; BA1.2)</li> <li>- Low return for producer (-&gt; BA1.4)</li> <li>- Inconvenient storage duration (-&gt; BA2.1)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Increasing national demand of paper (-&gt; BA2.3)</li> <li>- National strategy foresees the rise of paper processing capacity (-&gt; BA3.2)</li> <li>- Programme 661 (national reforestation programme; -&gt; BA3.2)</li> <li>- Bamboo plantations as CO<sub>2</sub> sink projects (-&gt; BA3.2)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Bamboo pests (fungi/ borer species; -&gt; BA1.3)</li> </ul>



**Picture BA 1: *Dendrocalamus asper* cluster in Ngo Luong commune**

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Bương đèn
Popular Vietnamese name:	Bương
Latin name:	<i>Dendrocalamus asper</i>
English name:	-



## **BA 1 Availability and cultivation/collection practices for bamboo shoots of *Dendrocalamus asper* in Ngo Luong commune**

### BA 1.1 Product characteristics and growth habitat

*Dendrocalamus asper* belongs to the wooden tribe *Bambusinea* of the family *Poaceae* and occurs naturally in Asia (BYSTRIAKOVA N. et al., 2001). As the species forms a sympodial rhizome, the culms grow in clusters (QUISHENG Z. et al., 2003). The best growth conditions are in rich and heavy soils of humid regions up to an altitude of 1500 m (RAO A. N et al., 1998). In Ngo Luong commune, the species occurs at the edge of forested areas in the valley and on hills.

The organic composition is similar to that of wood. In particular, a culm is composed of 55 % cellulose, 25% lignin and 20 % hemi-cellulose. The lignin content of a one-year old bamboo is 20-25 %, and similar to broad-leaved wood species. This favourable composition facilitates the pulping process because less chemicals are required. Therefore, bamboo species are regarded as a high-grade raw material in the papermaking industry (QUISHENG Z. et al., 2003).

### BA 1.2 Local knowledge and practices

Culms are mainly exploited for self-use, which occurs year-round based on farmers' needs. The main harvesting season is from November to January (PHAN HONG HUNG, 2004).

If culms are used to thatch roofs, they are soaked for three months in water to break down carbohydrates. House building with bamboo culms is traditional, but nowadays less common. For other daily life uses, semi-processing is not required. Commercial exploitation is only applied when traders collect the culms at the forest gate and transport them to the next customer. Besides the difficult road conditions, weight and volume for transportation are negative attributes of the raw material.

### BA 1.3 Availability and quantity traded out of Ngo Luong commune

In Ngo Luong commune, *Dendrocalamus asper* occurs on 11 ha (PHAN HONG HUNG, 2004). The clusters have been either cultivated for a long time, or for the past two or three years due to the beginning of customer demand for shoots.

As already mentioned for bamboo shoots of *D. asper*, the species is affected by branch and leaf discoloration and borer insects.

As culms are insufficiently thinned, clusters of 30-40 m height that remain become diseased, and shoot productivity is reduced in the following season (PHAN HONG HUNG, 2004). The annual exploited quantity is 570 culms/ ha, which corresponds to an exploitation intensity of 21% (PHAN HONG HUNG, 2004). Only one studied household transported one lorry load of culms to Tan Lac two years ago.

## BA 1.4 Economics for villagers

The sixteen studied households did not trade with this product. This might be explained by the low return of around 600 VND/ culm, and the low customer demand.

## BA 1.5 Similar products or substitutes in Ngo Luong commune

Besides *Dendrocalamus asper*, two *Indosasa* species, two *Bambusa* species and *D. barbatus* are available in the allocated forest land. However, the occurrence of *B. blumeana* (see case study BB) and *D. barbatus* are currently low. Culms of *B. textilis* are principally used for household needs. Those of *Indosasa angustata* are semi-processed to sticks, which are used for comb making (see case study BC).

## BA 2 Market assessment

### BA 2.1 Market place

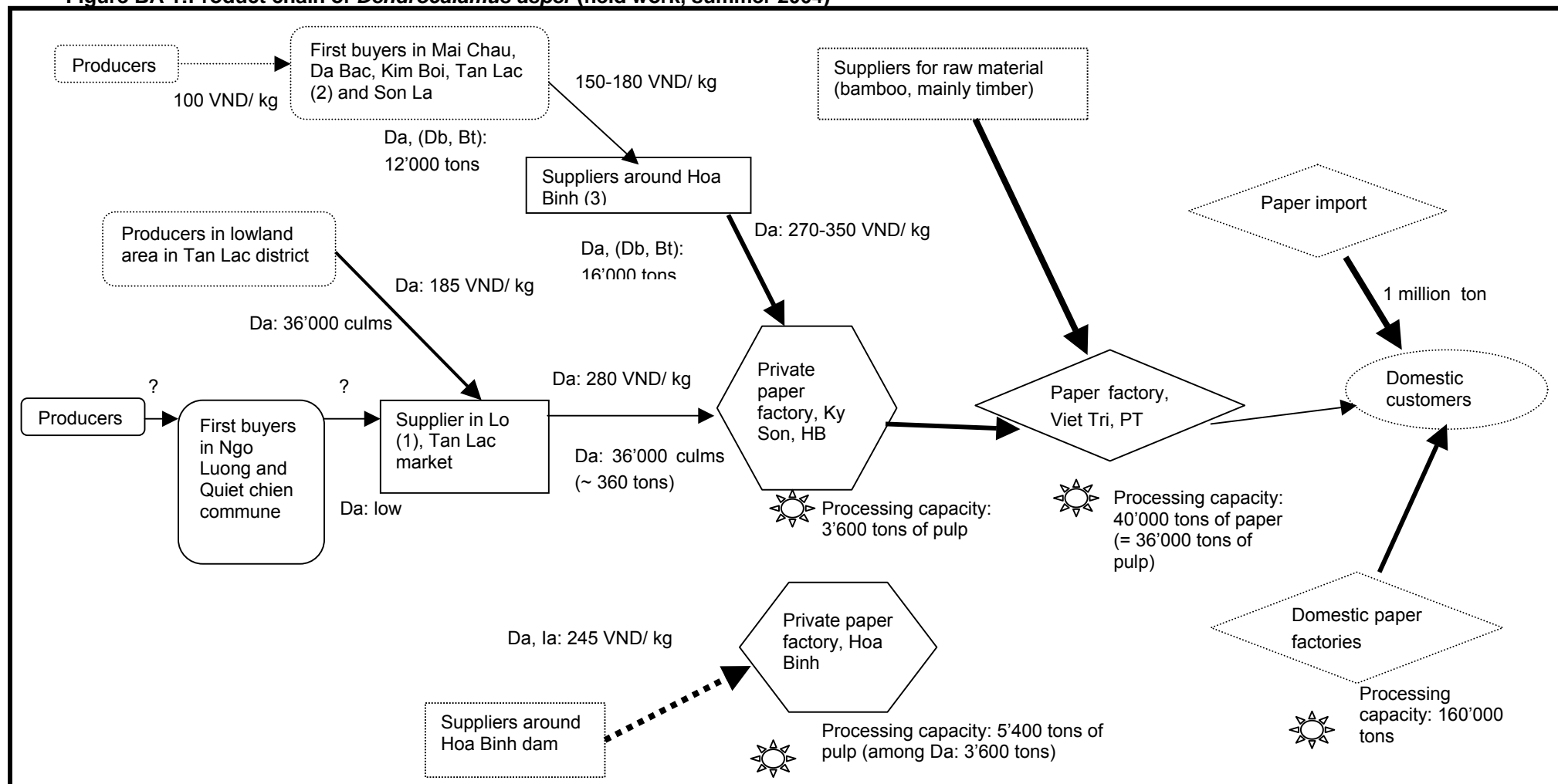
#### Market actors:

Characteristics of actors involved in paper processing are listed in table BA1. Figure BA1 shows the market chain.

**Table BA 1: Characteristics of market actors**


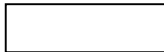




Actor	Location	Processing capacity	Special feature
Culm transporters	Tan Lac (1) and around Hoa Binh (3)	Truck capacity is 1.5-10 tons	<ul style="list-style-type: none"> <li>- Transporters from Hoa Binh are mainly provided from Son La province and the upland districts of Hoa Binh province such as Mai Chau, Da Bac and Kim Boi.</li> <li>- Transporters know each other and regard each other as competitors.</li> <li>- One transporter possesses five lorries.</li> </ul>
Pulp and paper processing company	Ky Son	Maximum 450 tons pulp/ month	<ul style="list-style-type: none"> <li>- Company background: foundation in 1967, merging with the Viet Tri paper company in 2000.</li> <li>- Processing ratio: 1 ton raw culm = 0.21 ton pulp with requested water ratio of 50 %.</li> <li>- Problems are: 1) insufficient supply, 2) no temporary liquidity, and 3) creating water pollution by daily industrial discharge (VIETNAM NEWS, 2004a).</li> </ul>
Joint stock paper and chopstick company	Hoa Binh	250 tons of paper/ month (in July)	<ul style="list-style-type: none"> <li>- Company background: foundation in 2002.</li> <li>- Main product: worship paper for Taiwanese customers.</li> <li>- Capacity trend: 750 tons paper/ month by the end of 2004.</li> <li>- Supply (culm and pulp): 450 tons/ month, culms are mainly from areas around the Hoa Binh dam</li> <li>- Competition: 3 other chopstick factories around Hoa Binh.</li> <li>- Storage: problem of preservation of freshly cut culms.</li> </ul>
Paper company	Viet Tri, Phu Tho province	40'000 tons of paper in 2004	<ul style="list-style-type: none"> <li>- Company background: foundation in 1958.</li> <li>- Processing ratio: 1 ton pulp = 1.1 ton paper</li> <li>- Supply: 10 % from the requested 25 % pulp of bamboo comes from Ky Son pulp company.</li> </ul>

Figure BA 1: Product chain of *Dendrocalamus asper* (field work, summer 2004)



Explanation: Quantity and price refer to 2004. The number in parenthesis indicates the number of stakeholders. Da = *Dendrocalamus asper*, Db = *D. barbatus*, la = *Indosasa angustata*, Bt = *Bambusa textilis*.

### Legend BA 1: Explanation for figure BA1

Sign	Signification	Line intensity	Signification
	Producer and first buyers at place of production	.....	Information from secondary data, not contacted areas
	First middlemen	————	Connect stakeholders without percentage indications
	Second middlemen	—————	Percentage of whole supplied quantity for one stakeholder is < 20 percent
	Third middlemen	—————	Percentage of whole supplied quantity for one stakeholder is > 20 percent
	End customer		Processing places

#### *Transportation:*

No further information is provided in addition to table BA1.

#### *Storage:*

Freshly cut culms can be stored without treatment for a maximum of one week. An improved storage method is to store culms vertically to allow water efflux. Another method is to cut culms and soak them either in pure water, or in a chemical solution under permanent circulation. The limited storage duration is regarded as a disadvantage. Recommendations are presented in outlook BB1 of the case study BB.

### BA 2.2 Product

#### *Quality, appearance and size:*

There are no quality standards for the paper factories other than signs of decay.

#### *Packing and branding:*

No information on packing and branding is collected for culms.

#### *Substitutes:*

The joint stock paper and chopstick company in Hoa Binh require *Indosasa angustata* in the shoot sprouting season of *Dendrocalamus asper*. This is in consideration of the fact that bamboo cutting in its growing season damages the stands and the new shoots. Transporters also trade with culms of *Dendrocalamus barbatus* and *Bambusa textilis* (see figure BA1).

## BA 2.3 Price

### *Demand and Supply:*

The domestic demand for paper is increasing and the potential has not yet been reached as current national paper consumption is moderate. The annual paper consumption rate in Vietnam was 3.5-4.3 kg/ person in 2000 according to the statistics of the Ministry of Industry (HA CHU CHU, 2004). In contrast, the annual rate in China is estimated at 10 kg/ person. About one seventh of current domestic demand is provided by Vietnamese companies. The remaining demand is imported. The national strategy foresees meeting 85-90 % of domestic demand by 2010 (HA CHU CHU, 2004). This corresponds to 1.05 mio tons of paper, or around 4.578 mio tons of culms.

The raw material supply refers to the available bamboo area, the shoot season and the producers' labour allocation. Lack of raw material is often associated with inefficient exploitation management and increasing competition between end users.

The purchase price of culms at the forest gate for transporters is 150-185 VND/ kg, who then dispose of the culms for 270-350 VND/ kg to Ky Son pulp and paper company (see figure BA1). The company determines the price. The joint stock paper company in Hoa Binh offers a stable purchase price of 245 VND/ kg at the factory gate.

### *Fluctuations:*

The product price between first buyers and transporters fluctuates at around 30-50 VND/ kg related to the availability of raw material and the producers' labour allocation. The fluctuations between transporters and the Ky Son company are apparently related to transportation certificates. If the commodity is traded without valid transportation certificates, the culms are sold for 270-280 VND/ kg. Otherwise, culms are sold for 320-350 VND/ kg at the factory gate.

### *Marketing costs and profits:*

The return for transporters per lorry is around 100'000 VND/ ton, excluding expenses for transportation. If resource and value added taxes of 83'000 VND/ ton (see below) are included, the calculated net benefit is 67'000 VND/ ton. This includes the higher purchase price of 350 VND/ kg, which becomes relevant for trade with transportation certificates. The joint stock and chopstick company in Hoa Binh states that it has an annual net income of 3.15 mio \$ from producing praying paper, and 1.5 mio \$ from chopsticks.

### *Commissions, taxes and informal rules:*

According to the tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB, of 9 July 2003*) culms of *Dendrocalamus asper* are liable to tax at a product value of 8'000 VND/ culm. Bamboo products in general have a resource tax of 10 % and a value added tax rate of 5 % (VU VAN DUNG et al., 2002). Transfers without transportation certificates are frequent. However, data on likely informal fees is not available.

## **BA 3 Influencing factors**

### **BA 3.1 Social and cultural**

Bamboo is a traditional material with 30 different applications identified in Vietnam (VU VAN DUNG et al., 2002). Paper processing, handicraft and construction are thereby the most essential industrial sectors. As aforementioned, Taiwan is a big trade channel for worship paper, which is used for religious ceremonies (LE THI PHI et al., 2004).

### **BA 3.2 Economic frame**

#### *Promotion activities to enable paper making:*

In order to ensure the raw material supply for paper and pulp factories, the Vietnam Paper General Corporation initiated a project to cultivate around 72'000 ha of *D. membranaceus* between 2002 and 2011 (HA CHU CHU, 2004). This should supply 750'000 tons of raw material annually for the designed paper and pulp factory in Thanh Hoa province, with an annual processing capacity of 60'000 tons.

As a result of the recently held Asian-Europe Meeting (ASEM) summit on the 8 and 9 October 2004 in Hanoi, the European Young Political Leaders Summit adopted a new initiative on 'Concept Paper of Asia' (website J).

Bamboo species are useful carbon sequestrators as bamboo stands have approximately the same impact on accumulating carbon dioxide than conifer forests. A Japanese cement manufacturer initiated a project as a carbon credit investment on 36 ha in Vietnam in 1996 (website K). According to the agreement at the 6<sup>th</sup> session of the United Nations Framework Convention on Climate Change (UNFCCC) in Bonn in July 2001, forest projects with a focus on reforestation and afforestation receive technological and financial support (ANGELSON A. and WUNDER S., 2003).

#### *Promotion of relevant species:*

*Dendrocalamus asper* is considered as a priority species regarding its commercial importance and its broad distribution in the Asia-Pacific region (BYSTRIAKOVA N. et al., 2003). In particular, VU VAN DUNG (2004) proposes the inclusion of this species for productive forests in the *Five Million Hectares Reforestation Programme 1998-2010* in Vietnam.

### **BA 3.3 Technological improvements**

The NTFP Research Centre developed the technological process of transforming black liquor adhesive (waste from paper industry) into a substance to make bamboo mat boards and plywood (website L).

### BA 3.4 Consumer movement

As reported under demand and supply, Vietnamese domestic supply of its paper demand is set to rise significantly according to the national strategy. The domestic output value for paper and paper products was 1'946.8 billion VND in 1996, and rose temporarily to 5'139 billion VND in 2002 (GENERAL STATISTICS OFFICE, 2003). The fabricated amount of cover and printed paper doubled in that time. In the global context, the bamboo market achieves a turnover of about 157'000 million US-dollar and is expected to double in the next ten years (VIETNAM NEWS, 2004e). The demand for paper is highest in the USA.

### BA 3.5 Political and legal conditions

The most relevant issues for bamboo culm exploitation and trade are given in table BA2.

**Table BA 2: Indications to the legal situation about bamboo culm exploitation**

Legal framework	Content
<i>Decision 02/1999/QD-BNN-PTLN</i> of 5 January 1999, article 31	Procedure of designing exploitation areas: area need to be marked and drawn on a plan of 1:5000. Trees are inventoried and output calculated.
<i>Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products</i> , article 9, clause 2 (issued with <i>Decision 47/1999/QD-BNN-KL</i> of 12 March 1999).	Transportation certificate: The commercial trade of forest products requires the certificate of the nearest rangership agency and the sale receipt. Bamboo are listed as forest products (article 1, clause 6).
<i>Decision 08/2001/TTg</i>	Harvesting quantity: Protective natural bamboo forests, which have reached a minimum cover of 80%, can be exploited to a maximum of 30 %. This includes shoot harvesting (VU VAN DUNG et al., 2002).
<i>Decision 178/2001/QD-TTg</i> of 12 November 2001, article 9, clause 3	Exploitation permission: The cultivator is authorised to determine the exploitation aim by himself, if households invest their own money to afforest waste land zoned as forest land.
<i>Decision 178/2001/QD-TTg</i> of 12 November 2001, article 13, clause 4	Household benefit: The complete economic value belongs to the owner of assigned or leased forest land by the state, after the resource and value added tax is paid. If households are contracted by the state to protect the forest, the households benefit 80-90 % of the after-tax value.

## BA 4 Conclusion and recommendations

### BA 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

The clusters of *Dendrocalamus asper* are dense and aged. As a consequence, thinning is recommended by PHAN HONG HUNG (2004), which positively stimulates

the shoot sprouting potential. The annual exploitation potential is 6'270 culms in Ngo Luong commune. This might correspond to an annual trade potential of around 15-17 lorries with four tons loading capacity.

*Economic conditions:*

The studied households in Ngo Luong commune had no income from trading with *Dendrocalamus asper* culms in 2003. The trade that apparently exists, however, is weak and irregular due to a low product value and transportation inconveniences.

If farmers in Ngo Luong commune sell the commodity for 185 VND/ kg directly at the village, the gross margin for the farmers might be 0.74 mio VND/ lorry with four tons loading capacity. If farmers need to rent a lorry for transporting culms to the district town, the investment is almost as high as the return due to the transportation costs.

*Legal conditions:*

To overcome the situation of aged clusters, the cultivation areas of *Dendrocalamus asper* might currently require more intensive thinning than the legally allowed thirty percent. This would require a special exploitation certificate, including the transportation certificate issued by the relevant authorities at district level (Forest Protection Station and Peoples Committee).

#### BA 4.2 Recommendations

Culm exploitation of *Dendrocalamus asper* for the paper industry is not profitable under the current market conditions for the upland farmers in Ngo Luong commune. Selected thinning is necessary to ensure favourable shoot production. The short-term recommendations are as follows:

*At village level:*

- Farmers should try to adopt more technically sound silvicultural practices to extend the clusters and maintain shoot productivity. As a consequence of aged clusters, the harvesting intensity should be higher in the next two years. A collaboration with the forest ranger office should be sought to clarify the silvicultural practices and legal situation.
- Groups of farmers ought to seek a closer collaboration with culm traders and paper customers in order to overcome transportation inconveniences. This could include paper customers equipping producers with culm cutting machines to produce bamboo chips. This results in reduced transportation volume and increased transportation efficiency as the density per volume increases.

*At commune level:*

- The commune authority should actively implement land use planning activities and request cultivation programmes for greening bare hills and improving livelihoods, as stipulated in Programme 661.



- Paper factories and local banks should be contacted to ensure access to processing equipment and investment capital.

*At district level:*

- The forest ranger office should favourably support thinning activities. This includes providing silvicultural knowledge and facilitating the issue of transportation certificates.
- District extensionists should support farmers to establish bamboo nurseries and to introduce effective propagation methods, such as cutting propagation.

*At provincial level:*

- The responsible department at provincial level should facilitate bamboo cultivation projects. The focus should be on a clear identification of producers and customers, and poorer households should be the target of business approaches and methods.

*At national level:*

- The option of using bamboo as a valuable CO<sub>2</sub> sink should be evaluated, and investment partners sought.

**BB Case study of bamboo culms of *Bambusa textilis* and *Bambusa blumeana* for handicraft and construction**

The results of the field survey (PRA), market analysis (RMA) and literature review of *Bambusa textilis* and *Bambusa blumeana* are presented in this case study. A short overview is given in the SWOT table BB1. Conclusions and recommendations can be found in chapter BB4.

**SWOT table BB 1: Culms of *Bambusa textilis* and *Bambusa blumeana***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- Favourable characteristics of <i>B. blumeana</i> for handicraft and construction sector (-&gt; BB2.2)</li> <li>- Relatively high product value in particular for <i>B. blumeana</i> in Tan Lac and processors places (-&gt; BB2.3)</li> <li>- Existing and stable markets in the lowlands (-&gt; BB2.1)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Low availability (-&gt; BB1.3)</li> <li>- Short storage duration of fresh culms (-&gt; BB 2.1)</li> <li>- Culm transportation is subject to informal fees (-&gt; BB2.3)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Programme 661 and KFW (national reforestation programme; -&gt; BB3.2)</li> <li>- High and increasing market demand for handicraft and construction (-&gt; BB3.4)</li> </ul>	<p><b>THREATS</b></p>



**Picture BB 1: Cluster of *Bambusa textilis* in Ngo Luong commune**

<b>SPECIES NAMES</b>		
Local Vietnamese name:	Tre (Hóp)	Tre gai
Popular Vietnamese name:	Hóp	Tre gai
Latin name:	<i>Bambusa textilis</i>	<i>Bambusa blumeana</i>
English name:	-	-

## **BB 1 Availability and cultivation/collection practices for bamboo culms of *Bambusa textilis* and *B. blumeana* in Ngo Luong commune**

### BB 1.1 Product characteristics and growth habitat

*Bambusa textilis* and *B. blumeana* belong to the wooden tribe *Bambusinea* of the family *Poaceae* and occur naturally in Asia (BYSTRIAKOVA N. et al., 2001). As the species forms a sympodial rhizome, the culms grow in clusters (QUISHENG Z. et al., 2003). Culms of *B. blumeana* are 15-25 m tall, have an internode length of 25-60 cm, a diameter of 6-10 cm and a wall thickness of 0.5-3 cm. In contrast, culms of *B. textilis* are 4.5-15 m tall, have an internode length of 35-60 cm and a diameter of 3-5 cm (RAO A. N et al., 1998).

*B. textilis* occurs in moderately rich soils, which are usually found on hills. *B. blumeana* shows a wider range from poorer to richer soils in humid or dry tropical regions. This species is frost resistant and can tolerate temperatures as low as -7°C (RAO A. N et al., 1998).

### BB 1.2 Local knowledge and practices

Both bamboo species are used for building fences, houses and cattle shelters, making baskets and chopsticks, and as fire-wood (PHAN HONG HUNG, 2004). Basket making and weaving is considered as men's work. In general, culms for commercial use are exploited from November to January.

### BB 1.3 Availability and quantity traded out of Ngo Luong commune

*Bambusa textilis* occurs on 4 ha and *B. blumeana* on 2 ha in Ngo Luong commune (PHAN HONG HUNG, 2004). Stands of *B. blumeana* show a density of 3'383 culms/ha. Commercial harvesting is only accidentally done by men if there are ready customers or an urgent need for cash.

### BB 1.4 Economics for villagers

Only one of the sixteen studied households shows an income contribution, which is 3 % of the household cash income and results from basket making.

### BB 1.5 Similar products or substitutes in Ngo Luong commune

Culms of *Dendrocalamus asper* are used in the paper industry (see case study BA), and a culm semi-product of *Indosasa angustata* is required for traditional comb production (see case study BC).

## **BB 2 Market assessment**

### BB 2.1 Market place

#### *Market actors:*

Characteristics of market actors are shown in table BB1. The product chain is given in figure BB1.

**Table BB 1: Characteristics of market actors**

Actor (number)	Location	Special feature
Transporters (2)	Tan Lac district, Hoa Binh	<ul style="list-style-type: none"> <li>Trade season: mainly in the dry season due to precarious road conditions to Ngo Luong commune</li> </ul>
Culm classifying actors (50)	Dan Hoa commune, Thanh Oai district, Ha Tay	<ul style="list-style-type: none"> <li>Village reputation: bamboo market village for 60-70 years. The reason is the high knowledge of inhabitants of classifying culm parts according to their end use.</li> <li>Trade season: 8 households carry a year-round trade, the others only in the main periods of February and August.</li> <li>Village organisation: no association.</li> <li>Supply: mainly from Hoa Binh, Son La, Thanh Hoa and Lang Son province.</li> <li>Customers: mainly in Haiphong, Hai Duong and Quang Ninh provinces.</li> </ul>
Traditional handicraft processors (5 villages)	Vien Noi commune and Van Ngoai commune, Ung Hoa district, Ha Tay	<ul style="list-style-type: none"> <li>Product: traditional baskets (potential annual productivity: 3'000 baskets/ households)</li> <li>Supply: nowadays from upland areas, in earlier times around the village.</li> </ul>
Handicraft factory	Dan Hoa commune, Thanh Oai district, Ha Tay	<ul style="list-style-type: none"> <li>Product: fashionable handicrafts items for export.</li> <li>Organisation: 1'000 villagers. Owners design new items and teach villagers.</li> <li>Supply: mainly from Son La province due to a close trade relationship.</li> </ul>
Traders for construction (15)	Thai Ha, Trung Kinh and Kim Nguu street in Hanoi	<ul style="list-style-type: none"> <li>Relation to Dan Hoa processors: unsatisfactory price-quality relation, because high quality culm parts are sold to the adjacent handicraft villages of Dan Hoa commune.</li> <li>Supply: mainly from Son Tay province, but also from Thai Nguyen, Vinh Phuc and Thanh Huyen provinces. The reason is the better price-quality relation.</li> <li>Foundation: 1 m<sup>2</sup> requires 25 bamboo culms.</li> </ul>

**Transportation:**

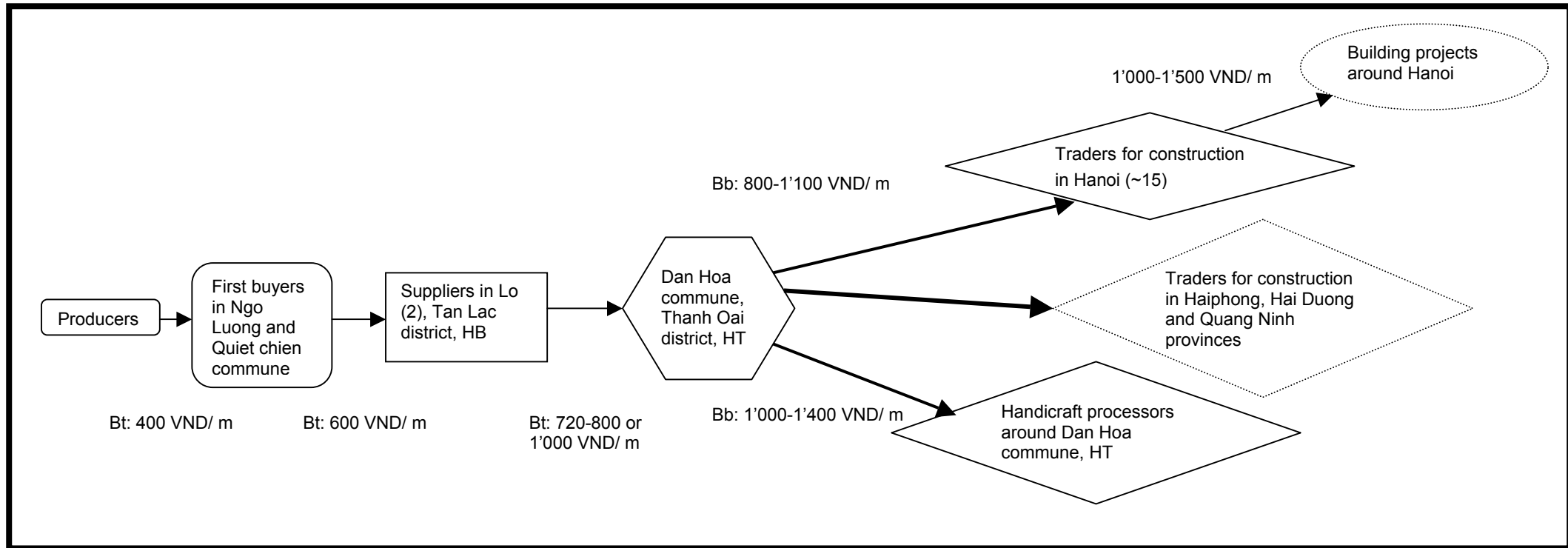
Common transporters in Tan Lac own trucks with 4-5 tons loading capacity. This is equivalent to 4'500-5'000 culm meters. Resource persons in Dan Hoa commune use lorries with an average capacity of 1.5-2 tons, or 1'000-2'000 culm meters. Traders in the three surveyed streets in Hanoi transport 2'000-4'000 culm meters per load to their customers.

**Storage:**

Freshly cut green culms of *Bambusa blumeana* can be stored in the shade for two to four weeks maximum. Rainy weather positively influences the storage duration. In contrast, culms of *B. textilis* can only be stored for several days or two weeks maximum. In general, culms are usually stored for a short time. However, in December stakeholders in Dan Hoa commune extend storage time up to three months to trade culms in the periods of no supply. In order to achieve this longer storage time, culms are put on earth and covered with plastic.

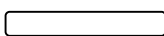
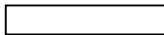
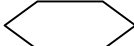


The storage capacity of construction traders in Hanoi is 6'000-10'000 m on average, and for a large-scale trader up to 40'000 m. The storage sites are mostly full in July.

Figure BB 1: Product chain of *Bambusa textilis* and *Bambusa blumeana* (field work, summer 2004)



Explanation: Prices refer to 2004. The number in parenthesis indicates the number of stakeholders. Bt = *Bambusa textilis*, Bb = *Bambusa blumeana*.

### Legend BB 1: Explanation for figure BB1

Sign	Signification	Line intensity	Signification
	Producer and first buyers at place of production	.....	Information from secondary data, not contacted areas
	First middlemen	—————	Traded quantity: < 100'000 m/ year
	Second middlemen	—————	Traded quantity: < 1million m/ year
	Third middlemen	—————	Traded quantity: < 4 million m/ year
	End customer	—————	Traded quantity: > 4 million m/ year

### BB 2.2 Product

#### *Quality, appearance and size:*

The culm has to be freshly cut (alive and green), which is a major criteria. Handicraft and construction customers principally require culms of *Bambusa blumeana*. Additional properties according to different stakeholders are listed in table BB2.

**Table BB 2: Quality characteristics of *Bambusa blumeana* culms**

Actor (number)	Location	Quality
Culm classifying actors (50)	Dan Hoa commune, Thanh Oai district, Ha Tay	<ul style="list-style-type: none"> <li>- Diameter: minimum 5 cm</li> <li>- Wall thickness: 1-2 cm. This is influenced by soil conditions. Higher quality culms are received from Tan Lac and Kim Boi district.</li> </ul>
Traditional handicraft processors (5 villages)	Vien Noi commune and Van Ngoai commune, Ung Hoa district, Ha Tay	<ul style="list-style-type: none"> <li>- Diameter: 7-8 cm on average, higher quality &gt; 10 cm</li> <li>- Length: often 5 m</li> <li>- Age: older parts are used for basket frame and younger parts for the more flexible basket mantle.</li> <li>- Mechanical strength: highest by an age of 4-6 years.</li> </ul>
Handicraft factory	Dan Hoa commune, Thanh Oai district, Ha Tay	<ul style="list-style-type: none"> <li>- Diameter: 8-12 cm</li> <li>- Length: unimportant</li> </ul>
Traders for construction (15)	Thai Ha, Trung Kinh and Kim Nguu street in Hanoi	<ul style="list-style-type: none"> <li>- Diameter: 4-8 cm</li> <li>- Length: minimal 1.5-2 m as customers request 1.5-2.5 m parts.</li> </ul>

#### *Packing and branding:*

The classified culms are tied in bundels of ten pieces with a length of 1.5-2 m when the commodity is traded to construction customers.

#### *Substitutes:*

Construction traders acquire culms of *Bambusa textilis*, *Dendrocalamus asper* and *D. barbatus* if there is a lack of *B. blumeana*.

High quality culms of *D. barbatus* are required in a special handicraft sector, which fabricates flower bowls for customers mainly in Korea, Japan and the USA. Culms with a diameter of 10 cm and 7-8 m length are burnt to provoke hardness and colour change. This product is used to make bowls. To extract humus substrate, culms are coaled.

## BB 2.3 Price

### *Demand and supply:*

Since Doi Moi in 1986, permanent economic growth, in particular in the infrastructure and handicraft sector, has generated an increasing demand for bamboo products. Trade season, traded quantity and buying prices are represented in table BB3. Construction traders in Hanoi sell the culms for 1'000-1'500 VND/ m in the main seasons, which are from January to February and from August to November. This is the main season for building houses.

Traders have a lack of raw material in August due to the shoot sprouting period. This inconvenience is solved by acquiring culms in June and July.

### *Fluctuations:*

Price fluctuations are related to changes in demand and quality differences. For example, construction traders pay around 100 VND/ m more in the higher demand period (see table BB3). The selling price is 1'200-1'800 VND/ m, which is around 200-300 VND/ m higher in the main trading season due to increased construction activities.

### *Marketing costs and profits:*

The benefit of market actors is listed in table BB4. A comparison is, however, only possible with construction traders, as handicraft processors transform the commodity.

**Table BB 3: Trade season and sold quantity of the different market actors**

Actor (number)	Location	Trade season	Quantity	Buying price in 2004
Culm classifying actors (50)	Dan Hoa commune, Thanh Oai district, Ha Tay	June-March, few actors all-season	1.2 mio m/ year (or 150-170'000 culms/ year)	Bt: 720-1'000 VND/ m Bb: 700-1'200 VND/ m
Traditional handicraft processors (5 villages)	Vien Noi commune and Van Ngoai commune, Ung Hoa district, Ha Tay	All-season	For example, one households buys 30-100 five meter culms/ time	Bb: 1'000-1'200 VND/ m [*1] Bb: 1'200-1'400 up to 1'800 VND/ m [*2]
Handicraft factory	Dan Hoa commune, Thanh Oai district, Ha Tay	All-season	No indication.	Bb: 2'000-2'500 VND/ m
Traders for construction (15)	Thai Ha, Trung Kinh and Kim Nguu street in Hanoi	Mainly from January-February and from August-November [*3]	In the main season: 4'000-20'000 m/ month 400'000 m/ month (big scale trader)	Bb: 800-1'100 VND/ m [*4] Bb: 900-1'500 VND/ m [*5]

Explanation: Bt = *Bambusa textilis*, Bb = *Bambusa blumeana*. [\*1] culms with diameter 7-8 cm, [\*2] culms with diameter > 10 cm. [\*3] period of the highest demand of construction customers, [\*4] in trade side season, [\*5] in main trade season.

**Table BB 4: Average benefit of the market actors**

Actor (number)	Location	Benefit	Remarks
Transporters (2)	Tan Lac district, Hoa Binh	50-80 VND/ m	Including transportation costs and informal fees of approximately 250 VND/ m to Dan Hoa commune.
Culm classifying actors (50)	Dan Hoa commune, Thanh Oai district, Ha Tay	120-140 VND/ m	Including transportation costs to Hanoi.
Traditional handicraft processors (5 villages)	Vien Noi commune and Van Ngoai commune, Ung Hoa district, Ha Tay	3'000-5'000 VND/ basket	Excluding labour and possible transportation costs.
Handicraft factory	Dan Hoa commune, Thanh Oai district Ha Tay	40-50 bio VND/ year	Total benefit of factory.
Traders for construction (15)	Thai Ha, Trung Kinh and Kim Nguu street in Hanoi	200-300 VND/ m	If provided from Son Tay province and sold in Hanoi.

**Commissions, taxes and informal rules:**

The transporters in Tan Lac refuse to pay tax and fees to the local authority in Ngo Luong commune or to the local tax station, although both instruments exist. The tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB, of 9 July 2003*) assigns *Bambusa textilis* culms a current market value of 5'000 VND/ culm. Bamboo products have a resource tax of 10 % and a value added tax rate of 5 % (VU VAN DUNG et al., 2002). The commune transit tax is 50'000-70'000 VND/ lorry. In order to store the commodity along the commune road, fees are determined differently by each village.

Additionally, informal fees exist for acquisition direct at the forest gate and for long distance transfers. For example, mobile forest rangers between Tan Lac and Dan Hoa commune in Ha Tay province demand four or five times the usual fees of 30'000-50'000 VND/ lorry, and even 200'000-300'000 VND/ lorry carrying around 5'000 culm meters. The police fine mostly for overloading at 100'000-200'000 VND/ lorry, which can happen up to three times per trip. As a result, transporters often take the road which passes Cho Ben (Cao Thang commune, Kim Boi district, Ha Tay province) to Dan Hoa commune. Traders in Dan Hoa commune also pay informal fees of 300'000-400'000 VND/ trip to police and forest rangers if the commodity is sold in Haiphong, Hai Duong or Quang Ninh provinces.

**BB 3 Influencing factors****BB 3.1 Social and cultural**

Bamboo is a traditional material with 30 different applications identified in Vietnam (VU VAN DUNG et al., 2002). Handicraft, construction and paper processing are the most essential industrial sectors. 1'400 handicraft villages in Vietnam produce items from bamboo or rattan (PHAN SINH, 2004). This positively affects economic development, job creation and hunger and poverty alleviation, mostly in the red river delta area.



Furthermore, 50 % of construction material originates from bamboo in rural areas (VU VAN DUNG et al., 2002). In urban centres bamboo culms are still used for foundations as available space is limited and concrete is expensive.

Although many traditional household equipment and containers have been gradually replaced by cheaper industrial products, such as synthetic derivatives, a growing export market for handicraft items can compensate the reduced local demand for bamboo raw material.

### BB 3.2 Economic frame

#### *Development of bamboo processing activities:*

Based on VU VAN DUNG et al. (2002), the economic significance of special trees and plants for handicraft, bamboo articles and other items was launched with the *Resolution 09/NQ-CP* of 15 July 2000. Furthermore, the *Decision 132/2000 TTg* of 24 November 2000, encourages the development of forest product processing, and bamboo and handicraft production in rural areas (PHAM XUAN PHUONG, 2001).

The annual export turnover for the handicraft sector gradually increased and reached a growth rate of 20 % in 2003 (PHAN SINH, 2004). The export value of bamboo, rattan and reed products reached 10 mio. \$, the highest monthly revenue compared to other craft products in May 2004 (VIETNAM NEWS, 2004c). However, export revenue seems to fluctuate due to poor and less-diversified designs, which cannot compete with other supplier countries. In order to overcome this problem, participation at international fairs provides know-how on current designs and allows price comparison (VIETNAM NEWS, 2004d). Although the government subsidises entrepreneurs with 5 % of enrolment costs for international fairs, small-scale processors cannot afford to participate. In addition, the government recognises the need to support the development of traditional craft villages to satisfy market demand (VIETNAM NEWS, 2004b).

Craft Link is a Vietnamese non-profit organisation, which aims to support and promote traditional handicrafts of ethnic minority and handicapped people. Among 50 current producer groups, there is one group in Lac Son, which was established in 1998 and fabricates fashion handicrafts made out of the string *Aristolochia tagala* (Day kho).

#### *Promotion of relevant species:*

*Bambusa textilis* and *B. blumeana* are priority species concerning their commercial importance and their broad distribution in the Asia-Pacific region (BYSTRIAKOVA N. et al., 2003). In particular, VU VAN DUNG (2004) proposes the inclusion of both species for protective forests, and *B. blumeana* additionally for production forests, in the *Five Million Hectares Reforestation Programme 1998-2010* for Vietnam.

### BB 3.3 Technological improvements

Suggestions to improve culm storage for big scale users are described in outlook BB1. Methods for bamboo culm preservation which are convenient for households are resin substitution and the immersion method (see outlook BB2) .

There is a high potential in bamboo processing, such as bamboo-based boards (PHAM VAN CHUONG, 2004), also called plybamboo (QUISHENG Z. et al., 2003). Bamboo charcoal and bamboo active carbon are additional products. The development of bamboo charcoal production is in its initial stage. Application is not only found in purifying water and air, but also in absorbing unpleasant odours. It is also applied to protect human health, as bamboo charcoal radiates low frequency infrared rays, which positively stimulates blood circulation (QUISHENG Z. et al., 2003).

#### **Outlook BB 1: Storage of bamboo culms (QUISHENG Z. et al., 2003)**

The storing inconveniences result from the culm characteristics of bamboo species. To improve the storage of bamboo culms, the following recommendations are suggested (unmodified copied from QUISHENG Z. et al., 2003): 1) To level and roll the stocking ground, to arrange drainage on it, to cover the ground with cement if possible. 2) To arrange truck roads and unloading fields for the effective motion of trucks and unloading of raw bamboo. 3) To establish parallel foundation ridges of reinforced concrete, the space between two adjacent ridges is 2 meters. Raw bamboo can be piled up over the ridges. In this way the raw bamboo does not come into contact with the ground surface, so efficient ventilation is ensured. 4) To set up poles of reinforced cement on the ground for helping the piling operation and ensuring the certain height of piles without collapse. The poles must be strong enough, 2.0-2.5 meters high, the space between piles should be 1.5-2.0 meters. 5) To set up awnings to shelter the sun if possible, otherwise to cover the bamboo piles with straw mats. 6) To indicate the date of stacking for every pile to follow the principle "first come, first used" and decrease storage time.

#### **Outlook BB 2: Bamboo culm preservation (NGUYEN THI BICH NGOC, 2004)**

Resin substitution	-	Required culm moisture: 70 %.
	-	Required material: 200 mlXM <sub>5</sub> / culm meter (safe in application, permitted to use, selling price in 2004: 30'000 VND/ kg).
	-	Required time: 12 hours/ culm meter.
Immersion method	-	Required material: containers for solution (made by brick or metal), 10 % XM <sub>5</sub> solution.
	-	Required time: 5-6 days for entire culms

### BB 3.4 Consumer movement

The national and international demand for handicrafts is increasing (VU VAN DUNG et al., 2002). The demand for bamboo for foundations and house building is likely to remain permanently high. Replacement by concrete is apparent for larger establishments and well-off people. The investment costs for one cubic meter is 30'000 VND for bamboo culms compared to 1.36 mio VND for concrete.

### BB 3.5 Political and legal conditions

This topic has already been documented in case study BA.

## BB 4 Conclusion and recommendations

### BB 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

*Bambusa textilis* and *B. blumeana* have a low availability in Ngo Luong commune. If bamboo species are going to be cultivated by households through the state Programme 661 or by self investment, *B. blumeana* should be chosen as it shows more favourable biological characteristics than *B. textilis*. Therefore, customer demand is significantly higher for *B. blumeana* than for *B. textilis*.

#### *Economic conditions:*

The studied households in Ngo Luong commune received no cash income from *Bambusa textilis* or *B. blumeana* culms in 2003, which is explained by weak customer demand. However, several truck loads of bamboo culms were transported out of Ngo Luong commune in the last quarter of 2004. Indeed, the potential in the construction and handicraft sector is permanently high. With respect to quality, a five meter culm sold in Ngo Luong commune should provide a return of around 2'000 VND. As prices fluctuate, in particular in the construction sector, slightly higher benefits might be achieved by producers in the main trade seasons from January to February and from August to November. However, trade in summer negatively correlates with the shoot sprouting season and can endanger the cluster's growth.

The benefit from trading *B. blumeana* culms could be 2.03 mio VND/ ha, including an annual thinning intensity of 30 % in stands with a density of 3383 culms/ ha (PHAN HUNG HONG, 2004). In comparison to culm products of *Dendrocalamus asper* (see case study BA) and *Indosasa angustata* (see case study BC), culms of *B. blumeana* achieve a higher revenue.

#### *Legal conditions:*

As profit for exploited products from allocated protection forests belongs to the producers after resource and value added taxes are paid, the legal situation for commercial exploitation of bamboo culms could be favourable. However, culm transfers are subjected to informal fees, which mainly result from absent transportation certificates. It is therefore necessary to facilitate procedures for the acquisition of these certificates.

### BB 4.2 Recommendations

In particular, *Bambusa blumeana* offers the potential to improve livelihoods through accessing the handicraft and construction markets. Recommendations to achieve benefits in 4-5 years focus on the promotion of cultivating *B. blumeana*.

*At village level:*

- Farmers should focus on cultivating *Bambusa blumeana* as an economically and ecologically more valuable species.
- Farmers ought to exploit culms of *B.blumeana* at the age of 4-6 years as this provides the most preferred quality of handicraft customers.
- Culms of *B.blumeana* with a diameter of 4-8 cm should be mainly harvested in November to January and sold to the construction sector.
- The culms should be classified into different diameter classes, such as 4-6 cm, 7-8 cm and >8 cm.

*At commune level:*

- The commune authority should develop land-use plans, including new *B.blumeana* cultivation areas.
- If the present *B. blumeana* stands show promising growth development, rhizomes of existing stands should be extracted and recultivated. Other more effective multiplication methods should be tested, and if successful applied.

*At district level:*

- The relevant section should identify target communes where a strong social imbalance between poor and rich households exists. Poor households should receive support in acquiring seedlings, and the knowledge in cultivation and sustainable exploitation.

*At provincial and national level:*

- The relevant departments and ministries should continue to support the handicraft sector and to create favourable conditions for product development, marketing and export of handicraft products.
- Micro entrepreneurs in handicraft villages should be supported to conserve traditional knowledge, to develop new products, and to facilitate the link between raw material producers in the uplands and processors.
- Research on bamboo culm storage methods that are easily applicable and convenient for households should be initiated.

## BC Case study of bamboo shoots of *Indosasa angustata* for comb making

The results of the field survey (PRA), market analysis (RMA) and literature review of *Indosasa angustata* are presented in this case study. A short overview is given in the SWOT table BC1. Conclusions and recommendations can be found in chapter BC4.

### SWOT table BC 1: Sticks as a semi-processed product of *Indosasa angustata* culms

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- High availability and potential for cultivation (-&gt; BC1.3)</li> <li>- Producers have well established relationships with customers (-&gt; BC1.2)</li> <li>- Locally added value (-&gt; BC1.3)</li> <li>- Income contribution for medium wealthy and richer households (-&gt; BC1.4)</li> <li>- Regular trade throughout the year (-&gt; BC2.1)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Poor households have hardly any income from cultivated area of <i>Indosasa angustata</i> (-&gt; BC1.4)</li> <li>- Moderate and rather declining customer demand for combs (-&gt; BC2.3)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Current exploitation intensity is lower than legally permitted (-&gt; BC3.5)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Fungi disease (-&gt; BC1.3)</li> </ul>



Picture BC 1: Steaming of *Indosasa angustata* sticks in Ngo Luong commune

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Lành hạnh
Popular Vietnamese name:	Vầu đắng
Latin name:	<i>Indosasa angustata</i>
English name:	-

## **BC 1 Availability and cultivation/collection practices for bamboo culms of *Indosasa angustata* in Ngo Luong commune**

### BC 1.1 Product characteristics and growth habitat

*Indosasa angustata* belongs to the wooden subtribe of *Shibataeinae* of the family *Poaceae* (BYSTRIAKOVA et al., 2001). The species possesses a monopodial rhizome. Therefore, culms do not grow in clusters but are scattered within an area and form 'open populations' (QISHENG Z. et al., 2003), which extend around 6-10 m each year (BEZONA N. C., RAUCH F. D., 1997). The culms are 17-20 m long and have a diameter of 10-12 cm on average (WONG K. M., 1996).

### BC 1.2 Local knowledge and practices

The species *Indosasa angustata* provides shoots, sheaths and sticks as semi-processed products of culms. Culms can be exploited at an age of five years. Exploitation only takes place when the culms are immediately semi-processed to avoid quality loss. The bottom culm part of 8-9 m lengths provides the highest quality for making approximately 100 sticks. Sticks are usually 2.5 cm wide and more than 50 cm long. A higher valuation is reached with sticks of 80-100 cm length and 3 cm width. A skillful person is able to slice 2'000 sticks/ day. First, the pith needs to be eliminated to enable faster drying of the sticks. Afterwards, the sticks are steamed for thirty minutes to an hour by the customer or by the farmers themselves, and exposed to the sun for drying. Steaming is required to conserve and avoid brown coloring of the sticks, which occurs after two days. The stick customer instructed the villagers to accurately semi-process culms and paid them in advance. However, careless processing often leads to low quality.

### BC 1.3 Availability and quantity traded out of Ngo Luong commune

The availability of *Indosasa angustata* has reduced since 1995. As a result, the farmers in Ngo Luong commune started to cultivate the species five years ago. The current availability is 49 ha with a density of 7'640 culms/ ha (PHAN HONG HUNG, 2004). A disease, which is probably caused by the fungi *Aciculosporium take* (name of conidial state) can be found at different places in the commune.

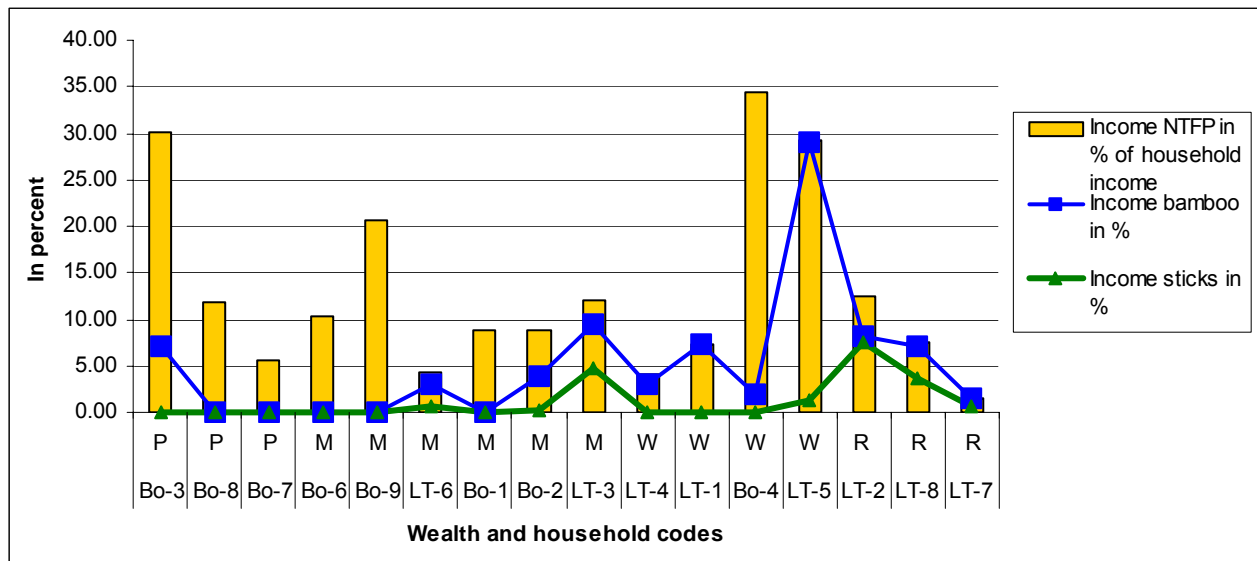
The estimated traded quantity is 1-1.5 mio sticks, or about 15'000 culms. The annual harvesting potential is 1'000 culms/ ha. Due to the rather reduced customer demand for combs, and the likelihood of increased competition among raw material providers, the annual stick processing quantity of Ngo Luong farmers has halved over the last ten years.

### BC 1.4 Economics for villagers

Seven of the sixteen studied households receive a cash income from stick production. For three wealthier households the cash income from stick production

amounts to 3-7.5 % of the household cash income (see figure BC1). In Bo village, one single studied household is slightly involved in this activity. The daily benefit for producing sticks of medium quality is 40'000 VND if the sticks are sold for 20 VND/ piece. As one culm provides around 100 sticks, the benefit could be 2'000 VND/ culm. Profit may reach 2 mio VND/ ha if culms are exploited with an intensity of 13 % of the population density per hectare, as practised up to now.

**Figure BC 1: Contribution of sticks in relation to bamboo products as a whole to household cash incomes in 2003**



Explanation: LT = Luong Tren, Bo = Bo village. Household wealth with P = poor (< 7.2 mio VND/ year), M = medium (7.2-25 mio VND/ year), W = well-off (25-40 mio VND/ year) and R = rich (> 40 mio VND/ year).

### BC 1.5 Similar products or substitutes in Ngo Luong commune

There are no other bamboo species suitable for processing into sticks.

## BC 2 Market assessment

### BC 2.1 Market place

#### Market actors:

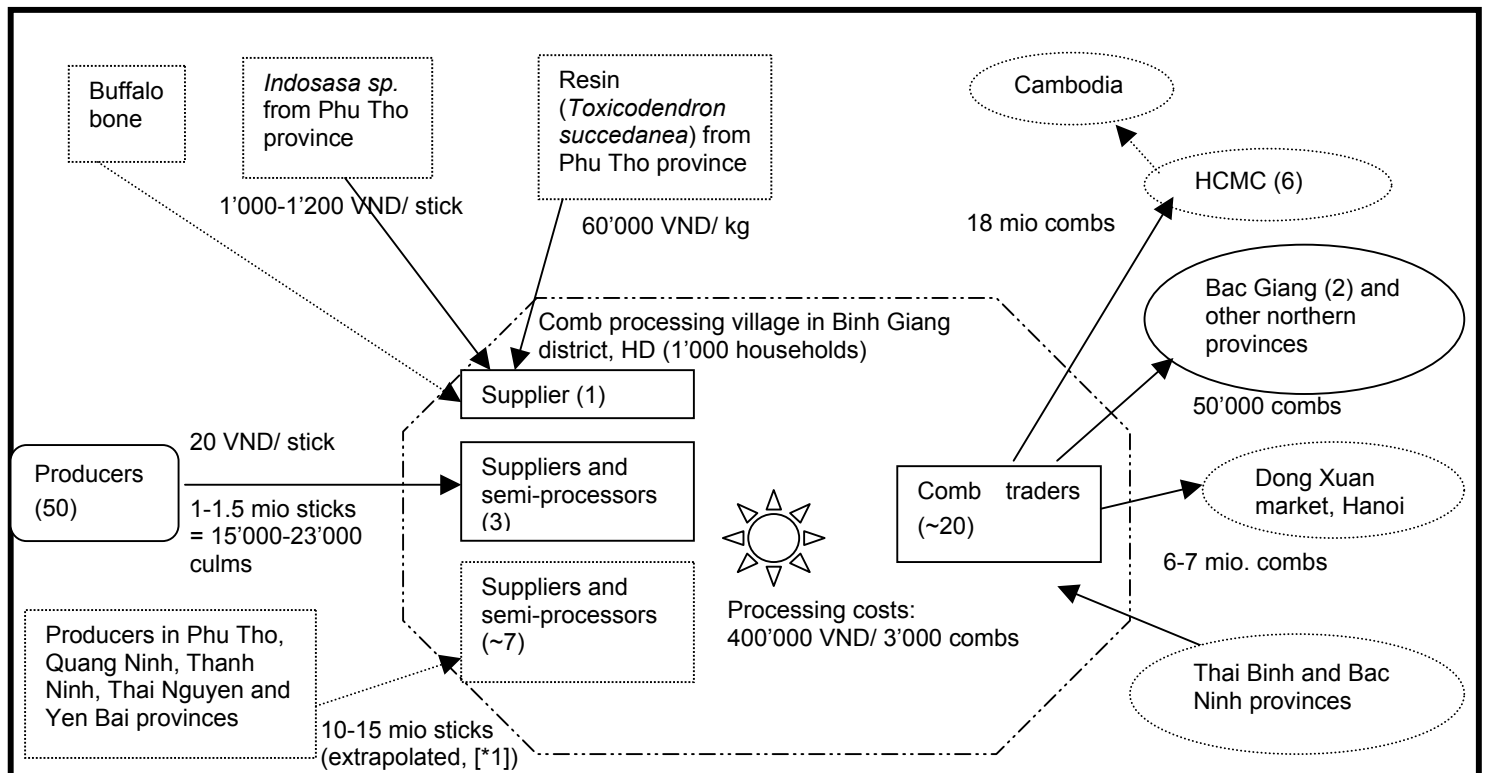
Three customers request sticks in Ngo Luong commune. They are residents of the comb-making handicraft village in Thai Hoc commune in Binh Giang district of Hai Duong province (see figure BC2). In this craft village, 95 % of a total of 1'000 households are involved in producing combs. The village is so organised that different households are responsible for either one or several of the 37 processing steps, providing raw material or trading combs.

Sticks of *Indosasa angustata* form the teeth of the comb and are one of four required components. On average, five people are able to produce 100 combs/ day. The material required for 100 combs is around 350 sticks of *Indosasa angustata*, 20

sticks of another *Indosasa* species, approximately 200 grams of the resin extracted from *Toxicodendron succedanea* and buffalo bone.

Villagers either sell the combs at home, or regularly transport them to HCMC, Hanoi or other provinces in Northern Vietnam. HCMC is the trade platform to Cambodia, where combs are usually used for religious ceremonies.

**Figure BC 2: Product chain of the semi-product of *Indosasa angustata* culms (field work, summer 2004)**



Explanation: Prices and quantity are indicated for 2003. The estimated number of involved persons is represented in parenthesis. [\*1] The annual supplied quantity is extrapolated in relation to the estimated quantity of combs sold and the processing capacity of the villagers throughout the year.

**Legend BC 1: Explanation for figure BC2**

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		End customer
	First middlemen		Local processing (comb-making)
	Processing village		



*Transportation:*

The three customers from Hai Duong province rent a lorry with a loading capacity of 200'000 moist or 270'000 dry sticks. In total, 5-6 lorries/ year carry sticks to the lowlands during dry periods. Combs are transferred in small containers by the villagers of Than Hoc commune to the different locations. One container has a capacity of around 10'000 combs.

*Storage:*

Dried steamed sticks are usually stored for one week, before they start to become mouldy. Combs can usually be kept for several months, whereas lower quality combs quickly degrade.

BC 2.2 Product

*Quality, appearance and size:*

The sticks need to be longer than 50 cm, 2.5 cm wide, without pith and steamed. The combs are classified into three qualities according to thickness, length of comb teeth and the free space between the teeth (see table BC1).

*Packing and branding:*

Sticks are tied to bundles of 500 pieces, and combs to bundles of ten pieces.

*Substitutes:*

There are no substitute species, as only sticks of *Indosasa angustata* remain untwisted after drying.

BC 2.3 Price

*Demand and Supply:*

The customer demand for sticks in Ngo Luong commune is related to the demand for combs, as well as the number of other stick providers. The highest customer demand for combs throughout the year is associated with religious ceremonies. The Cambodian market requires combs between October and December. The highest domestic demand is during the Tet holiday and the wet season.

The demand is estimated at 30 mio combs for the whole of Vietnam, although trade is declining. Between 1991 and 1997, comb demand significantly reduced due to improved living standards. Nowadays, the traded quantity is one twentieth of the quantity twenty years ago. As an example, demand in HCMC was 5-6 mio combs/ month two years ago compared to 0.2-0.25 mio combs/ months in 2004. Hanoi currently receives deliveries every other day of one large container of 10'000 combs on average. Rural areas in Northern Vietnam receive deliveries twice a month with a lower quantity than urban centres.

The Cambodian market requires rather low quality combs for religious ceremonies. In Vietnam, this is especially the case during the Tet holiday. Rural people mostly

buy combs of medium and high quality for their intended use. The life span of high quality combs is half a year on average.

The raw material supply of Ngo Luong commune made one tenth of the extrapolated raw material quantity for 30 mio combs in 2003. In Ngo Luong commune, sticks of lower quality are sold for 15-20 VND/ piece, and of higher quality for 25-30 VND/ piece. Combs have a product value of 250-700 VND/ piece depending on quality and market place (see table BC1). There is no information about the selling prices of combs in Cambodia or other foreign countries.

**Table BC 1: Selling prices of combs according to quality and market prices in 2004**

Type	Quality	Description	Selling place			
			At processing village	Hanoi	Bac Giang [*1]	HCMC
A	High	Equal spaces between teeth, thicker and long sized teeth.	600	700	700	550-600
B	Medium	Unequal spaces and shorter teeth	400	450-500 [*2]	500	450-520
C	Low	Inferior to B	250	300	400	380

Explanation: [\*1] The value is indicated by the contacted customers. [\*2] 450 VND/ comb to wholesalers in Hanoi, and 500 VND/ comb to endcustomers in Hanoi.

*Fluctuations:*

The product value of combs fluctuates slightly throughout the year based on the comb producers' labour allocation and the main customer demand periods. In general, the selling price at domestic markets rises by 10 VND/ comb in the first half year, when demand is higher. As a result of the Cambodian market behaviour, fluctuations range from 50-70 VND/ comb in HCMC (see table BC1). Moreover, the product value has slightly declined in HCMC since 2002.

*Marketing costs and profits:*

If five persons produce 100 combs/ day of rather medium quality with estimated processing costs of 13'500 VND, the probable daily benefit amounts to approximately 4'000-5'000 VND/ person. This includes raw material costs, but excludes transportation costs to retailers.

*Commissions, taxes and informal rules:*

The sticks and comb transporters refuse to pay informal fees. There are no tax payments to the local tax station or to the local authority for transporting sticks out of Ngo Luong commune. Combs are subjected to official trade tax.

## **BC 3 Influencing factors**

### BC 3.1 Social and cultural

The comb model in question was a common tool for getting rid of fleas and lice in Vietnam in earlier times. Nowadays, combs are still used by rural people, who cannot afford more expensive substitutes. Another purpose of these combs is as a religious sacrifice of a more valuable artefact.

### BC 3.2 Economic frame

*Indosasa* species are neither promoted as a priority species regarding its commercial importance and wide distribution in the Asia-Pacific region BYSTRIAKOVA N. et al. (2003), nor short-listed as a suggested protection or production species for the *Five Million Hectares Reforestation Programme 1998-2010* in Vietnam (VU VAN DUNG, 2004).

### BC 3.3 Technological improvements

There is no incentive to improve the processing of this traditional hand-made artefact.

### BC 3.4 Consumer movement

Vietnamese rural people are likely to abide near this cheap but efficient product. Demands to improve design are absent. To develop more fashionable combs would be an option for overseas demand if markets were established.

### BC 3.5 Political and legal conditions

This topic is documented in case study BA.

## **BC 4 Conclusion and recommendations**

### BC 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

The distribution of *Indosasa angustata* is the highest in Ngo Luong commune with 49 ha. The high availability might be the result of its use as a shoot, sheath and culm product. The single inconvenience is the fungi disease, which farmers cannot appropriately treat.

*Economic conditions:*

The customer demand for sticks is connected with the demand for combs, which has declined in recent years and is likely to continue in the future. Stick processing offers an almost year-round cash income, and the calculated profit could reach 2 mio VND/ha under promising market conditions. However, rather wealthier households in Ngo Luong commune benefit from this activity. This might be explained by poorer households not yet having cultivated or mature areas, or not having the available labour to harvest and semi-process culms.

*Legal conditions:*

Inhabitants in Ngo Luong commune exploit at an intensity of 13 %, which is below the legally allowed 30 % exploitation intensity for protection forests. Although semi-processed forest products require a transportation certificate, the processors in Than Hoc commune trade without this form, and are not obliged to pay informal fees up to now.

#### BC 4.2 Recommendations

The locally added value of *Indosasa angustata* culms is easily applicable and provides cash-income, even if the contribution to the household income is low. However, income is generated regularly throughout the year, and the main beneficiaries are wealthier households. The long-term benefit is associated with the comb demand, which seems to face sale problems. Recommendations to keep this cash income source and allow the participation of poorer households are the following:

*At village level:*

- Farmers should maintain the good relationship with the comb processors.
- Poorer households should try to become involved in the stick processing business as it offers a low, but regular income throughout the year.
- Farmers should orient themselves to the market situation of combs and the competition with other stick providers.
- Alternative markets for sticks should be actively sought by processors and local traders.

*At district level:*

- The process and intensity of the fungi infection should be supervised. This should include the provision of information about silvicultural measurements and pest-management to moderate intensity and avoid outbreaks on healthy areas.
- Operations of local processors and traders of bamboo raw material should be facilitated.

*At provincial and national level:*

- The relevant ministry should continue to support handicraft villages not only with respect to conserve traditional knowledge and to improve the livelihoods of these villages, but also to positively influence the livelihoods of raw material producers in the uplands.
- International markets should be explored to promote and label this comb model as a traditional Vietnamese handicraft made by raw material produced in the uplands.

## C Case study of bamboo sheaths of *Indosasa angustata* for hat making

The results of the field survey (PRA), market analysis (RMA) and literature review of *Indosasa angustata* are presented in this case study. A short overview is given in the SWOT table C1. Conclusions and recommendations can be found in chapter C4.

**SWOT table C 1: Sheaths of *Indosasa angustata***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- High availability and potential for cultivation (-&gt; C1.3)</li> <li>- Income contribution for wealthier households (-&gt; C1.4)</li> <li>- Well established trade net (-&gt; C2.1)</li> <li>- Stable marked demand (-&gt; C2.3)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Poor households have hardly any access to this income source (-&gt; C1.4)</li> <li>- Unclear legal status of terminologies (-&gt; C2.3/3.5)</li> <li>- Price fluctuations (-&gt; C2.3)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Hats are increasingly internationally traded (-&gt; C2.1)</li> <li>- Steadily and relatively high demand for hats (-&gt; C2.3)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Fungi disease (-&gt; C1.3)</li> </ul>



**Picture C 1: Sheaths of *Indosasa angustata* are tied in bunches in Ngo Luong commune**

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Lành hạnh
Popular Vietnamese name:	Vầu đắng
Latin name:	<i>Indosasa angustata</i>
English name:	-

## **C 1 Availability and cultivation/collection practices for bamboo sheaths of *Indosasa angustata* in Ngo Luong commune**

### **C 1.1 Product characteristics and growth habitat**

*Indosasa angustata* belongs to the wooden subtribe of *Shibataeinae* of the family *Poaceae* (BYSTRIAKOVA et al., 2001). The species possesses a monopodial rhizome. Therefore, culms do not grow in clusters, but are scattered within an area and form 'open populations' (QISHENG Z. et al., 2003), which extend around 6-10 m each year (BEZONA N. C., RAUCH F. D., 1997). The culms are 17-20 m long, have a diameter of 10-12 cm on average and possess sheaths of 7-15 cm length (WONG K. M., 1996).

Sheaths of bamboo species protect the tender lower part of an internode, while its tissues actively divide and lengthen (WONG K. M., 2004). A characteristic of sheaths is that they show a certain persistency, even if they are brown. Sheaths depending on the species can be glabrous, variously hairy or waxy.

### **C 1.2 Local knowledge and practices**

Farmers in Ngo Luong commune collect sheaths of *Indosasa angustata* on sunny days mainly in June to sell them to customers who make the traditional conical hat. The daily collection is 1'000-5'000 sheaths/ person with respect to cultivation size and accessibility of the stand. Sheaths are then exposed to the sun for one or two days, counted, classified into mainly two groups and tied into 100 sheaths/ bunch. Classification criteria are length, width, thinness and whiteness. Sheath bunches are stored at the forest gate until customers from the lowlands collect the products by truck, which normally occurs during June.

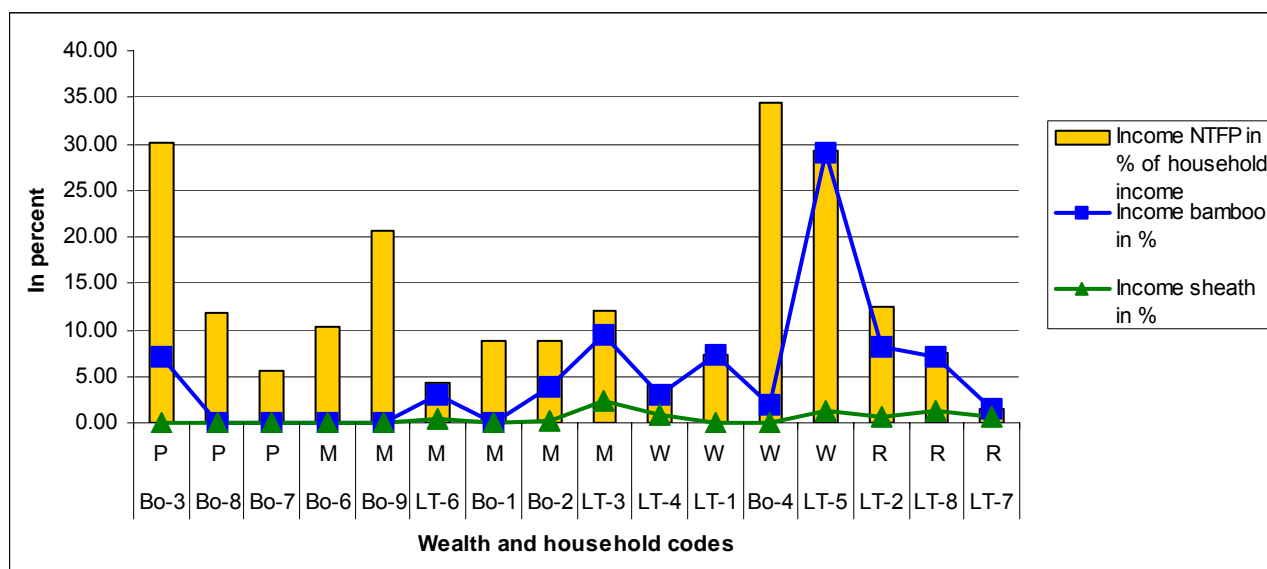
### **C 1.3 Availability and quantity traded out of Ngo Luong commune**

*Indosasa angustata* occurs on 49 ha with a density of 7'640 culms/ ha in Ngo Luong commune (PHAN HONG HUNG, 2004). In Bo village in particular, the majority of *Indosasa angustata* cultivation is two to five years old. A culm usually provides 12 sheaths of satisfactory quality. The estimated collected quantity for both studied villages, Luong Tren and Bo villages, is 1 mio sheaths in 2003. The potential annual sheath availability in the commune is around 4.5 mio sheaths.

### **C 1.4 Economics for villagers**

Eight of the sixteen studied households are involved in sheath trade. These are only wealthier households, which mostly live in Luong Tren. In general, sheaths contribute less than 1 % to household cash incomes. In only three cases, sheaths make a contribution of 3 %. The collected quantity in 2003 resulted in a profit of 20 mio VND, as long as sheaths are sold for 20 VND/ piece on average. A possible daily wage is 20'000-100'000 VND/ person. If the indicated sheath production per culm and stand density per hectare are taken into account, the gross margin could be around 1.83 mio VND per hectare.

**Figure C 1: Contribution of sheaths in relation to bamboo products as a whole to household cash incomes in 2003**



Explanation: LT = Luong Tren, Bo = Bo village. Household wealth with P = poor (< 7.2 mio VND/ year), M = medium (7.2-25 mio VND/ year), W = well-off (25-40 mio VND/ year) and R = rich (> 40 mio VND/ year).

### C 1.5 Similar products or substitutes in Ngo Luong commune

Farmers in Ngo Luong commune only collect sheaths of *Indosasa angustata* for handicraft items. Sheaths of other bamboo species have yet to be collected for commercial or self use.

## C 2 Market assessment

### C 2.1 Market place

#### Market actors:

Transporters, who either live in Tan Lac or Chuong village in Ha Tay province, have carried on a seasonal trade for 10-25 years. Further characteristics of actors are listed in table C1. The product chain is represented in figure C2.

#### Transportation:

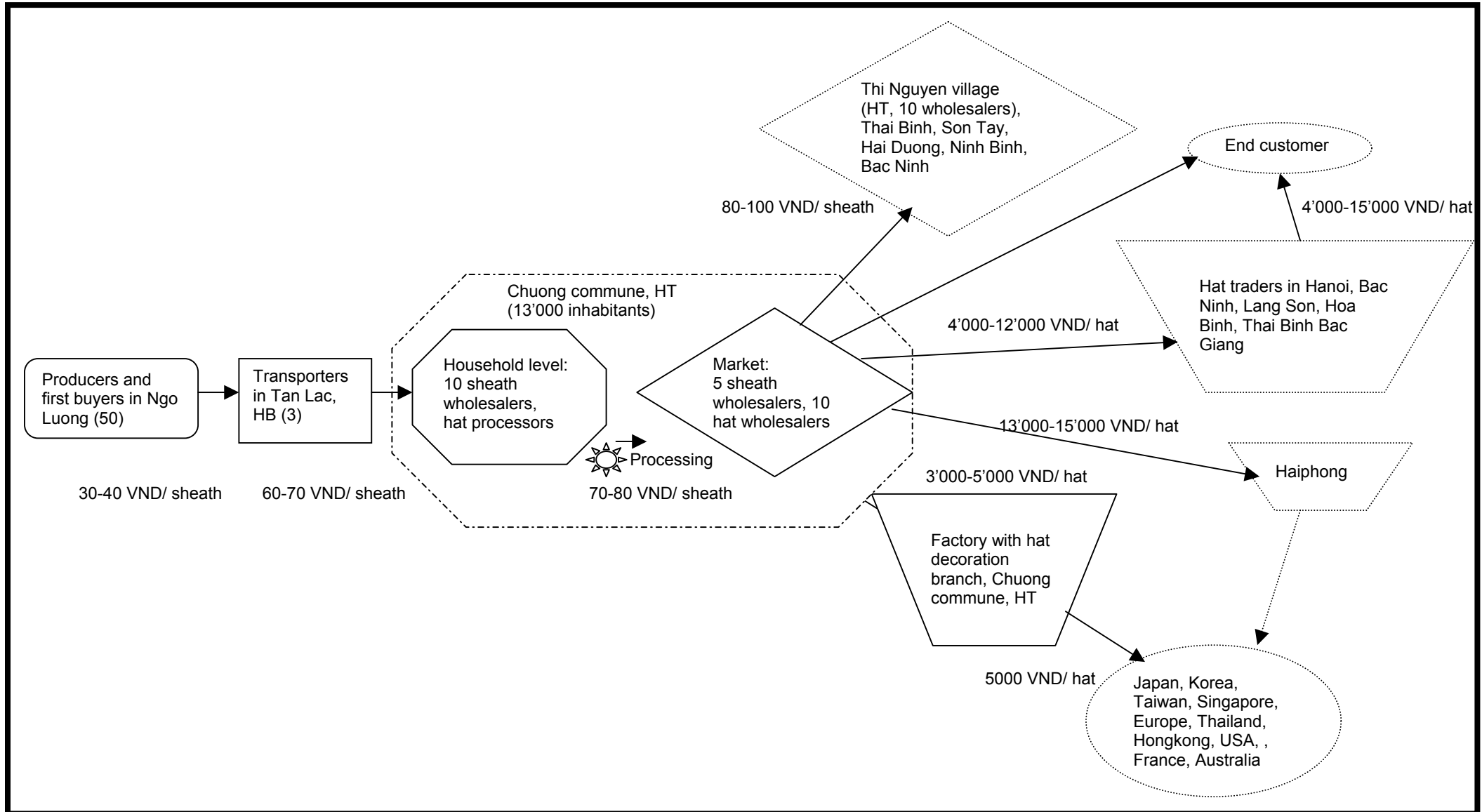
500 big sheath bunches are transported by lorries with a capacity of 4 tons. Hats are conveyed by motorbike, lorry or public transport in nylon bags containing 50 to 100 hats.

#### Storage:

Completely dry sheaths can be kept inside houses for two or three years. If the sheaths become moist, they perish easily. Sulphur ventilation prevents sheaths and hats from becoming mouldy too quickly

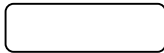








Figure C 2: Product chain of *Indosasa angustata* sheaths (field work, summer 2004)



Explanation: The product price is indicated for sheaths of higher quality in 2003. The estimated number of involved persons is represented in parenthesis.

**Legend C 1: Explanation for figure C2**

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		Forth middlemen
	First middlemen		End customer
	Second middlemen		Local processing (hat making or hat decorating)
	Third middlemen		

**Table C 1: Characteristics of market actors**

Actor (number)	Location	Special feature
Transporters (3)	Lo commune, Tan Lac	– Customer: Chuong village.
Transporters (10)	Chuong commune, Thanh Oai district, Ha Tay province	– Provider: Lac Son, Da Bac and Tan Lac district in Hoa Binh province; Yen Bai, Son La and Lang Son province.
Hat processors (13'000, fairly all residents)	Chuong commune	– Traditional handicraft: for 25-30 years. – Processors characteristics: especially younger and elderly people. – Productivity: likely 5 mio hats/ year. – Hat characteristics: 3 layers with the middle layer made by 4-8 sheaths according to different qualities. Both other layers are made by <i>Rhapis laosensis</i> leaves mainly provided from Quang Binh province (see also WETTERWALD O. et al., 2004).
Sheath traders (5)	At Chuong market	– Classification criteria: shape, colour, entireness and evenness. – Storage duration: a measure to regulate the price. – Customer: neighbouring village Thi Nguyen and different provinces in Northern Vietnam.
Hat traders (10)	At Chuong market	– Customer: Hanoi, other northern provinces and China
Hat factories (5)	Surroundings of Chuong commune	– Products: different handicrafts made of mainly bamboo or rattan. – Organisation: contract with export companies in Hanoi or HCMC. – Binding agreements: upon request – Employees: farmers of adjacent villages who are taught to fabricate new designs and adapt new processing techniques.

## C 2.2 Product

### *Quality, appearance and size:*

In table C2, the most relevant criteria for classifying sheath quality are listed. When bought per weight, quality is controlled by counting, comparing the different lengths inside a bunch and looking for additional material like stones. However, bunches are mostly only controlled by eye.

Hats are classified into those with two or three layers. Further criteria are the amount and quality of used sheaths, the sewing span and the frame. Higher quality hats are made with six to eight sheaths. These hats have a life span of around one year compared to hats of lower quality. The method of arranging holders for attaching the hat is irrelevant.

**Table C 2: Quality characteristics of sheaths**

- 
- Sheaths without tears.
  - Highest quality: 45-50 cm long, 35 cm wide, bright or slightly yellow coloured.
  - Thickness: related to species and origin.
  - Evenness: controlled by the amount of gaps inside a bunch.
  - Culm position: middle part provides highest quality sheath, upper and bottom parts lower quality sheaths.
  - Origin: highest quality from Yen Bai province. Beautiful, but unsuitable thickness from Tan Lac district.
- 

*Packing and branding:*

Sheaths are tied in ten bunches of a hundred sheaths each.

*Substitutes:*

Sheaths of *Bambusa textilis* and *Dendrocalamus asper* can be used for making conical hats. However, the quality is lower due to sheath thickness.

Different hat models exist, which are made of specific leaf and sheath species. Besides the traditional model, modern shapes are being fabricated more and more. There is one traditional hat made by sheaths of *D. asper*. This type is produced by nearly all inhabitants of Tan Uoc commune in Thanh Oai district of Ha Tay province in their free time for the last 20-30 years. One sheath of *D. asper* is necessary per hat. These sheaths are supplied by traders from Phu Tho province. As a characteristic, *D. asper* sheaths are less hairy than sheaths of *I. angustata* and *B. textilis*, which demand less intensive polishing. The purchase price is 15-40 VND/ sheath. Hats were sold for 4'000-7'000 VND/ hat ten years ago, when that product achieved its economic culmination point. Nowadays, tougher competition from adjacent villages or handicraft enterprises exists. Although the domestic and international demand is satisfactory, cost effectiveness is low, as claimed by the contacted resource persons.

**C 2.3 Price**

*Demand and Supply:*

The domestic demand for hats is stable as rural people wear the conical hat for field work. Wholesalers in Chuong market sell 10'000 hats/ month on average to different regular customers. These customers provide end customers in the rural areas of Northern Vietnam. International overseas demand is associated with current fashion trends. Production is often upon request. Chinese demand has been stable for years, whereas demand usually reduces slightly from June to October. As an example, one handicraft factory exports around 50'000-100'000 hats/ month to China.

The sheath supply is based on weather conditions, labour allocation of producers and their urgent need for cash. The extrapolated supply for Chuong commune was around 45 mio sheaths, and around 120 million sheaths for the aforementioned handicraft factories in 2003. Due to the weather conditions in 2003, the provided

sheath quantity was lower than it will be in 2004. The prices for sheaths and hats also depends on quality (see table C3).

**Table C 3: Selling price for sheaths and hats of different qualities in 2003**

Product	Selling place	Selling price (in VND/ piece) according to quality classes		
		High	Medium	Low
Sheath	Ngo Luong village	30-40	20-30	10-20
	Other upland villages	35-50	35-40	8-30
	Chuong commune, Ha Tay	70-100	40-50	16-40
Hat	Chuong commune, Ha Tay	13'000-20'000	6'000-10'000	2'500-5'000

*Fluctuations:*

Sheath trade has underlied annual fluctuations for 15 years because of productivity changes and the amount of stored material, which affects the product price. For example, the product price in Chuong commune was twice as high in 2003 as in 2004. The product value of high quality sheaths was only 45-50 VND/ piece in 2004.

*Marketing costs and profits:*

The profit for sheath traders in Chuong commune was around 25-30 VND/ sheath in years similar to 2003. If two hats of medium quality are made per day, the calculated gross margin is around 7'000-15'000 VND/ person. This includes expenses for transportation and informal fees of around 5 VND/ sheath. The estimated raw material costs of 2'000 VND for the two layers made by *Rhapis laosensis* leaves are also taken into account.

*Commissions, taxes and informal rules:*

According to the tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB*, of 9 July 2003) sheaths are not subject to tax. However, the local tax station requires 10 % resource tax and 5 % value added tax. This results in costs of around 0.5 mio VND for a lorry of 200 big bunches.

Transfer fees in Ngo Luong commune are 50'000-70'000 VND/ lorry. Total transportation expenses from the forest gate to Chuong commune could be around 1.5 mio VND/ lorry. This includes loading costs, authority taxes, official fees at the tax station and fines issued by police and forest rangers. Informal fees issued by forest rangers of up to 100'000 VND/ lorry are justified by the fact that sheaths contribute to the decomposition system of the forest ecosystem. In cases where sheaths are only regarded as a sub forest product, no transportation fees are paid.

### **C 3 Influencing factors**

#### **C 3.1 Social and cultural**

The conical hat is a symbol of Vietnamese farmers and is associated with working in rice fields. Hat making is a traditional handicraft, which provides an off-farm occupation and a side income.

#### **C 3.2 Economic frame**

##### *Development of bamboo processing activities:*

Information on the current situation of handicraft development in Vietnam is documented in case study BB.

##### *Promotion of relevant species:*

*Indosasa angustata* is neither in the annex as species suitable for plantation of watershed protection forest of the *National Five Million Hectare Reforestation Programme (1998-2010)*, nor short-listed in VU VAN DUNG (2004) as a recommended bamboo species for this programme.

#### **C 3.3 Technological improvements**

As hat making is traditionally manual work and mostly applied at household level, the hat trade is often a small-scale business. However, establishments of large-scale hat or handicraft processing factories exist and are on the rise. This trend could result in lower production costs and more competitive prices. Lower prices would definitely have a negative impact on small-scale hat makers and sheath collectors, and would equally reduce the income of needy upland farmers.

#### **C 3.4 Consumer movement**

As these conical hats are affordable and of good quality, rural people in Vietnam continue to buy this item. The international demand might rise, especially when these hats correspond to fashion trends and are promoted as a Vietnamese symbol along with the booming tourism sector.

#### **C 3.5 Political and legal conditions**

If sheaths are legally attributed to leaves of forest products (*Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products*, issued with *Decision 47/1999/QD-BNN-KL* of 12 March 1999, article 1, clause 6a), a transportation certificate is required.

## C 4 Conclusion and recommendations

### C 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

The distribution of *Indosasa angustata* is the highest within all bamboo species in Ngo Luong commune at 49 ha. The annual exploitation potential of an estimated 4.5 mio sheaths for the commune has not been reached. This might be explained by farmers investing little time to collect sheaths, because other farm activities at that time are more important and profitable than sheath collection. As sheaths are a yearly renewable product, long-term collection is guaranteed, unless populations of *I. angustata* are overexploited or show leaf and branch discoloration.

#### *Economic conditions:*

Conical hats have a high and permanent demand, and therefore the demand of *Indosasa angustata* sheaths seems to be ensured in the long run. Although the species is currently not prioritised in any state programme, sheath supply seems to be guaranteed. The contribution to the cash incomes of the studied households in Ngo Luong commune is rather low. Moreover, only wealthier households profit from sheath collection. The potential benefit could reach 1.83 mio VND/ ha, provided almost all usable sheaths are collected.

#### *Legal conditions:*

The legal term of sheaths seems to be unclear. Sheaths are likely attributed to forest products and would thus be subjected to transportation certificates for commercial trade. However, a clear and explicit definition is not available within the existing laws or forest protection regulations.

### C 4.2 Recommendations

Although the current profit from sheath trade is rather low for the studied households, sheaths still provide cash income to wealthier households. The recommendations to maintain and improve this income source for households are the following:

#### *At village level:*

- Farmers should continue to classify the sheaths into different qualities.
- Poorer households should evaluate whether sheath trade provides additional cash income or merely results in additional labour.
- Mainly wealthier households could sub-contract the sheath collection to poorer households against remuneration, or as a charitable action.

*At provincial and national level:*

- The legal term of bamboo sheaths should be clarified in the law. This could lead to a reduction of administrative burdens, and offer a transparent basis for tax payments.
- The relevant departments and ministries should continue to support handicraft villages not only with respect to conserving traditional knowledge and improving the livelihoods of these villages, but also to positively influence the livelihoods of raw material producers in the uplands.

## D Case study of ornamental orchids like *Aerides odorata*

The results of the field survey (PRA), market analysis (RMA) and literature review of *Aerides odorata* and orchids in general are presented in this case study. A short overview is given in the SWOT table D1. Conclusions and recommendations can be found in chapter D4.

**SWOT table D 1: Ornamental orchid species *Aerides odorata***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- Species characteristics (-&gt; D1.1)</li> <li>- Native to Ngo Luong commune (-&gt; D.1)</li> <li>- Income contribution to rather poor households (-&gt; D1.4)</li> <li>- Knowledge on storage and vegetative reproduction is available (-&gt; D2.1)</li> <li>- High product value (-&gt; D2.3)</li> <li>- High and increasing market demand (-&gt; D2.3)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Weak legal implementation (-&gt; D3.5)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Locally added value through storing (-&gt; D2.1)</li> <li>- Improvements of transportation (-&gt; D2.1)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Complete resource depletion and loss of cash income source for the poor (-&gt; D1.3/1.4)</li> <li>- Cultivation at forest gate may only support richer households (-&gt; D3.2)</li> </ul>



**Picture D 1: Orchid nursery in La Phu commune, Ha Tay province**

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Lan quế
Popular Vietnamese name:	Quế lan hương
Latin name:	<i>Aerides odorata</i>
English name:	Fox Brush Orchid



## **D 1 Availability and cultivation/collection practices for ornamental orchids like *Aerides odorata* in Ngo Luong commune**

### D 1.1 Product characteristics and growth habitat

The genus *Aerides* belongs to the family of *Orchidaceae*. Orchids are susceptible to stress factors such as temperature fluctuations, low humidity and mechanical damage (website M). As epiphyte *Aerides odorata* occurs on trees (website H), It grows monopodially. Another characteristic is its fragrance, which makes the genus *Aerides* very attractive to collectors (website I). The flowers of *A. odorata* are white, and flower between June and September. Besides ornamental use, the ground fruit of this species is harvested to heal boils in ears and noses (NAGESWARA RAO A., 2004).

The species occurs especially in areas of 650 m above sea level and at a high humidity rate in Northwest Vietnam. In Ngo Luong commune, the species is found in natural forest with few human impacts.

### D 1.2 Local knowledge and practices

Orchids are collected opportunistically by men throughout the year, where the entire plant is taken. Farmers attempt to collect only orchids which are at least 20 cm in size. If several plants occur on one tree, usually only the bigger ones are harvested. Collection time depends on walking distance and reachability on the tree. In general, harvesting time has increased in the last few years due to resource decline. The plants are usually thrown down instead of letting them down on strings.

Even though most of the forest land was allocated in 1996, uncultivated NTFPs such as medicinal plants, orchids or naturally available fruit trees, belong to all of the villagers in Ngo Luong commune. Therefore, farmers have the right to access and to harvest these NTFPs as long as trees are not cut down. If collectors of epiphytes cut down trees for easier access, they are fined at least 20'000 VND/ tree by the village leader. If the delinquent refuses to pay the fine, it is dealt with by the commune authority, who will fine him 100'000 to 150'000 VND/ tree.

Collected orchids are stored in bowls or attached on trees around houses. If the roots are too long, they are cut. As a consequence of an extended storage period under inappropriate conditions, the orchids weight is reduced.

### D 1.3 Availability and quantity traded out of villages in Ngo Luong commune

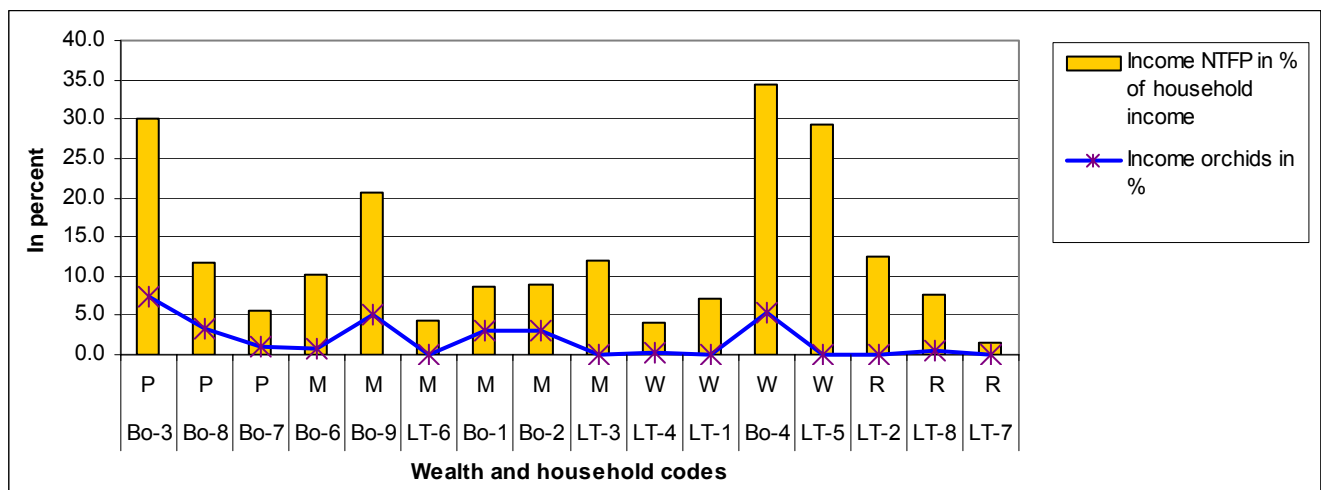
The commune has experienced an increase in customer demand since 2000. Due to unsustainable exploitation practices, availability is decreasing significantly. The availability is higher in the more remote forests of Bo village than in Luong Tren. The estimated exploited quantity for *Aerides odorata* was one ton of plant material for both villages in 2003.

#### D 1.4 Economics for Ngo Luong commune

Cash income through orchid trade includes species for ornamental and medicinal use. Orchids contribute 3-8 % to the household cash-incomes of six of the sixteen studied households. They mostly belong to the poor and medium wealth class and live in Bo village. The cash income for orchids contributes one fourth to the NTFP income of the one medium wealthy and two poorer households. The orchid contribution even reaches one third of the NTFP income for two other medium wealthy households. However, their NTFP cash income contributes little to overall household cash incomes.

According to the estimated collected quantity of one ton, the calculated benefit for residents of both villages is approximately 5 mio VND with a selling price of 5'000 VND/ kg on average. Maximum selling price are 7'000 VND/ kg.

**Figure D 1: Contribution of orchid products to household cash incomes in 2003**



Explanation: Income of orchid products are generated from orchid species used for ornamental and medicinal purpose. LT = Luong Tren, Bo = Bo village. Household wealth with P = poor (< 7.2 mio VND/ year), M = medium (7.2-25 mio VND/ year), W = well-off (25-40 mio VND/ year) and R = rich (> 40 mio VND/ year).

#### D 1.5 Similar products or substitutes in Ngo Luong commune

*Dendrobium transparens*, *Hygrochilus parishii*, *Lan đuôi chó* (local Vietnamese name) and probably *Rhynchostylis gigantea* occur in Ngo Luong commune and are commercially traded as ornamental orchids (see table D2). Apart from *Lan đuôi chó*, the availability for the other species is low. On the other hand, the availability of four medicinal orchid species is relatively high. These are *Dendrobium nobile* var. spp. and in its local Vietnamese name *Lan truc*, *Lan qua* and *Lan đũa*.

## D 2 Market assessment

### D 2.1 Market place

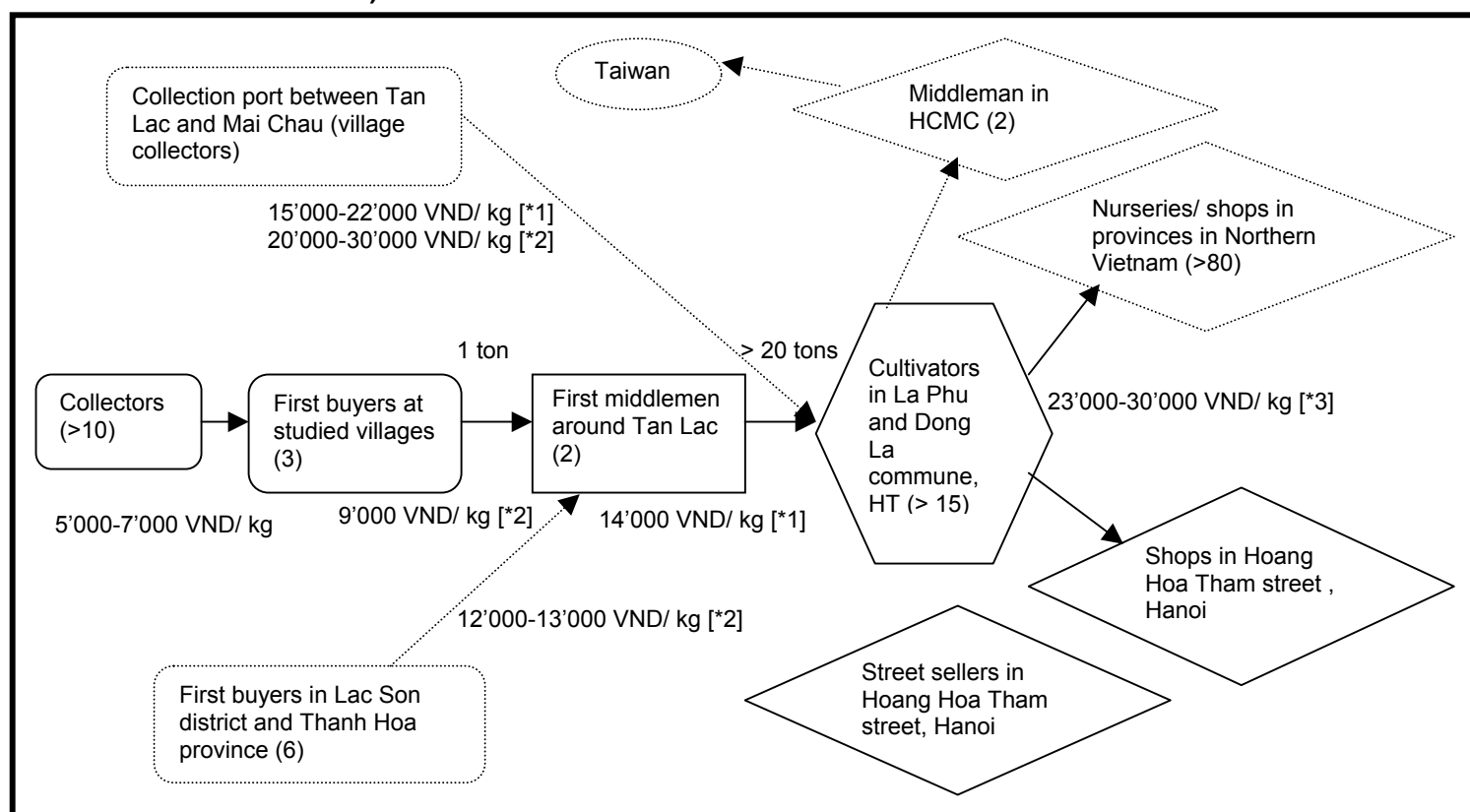
#### Market actors:

Orchids are professionally cultivated in an area close to Hanoi (see table D1 and figure D2).

**Table D 1: Characteristics of market actors**

Actor (number)	Location	Special feature
First middlemen (2)	Tan Lac	<ul style="list-style-type: none"> <li>Characteristics: shop owner, who also sells orchids.</li> <li>Trade relation: close with producers at the forest gate.</li> </ul>
Cultivators (15)	La Phu and Dong La commune, Hoai Duc district, Ha Tay	<ul style="list-style-type: none"> <li>Characteristics: orchid cultivation as main activity, some are orchid shop owners in Hanoi, some have employees.</li> <li>Knowledge: high in species diversity, suitable keeping methods and vegetative multiplication.</li> <li>Establishment: started around 20 years ago, intensification in the last five years.</li> <li>Nursery size: 200-500 m<sup>2</sup>.</li> <li>Diversity: 20-60 different species</li> <li>Destination: owners of small nurseries and shops mainly in Hanoi, Hai Duong and Haiphong, but also in Lang Son, Quang Ninh and other provinces. Export to Taiwan through HCMC.</li> </ul>
Street sellers (> 10)	Hoang Hoa Tham street in Hanoi	<ul style="list-style-type: none"> <li>Shopkeeper: offer higher quality plants, have better knowledge.</li> <li>Most crowded days: on the 4<sup>th</sup>, 9<sup>th</sup>, 14<sup>th</sup>, 19<sup>th</sup>, 24<sup>th</sup> and 29<sup>th</sup> of each month</li> </ul>

**Figure D 2: Product chain of the ornamental orchid species *Aerides odorata* (field work, summer 2004)**



Explanation: Quality and price refer to 2003. The amount of involved stakeholders is indicated in parenthesis. [\*1] Buying price at the suppliers' place. [\*2] Buying price at the buyers' place. [\*3] Selling price for wholesale customers. The selling price for end customers is often indicated in the unit 'leaf'.

### Legend D 1: Explanation for figure D2

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		Third middlemen
	First middlemen		End customer
	Second middlemen		

#### *Transportation:*

Orchid material is carried in sacks on motorbikes from Ngo Luong commune. To avoid a high transportation weight, orchids are principally transported as raw material. This means they are not attached to timber or planted in bowls. The capacity is around 30-40 kg/ motorbike. If the commodity is given to lorry drivers, the producers are still responsible for sales in Tan Lac. Transfers to Hoai Duc district in Ha Tay province is organised by motorbike, public transport or lorry. A few years ago, when the supply was clearly higher, lorries were a common means of transportation.

If orchids are transported by lorry, the plants have to be tied together to avoid being shaken, which could damage leaves and leads. Furthermore, leaves perish easily in humid conditions. As a consequence, long distance transfers should take place during the dry season. Another possibility is to use polystyrene boxes.

#### *Storage:*

Cultivators in Hoai Duc district store orchids in nurseries, which are equipped with multi-level frames and a black cover permeable to air and limited to sunlight. Convenient growth conditions, such as substrate and intensity of watering are related to the species. *Aerides odorata* is known as a species which requires little effort to care for.

### D 2.2 Product

#### *Quality, appearance and size:*

Cultivators in the lowlands require individuals without broken leaves that are not attached to timber, and show no sign of fungi decay. The appearance is influenced by the harvesting and transporting methods. Nowadays, cultivators are willing to buy small and slightly damaged individuals, as availability has reduced. The highest quality orchids are big, healthy, and produce build flowers and new leaves.

#### *Packing and branding:*

If orchids are sold to domestic end customers, the plants are put on timber or in bowls.

*Substitutes:*

The ornamental orchid species which are provided from Hoa Binh province are *Dendrobium transparens*, *Dendrobium nobile* var. *spp.*, *Hygrochilus parishii*, *Lan đuôi chó* (local Vietnamese name) and *Eria hauletiana*. *Rhynchostylis gigantea* is often introduced from Laos or Cambodia. Tissue culture is further applied for this species in HCMC. The highest customer demand is for *R. gigantea* due to its flowering time around Tet holiday and its fragrance (see table D2).

**Table D 2: Overview of the most frequently traded ornamental orchid species from Hoa Binh province**

Vietnamese name	Latin name	Flowering period	Availability and trend in Ngo Luong	Sold quantity at commune in 2003	Selling price at commune in 2003	Selling price in Hanoi in 2004	Customer demand
Lan quế	<i>Aerides odorata</i> Lour.	June-September	Low – medium, strongly reducing	~ 1 ton	5'500-7'000 VND/ kg	– 30'000 VND/ kg, – 10'000-15'000 VND/ leaf, – With timber: 10'000-20'000 VND/ leaf, – in average for lower quality: 40-50'000 VND/ piece; for higher quality: 200'000-300'000 VND/ piece	High
Dai Chau/ (Lan tai trâu ?)	<i>Rhynchostylis gigantea</i> (Lindl.) Ridl.	January-February	Very low	Hardly ever	5'5-7'000 VND/ kg	– 10'000-20'000 or 70'000-100'000 VND/ leaf (depends on beauty) – without timber: 3'000-4'000 or 10'000-15'000 VND/ leaf	Highest
Lan thảo	<i>Dendrobium nobile</i> var. <i>spp.</i>	Feb-May	High, permanently	High, several lorries (with capacity 4-5 tons)	2003: 1'600-2'000 VND/ kg 1994: 500 VND/ kg	50'000-100'000/ piece	Only in flowering season, high for medicinal use (China)
Phi diep	<i>Dendrobium transparens</i>	April-May	Very low (unsuitable climate)	No indication	7'000 VND/ kg	70'000 VND for piece with 3-4 canes and flowers	Higher than for <i>A. odorata</i>
Cam bao (Da bao)	<i>Hygrochilus parishii</i> (Reichb. f.) Pfitz.	March	Low (unsuitable climate)	No indication	9'000 VND/ kg	Small individual for 100'000 VND	Quite high
Tam bao sac	<i>Eria hauletiana</i> (?)	March	Unknown	-	-	20'000 VND/ leaf	Quite high
Lan đuôi chó/ Duoi soc (?)	-	March-April	High	-	-	– normal leaves: 5'-10'000 VND/ leaf – more beautiful leaves: 30'000-40'000 VND/ leaf	-

Remark: Information about *Rhynchostylis gigantea* and *Duoi soc* (Vietnamese name) by upland villagers may concern different species.

## D 2.3 Price

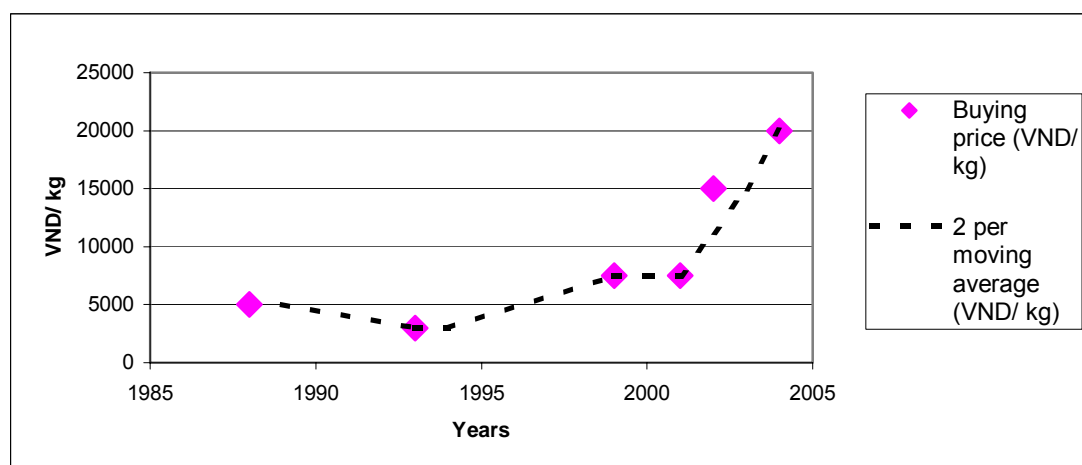
### *Demand and supply:*

Customer demand for ornamental orchids has increased over the last few years in tandem with improved life standard in Vietnam. The main demand of end customers is from June to September, when *Aerides odorata* flowers. However, the species is traded year-round. Cultivators in Hoai Duc district require *A. odorata* mostly after the Tet holiday to enhance appearance until it flowers.

The extrapolated supply was around 20 tons for all cultivators of both communes in Hoai Duc district in 2003. In contrast to the increase of established orchid nurseries in Hoai Duc district, individual supply has reduced over the last few years in line with the depletion of resources. In consequence, product prices and the willingness to purchase low quality products have both risen (see figure D3).

The price for *Aerides odorata* gradually increase from the forest gate to the end customers. The result is a price difference of around 20'000 VND/ kg (see figure D2). The final product price is often determined by the number of leaves, timber décor, first appearance and flowering time. Individuals on timber reach prices from 10'000 to 35'000 VND/ leaf or 40'000-100'000 VND/ individual for lower and medium quality. High quality products achieve values of 200'000-300'000 VND/ individual.

**Figure D 3: Development of buying price for *Aerides odorata* in Hoai Duc district, Ha Tay province**



Remark: This information is obtained by unique statements. The trend is therefore considered carefully, which is highlighted with a moving average trend line.

### *Fluctuations:*

Price fluctuations are related to quality, availability in the forest, labour allocation and need of cash income of producers. For example, the product value is four times lower in periods of higher than average supply. Product value during the flowering period can increase by 1.5 times of the common value.

#### *Marketing costs and profits:*

Both middlemen in Tan Lac have a gross margin of 1'000-2'000 VND/ kg when the commodities are provided and purchased at their homes. Estimated transportation costs for motorbikes are 500-1'000 VND/ kg between Tan Lac and Hoai Duc district in Ha Tay province. Transfer costs to Hoai Duc district are 250-300 VND/ kg for renting a lorry and 200-300 VND/ kg for using public transport. The profit for cultivators in Hoai Duc district seems therefore higher if the orchids are acquired in the uplands instead of being transferred to their homes in the lowlands. If orchids are immediately sold in Hoai Duc district, the benefit to cultivators is around 4'000-10'000 VND/ kg. Otherwise, when orchids are stored in the nurseries for some years, profit can reach several 10'000 VND/ piece according to the quality. This excludes storage costs, establishment and maintenance of the nursery and species specific requirements.

#### *Commissions, taxes and informal rules:*

Forest products like orchids are subject to the resource tax of 10 % and the value added tax of 5 % (VU VAN DUNG et al., 2002). However, there are no tax requests at the local tax stations in Tan Lac district. There is also no reference in the tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB, of 9 July 2003*). The failure to request taxes is explained by the low traded quantity, and the fact that fees can only be demanded if a transportation certificate is issued.

### **D 3 Influencing factors**

#### **D 3.1 Social and cultural**

As living standards have increased since the open market policy under Doi Moi, ornamental orchids are considered as prestige objects and luxurious goods. Orchids have always had a special status and there are many passionate collectors in urban areas.

#### **D 3.2 Economic frame**

##### *Investment opportunities:*

If orchids flourish when cultivated in nurseries, such as the ones in Hoai Duc district, investment loans for projects in production activities could become relevant. These investment loans had an interest rate of 5.4% in 2000, with a maximum loan period of ten years based on the *Law on Domestic Investment Encouragement*, revised on 20 May 1998 (PHAM XUAN PHUONG, 2001). Furthermore, households involved in commercial production, processing and trade of forest products can borrow up to 10 mio VND for a certain period, which is defined by the life cycle of the product. This requires fulfillment of the bank's security requirements.

The policy and investment bank in Tan Lac demands collateral, and in the case of loans higher than 10 mio VND, a guarantee such as house, land or red book. Indeed, poor households generally receive loans for only 3-5 mio VND, with an interest rate of 0.45 %. It is easier for poorer households to form groups and request group credit.

### D 3.3 Technological improvements

*Aerides odorata* can be vegetatively reproduced. The individual needs at least two leads to initiate the sprouting of a new leaf. The stimulation for producing a new leaf is made by attaching a bronze wire around the bulbs. A new leaf should appear after six months. This individual can be separated with a sharp disinfected knife one year later (KURZKE J., 1998). Vegetative reproduction supports the individual's ability to flower. The knowledge and experience to appropriately apply this method is more important than investment costs, which are low.

Generative reproduction with seeds in the form of *in vitro* reproduction on an artificial medium seems possible with *Aerides odorata*. The success rate is 90-95 %. Individuals first flower at an age of 3-10 years, which is related to the species (KURZKE J., 1998). Production costs might be high, as seedlings in glass have a product value of 3'000 VND, and 3-5 year-old individuals have a value of 60'000 VND according to the resource person of the research centre in Ha Tay province.

### D 3.4 Customer movement

There are two types of customers. They are either interested in the natural fragrance of wild forest orchid species, or in the attractiveness of colourful and large flowers, which are achieved by cross-breeding. The mainstream probably belongs to the second type according to the resource person in the research centre in Ha Tay province. With respect to the increasing customer demand and conservation aspects, the trend leads towards the establishment of nurseries, artificial seedling reproduction and tissue culture. In order to conserve the genetic variations of selected species, ex-situ conservation becomes essential.

### D 3.5 Political and legal conditions

#### *Species protection status:*

The Vietnamese Red Book lists two species from the gender *Aerides* as most endangered, however *A. odorata* is not among them.

#### *Regulation on exploitation:*

Article 5 clause 1b of *Decree 17/2002/ND-CP* of 8 February 2002 states that orchid species are illegally exploited in protection forests if the commodity value exceeds 300'000 VND. According to the local market value of 14'000 VND/ kg in Tan Lac in 2004, illegal exploitation might be evident if more than 20 kg are traded. Article 4, clause 2 of *Decision 178/2001/QD-TTg* of 12 November 2001 reveals that



exploitation of secondary forest products in protection forests is assigned to households as part of their management, protection and regeneration responsibility.

Implementation at district and provincial forest ranger offices forbids any orchid exploitation. In Ngo Luong commune, orchid exploitation only occurs on a small scale and is intervened with oral warnings by local rangers. The chief inconveniences to appropriate monitoring of orchid exploitation are a lack of control and management instruments, as well as the fact that orchid exploitation is a year-round activity.

In respect to the forthcoming establishment of the Ngoc Son Ngo Luong reserve in 2005, any exploitation activities would be restricted or forbidden. Resource management might then focus on an effective monitoring system as a prior measurement.

#### *Regulation on trade:*

According to article 1, clause 6 of the *Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products* (issued with *Decision 47/1999/QD-BNN-KL* of 12 March 1999) orchid species are forest products. If the products are economically exploited (article 9, clause 2), a transportation certificate from the nearest forest ranger station, and a sales receipt or purchase list are required, which are issued within ten days. However, there is no implementation in Tan Lac district as no transportation certificates have been issued up to now.

## **D 4 Conclusion and recommendations**

### D 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions:*

Tan Lac area apparently shows convenient growth conditions for *Aerides odorata*. Nevertheless, the natural availability due to over-exploitation has declined dramatically over the last five years. On the other hand, vegetative multiplication in lowland nurseries is successfully applied and provides the potential to conserve the species in the forest or nearby forest areas.

#### *Economic conditions:*

The current market demand for *Aerides odorata* is high all year, with a culmination phase in June to September. The high customer demand is likely to continue in the next decade. As a result of the significantly declining resource availability, the product value increased. However, cultivators in the lowlands benefit the most as the value at the forest gate is five times lower than at the cultivators site close to urban centres.

Ornamental orchid trade, with a forest gate value of 5'000 VND/ kg on average, provides a welcome cash income for poor households in particular. However, the product value could be increased if farmers were aware of smooth harvesting practices and suitable storage conditions outside the forest.

*Legal conditions:*

Although regulations on exploitation and trade are present, efficient implementation is missing. This is explained by low or inexistent monitoring systems at commune and district level. Another point is the low traded quantity, which apparently prevents forest rangers taking rigorous action. Moreover, year-round trade complicates effective exploitation control.

#### D 4.2 Recommendations

Activities in ornamental orchid trade favourably support the livelihoods of each stakeholder, and in Ngo Luong commune especially that of poorer households. This business is ensured because of long-term customer demand. On the other hand, the species availability has declined due to over-exploitation and inefficient resource management. To prevent resource depletion and achieve locally added value, the following recommendations are made.

*At village level:*

- Farmers should collect orchids at a higher rate in January and February as this is the most preferred acquisition period of nurseries in the lowlands. This avoids longer storage time, and therefore a decrease in value.
- Due to high susceptibility to mechanical damage, farmers should pay more attention to more cautious collection and transportation of orchids.
- Sustainable harvesting might be achieved when only the youngest part with at least two leaves is clipped. This, however, requires knowledge on appropriately planting the young plant part in the specific substratum.
- An interest group, which should include poor households, could acquire the knowledge on appropriate harvesting, storing and transportation methods. As orchids are an objective of the Forest Management Learning Group in Ngo Luong commune, a proposal for building an orchid nursery at the forest gate could be elaborated.

*At commune level:*

- In order to signify the ownership of individual orchids in the forest, the commune needs to elaborate clear guidelines on whether the individuals directly belong to the forest land owner or to the person who first discovers the plant. The individuals should be marked and registered with location, date, species name, size and owner at village level. This could be part of the community forest management activities.

*At district level:*

- If the Ngoc Son Ngo Luong Nature Reserve becomes a reality, the aforementioned proposal should be presented to the persons in charge. As it is aimed at ensuring sustainable conservation associated with improved livelihoods, Ngoc Son project members should support this proposal.
- In order to improve the monitoring on orchid exploitation and trade, the following points should be taken into account: 1) Legal harvesting and trade activities are limited to a certain season related to the species' life cycle. This would signify for *Aerides odorata* that collection could be legally allowed from December to March, and long-distance trade from February to July. 2) The legally harvested quantity is determined for each commune based on inventories and estimated regeneration potential. 3) Trade activities are controlled by the forest rangers as well as the local tax stations. The resource tax of 10 % is applied to commercial orchid trade and registered in a tax list, which includes ornamental orchids as a tax item.

*At provincial level:*

- Studies on domestication and cultivation of different endangered orchid species should be initiated.
- Training workshops on field implementation for orchid cultivation should be organised and conducted with a target audience that strongly depends on orchid species.

*At national level:*

- Research and collaboration with foreign stakeholders on tissue cultures and generative reproduction could be extended to meet high customer demand and conserve natural resources.
- Ornamental plant species should be listed in the national trade statistics as this product group will experience strong market development.

## EA Case study of the medicinal plant species: *Drynaria fortunei*

The results of the field survey (PRA), market analysis (RMA) and literature review of *Drynaria fortunei* are presented in this case study. A short overview is given in the SWOT table EA1. Conclusions and recommendations can be found in chapter EA4.

### SWOT table EA 1: Medicinal plant species *Drynaria fortunei*

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- Income contribution to rather poor households (-&gt; EA1.4)</li> <li>- Relatively stable product price (-&gt; EA2.3)</li> <li>- High and increasing market demand (-&gt;EA2.3)</li> <li>- High product value among medicinal plants (-&gt; EA4.1)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Declining availability (-&gt; EA1.3)</li> <li>- Weak legal implementation (-&gt; EA3.5)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Cultivation can be applied (-&gt; EA3.3)</li> <li>- Locally added value through improved methods (-&gt; EA2.1)</li> <li>- Higher requests for traditional medicine (-&gt; EA3.4)</li> </ul>	<p><b>THREATS</b></p>



Picture EA 1: The epiphytic fern *Drynaria fortunei* in the natural forests of Ngo Luong commune

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Bện bà
Popular Vietnamese name:	Cốt toái bổ
Latin name:	<i>Drynaria fortunei</i>
English name:	Fortune's Drynaria

## **EA 1 Availability and cultivation/collection practices for the medicinal plant species *Drynaria fortunei* in Ngo Luong commune**

### EA 1.1 Product characteristics and growth habitat

*Drynaria fortunei* is a perennial fern and belongs to the family of *Polypodiaceae*. As it grows epiphytic, its rhizomes creep (TRAN HUNG, 1999). It reproduces either vegetatively by layers, or generatively by spores. This vigorously growing species annually produces two to four fronds. The species appears in the evergreen wet, or limestone mountainous forests in northern Vietnam, at a sea level of 500-1500 m.

TRAN HUNG (1999) states that the rhizome is gathered, cleaned, cut and dried year-round. The thick ramenta (hair) cover is eliminated by burning. As a result, the surface of the rhizome is brown or dark brown.

### EA 1.2 Local knowledge and practices

Trees of the families *Fagaceae* and *Meliaceae* often host *Drynaria fortunei*. The species usually grows in crotches of the middle trunk section. In particular, the fern is found at places with a higher air humidity. This fern species provides a yield of 20 kg raw rhizomes after five years, and can in general be collected again after three years.

The rhizome has been commercially harvested for three years, although the farmers are unfamiliar of its medicinal use. The collection period is related to customer demand, farmers labour allocation and the most appropriate season for drying the rhizome. As a consequence, September and October are identified as preferred months.

Apart from individuals with small fronds, entire rhizomes are exploited. The daily harvesting efficiency is indicated at 60 kg of raw rhizomes per person, unless the collection distance is too far, or additional instruments like ladders are necessary.

Even though the forest land was allocated in 1996, forest products like medicinal plants belong to common property for farmers in Ngo Luong commune. However, if collectors of epiphytes cut down trees for easier access, they are fined at least 20'000 VND/ tree.

The raw rhizome can be stored for two weeks maximum, when it becomes mouldy. In order to enhance the product value and to extend the storage duration, the rhizome is usually cut by hand and dried. The potential daily processing capacity is 500 kg of raw rhizomes if a self-made 'knife-wheel' is used. In a further step, the slices are continuously exposed to the sun for three days. If it rains once, the slices have to be dried again, mostly above the fire place for one additional day. The weight reduction is 75 % on average.

### EA 1.3 Availability and quantity traded out of villages in Ngo Luong commune

Despite the relatively high abundance, the impact of recent customer demand is evident, as farmers need to go to further and more inconvenient places. The estimated traded quantity for both villages was around 40 tons of raw rhizomes in

2003. This product is collected more intensively by farmers in Bo village than in Luong Tren.

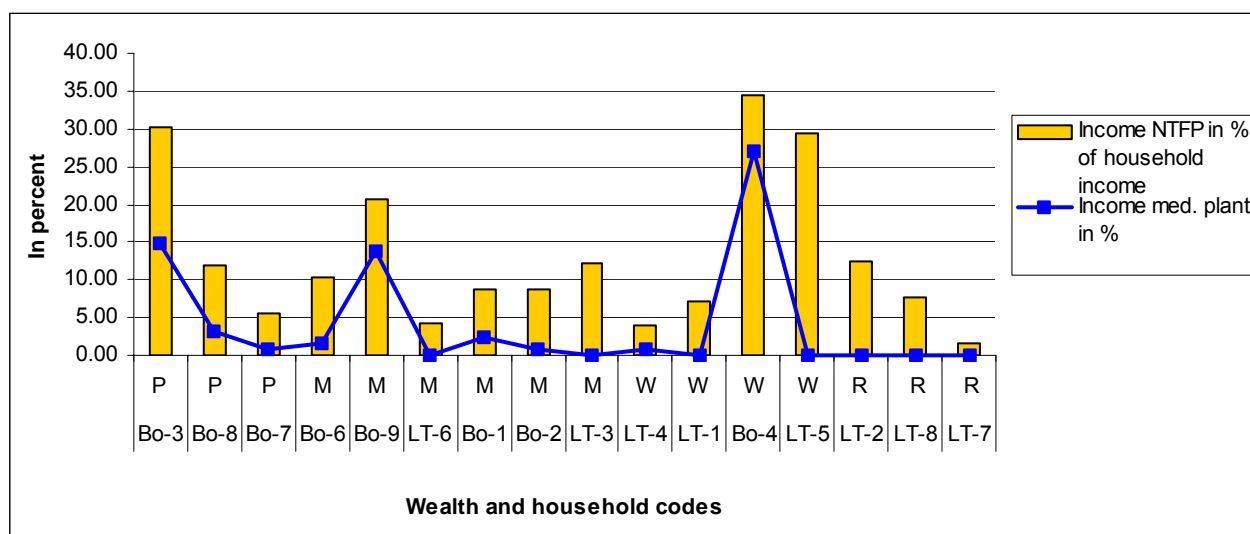
#### EA 1.4 Economics for villagers

One household in Luong Tren and all eight studied households in Bo village receive a cash income contribution of 0.7-27 % of household incomes. This income contribution includes the traded medicinal plant products of *Drynaria fortunei* and *Geranium nepalense*.

Medicinal plant species account for more than 10 % of household cash incomes for three households of different wealth classes. In addition, medicinal plant species contribute more than half of the entire NTFP cash income. The households Bo-4 and Bo-9 earn exclusively from trading with *Drynaria fortunei*, as they are the first buyers in Bo village.

Collectors sell the raw product for 500 VND/ kg to the first buyers in the commune. First buyers trade the rhizomes either raw, or less frequently as a semi-processed product. The benefit of the semi-processed product is around 350-600 VND/ kg raw by a weight reduction of 75 %.

**Figure EA 1: Contribution of medicinal plant products to the household cash incomes in 2003**



Explanation: LT = Luong Tren, Bo = Bo village. Household wealth with P = poor (< 7.2 mio VND/ year), M = medium (7.2-25 mio VND/ year), W = well-off (25-40 mio VND/ year) and R = rich (> 40 mio VND/ year).

#### EA 1.5 Similar products or substitutes in Ngo Luong commune

Further medicinal plants regularly collected for economic purposes are *Nervilia fordii* (see case study EB), *Anoectochilus setaceus* (see case study EC), *Geranium nepalense* and two *Dendrobium nobile* subspecies. Another high valuespecies for farmers in Ngo Luong commune could be *Paris polyphylla*, which has recently seen

the beginning of customer demand in June 2004. The occurrence of all the aforementioned wild substitutes, except the two *Dendrobium* subspecies, is low.

*Geranium nepalense* is cultivated following Programme 135 in 2001. It includes locally added value and a guaranteed sale to the research centre on cultivation and processing medicinal plants, which belongs to the Institute of Medicine of Vietnam in Van Dien (Thanh Tri district, Hanoi). To provide locally added value, the project established two ovens in the commune. The minimum processing quantity for raw material is 2 tons and requires 48 hours. If the farmers dry *G. nepalense* on their own in 2005, the benefit will be 7'600 VND/ kg dry or 1'150 VND/ kg raw. This requires a stable selling price of 13'000-13'500 VND/ kg dry. Calculated expenses are around 5'400 VND/ kg dry for 6.5 kg raw material (800 VND/ kg raw) and for coal (30 VND/ kg raw plant material). The drying process of the plant parts takes from 1-2 months and is conducted immediately after the harvest season from June to July. However, the farmers seem less confident of semi-processing, transporting and selling the product by themselves.

## **EA 2 Market assessment**

### EA 2.1 Market place

#### *Market actors:*

*Drynaria fortunei* is used in East and North traditional medicine. The East traditional medicine is applied in Vietnam, whereas the North traditional medicine is used in China. The different Vietnamese stakeholders are described in table EA1, and the chain is shown in figure EA2.

There is evidence that the species is exported to China (TRAN VAN ON et al., 2002), and that Chinese traders attempt to arrange contracts with producer villages in remote areas in Vietnam and Laos (DONOVAN D. G. et al., 1998). A collection port with a likely annual traded quantity of 3000 tons of raw material might even have been established near Bac Ninh in 2003.

#### *Transportation:*

Wholesalers in the Tan Lac area mostly use motorbikes with a carrying capacity of 60 kg of dry material on average. If the commodity is transferred by rented lorries to Hanoi or Lang Son, the loading capacity is 15-20 tons on average. In general, the rhizome is transported in nylon bags of 50 kg.

#### *Storage:*

Wholesalers in the Tan Lac area usually store the raw rhizomes for one week. The processors in Tan Quang commune either do not store the rhizomes, or only do so for half a year. The raw rhizome is then covered under plastic or in nylon bags. Weight reductions of 10 % are likely as soon as the raw rhizome is stored for more than one month. On the other hand, dry slices can be stored for a maximum of two

years. In order to prevent fungi infections, the slices are occasionally cleaned with water.

**Table EA 1: Characteristics of market actors**

Actor (number)	Location	Special feature
Wholesalers (8)	Tan Lac and Lac Son district, HB	<ul style="list-style-type: none"> <li>- Processor A: slices rhizome with cutting machine (capacity: 2 tons of raw material/ day). Slices are exposed to sun or oven-dried.</li> <li>- Processor B: dries 500-600 kg of raw rhizomes for 30 hours in a stone oven (requires 200 kg coal).</li> <li>- 6 small-scale traders: trade with dried product.</li> <li>- Other products: 5 stakeholders also trade with <i>Anoectochilus setaceus</i> and <i>Nervilia fordii</i>.</li> <li>- Destination: National pharmaceutical industry -&gt; medicinal companies in Hoa Binh and Ha Dong. End consumer -&gt; Lan Ong street in Hanoi. Export -&gt; Haiphong and Chinese borders in Lang Son and Quang Ninh province.</li> </ul>
Processing factories (2)	Hoa Binh and Ha Dong, Ha Tay province	<ul style="list-style-type: none"> <li>- Quality: dry products.</li> <li>- End product: tablets.</li> <li>- Factory A: annual supply of all 200 species is 56 tons.</li> </ul>
Shop owners (20-30)	Lan Ong street in Hanoi	<ul style="list-style-type: none"> <li>- Reputation: one large centre among 600 places for traditional medicine in Hanoi city. Another famous place is Ninh Hiep commune in Gia Lam district (BIEN QUANG TU, 2000).</li> <li>- Supply: northern upland areas and more regular providers from collection ports like Tan Quang commune in Hung Yen province.</li> <li>- Competition: high.</li> </ul>
Traditional medicinal village	Nghia Trai village in Tan Quang commune, Van Lam district, Hung Yen province	<ul style="list-style-type: none"> <li>- Medicinal plant activities: start in 1572 (JHA V., 2001; see outlook EA1).</li> <li>- Organisation: 409 households process medicinal plant species.</li> <li>- Processing: rhizome is sliced with special cutting knife (capacity 0.5-0.8 tons/ machine and day on average) and exposed on the ground for two days of high sun intensity. Hairs are removed with a tool like an elongated Bunsen burner.</li> <li>- Weight reduction: 60-80 %.</li> <li>- Supply: Hoa Binh, Tuyen Quang, Cao Bang, Lang Son and other provinces.</li> <li>- Destination: institutes or whole sale shops, domestic market (also to South Vietnam).</li> </ul>
Border cross traders (2), EMA members (2), Retail seller (1)	Lang Son province	<ul style="list-style-type: none"> <li>- Supply: buying port in Hanoi. Supply transfers from different northern provinces such as Hoa Binh and Ha Giang.</li> <li>- Quality: raw.</li> </ul>

**Outlook EA 1: Nghia Trai village in Tan Quang commune Van Lam district Hung Yen province**

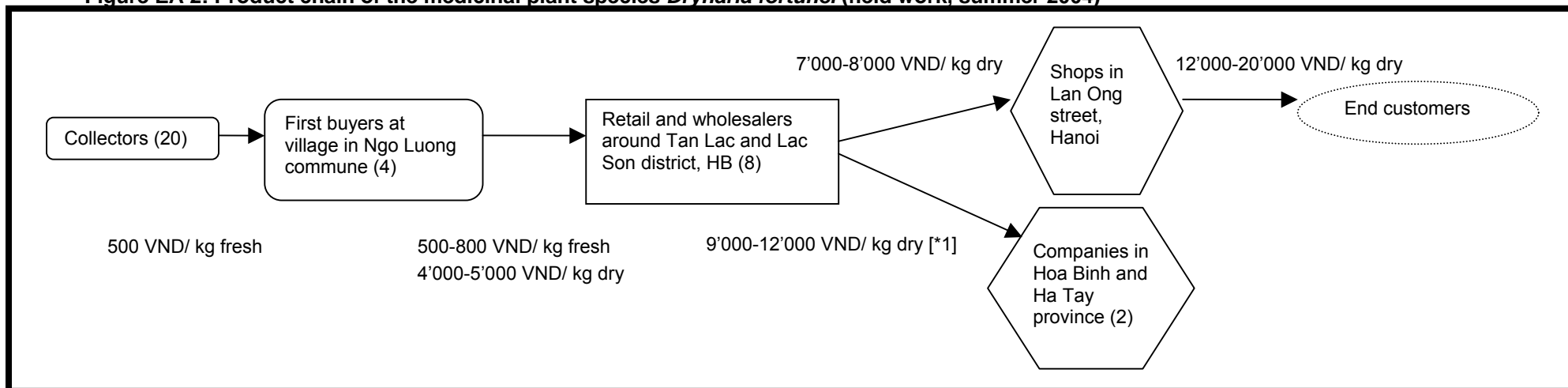
The strategy is to grow plant species with a high demand and to stop if the demand declines (JHA V., 2001). Moreover, the shops of Nghia Trai villagers in Hanoi or elsewhere are attributed with the prefix 'Nghia' like a business label. Due to the higher benefit compared to crop work (JHA V., 2001), adjacent villages are nowadays also involved in medicinal plant activities.

At national level, the export market makes up half of the total medicinal plant production, whereas raw material is principally exported to China using the border gates in Lang Son and Quang Ninh province as documented in JHA V. (2001). Products to HCMC are disposed either to Chinese or other South East Asian brokers. Domestic customers are identified as private traders providing processing establishments, state-owned pharmaceutical companies, trading agents and traditional healers.

The daily processing capacity in Nghia Trai village is around 60 tons of raw material independently on the species according to PHAM THANH HUYEN (2003). In addition, nearly 100 forest and cultivated species are traded year-round by 50 households, whereas the supply either from the forest in the northern uplands or from China accounts for about 88%. *Drynaria fortunei* is one of the most traded species in this village.



**Figure EA 2: Product chain of the medicinal plant species *Drynaria fortunei* (field work, summer 2004)**



Explanation: Quality and prices refer to 2003. The amount of involved stakeholders is indicated in parenthesis. [\*1] Buying price of the medicinal companies.

**Legend EA 1: Explanation for figure EA2**

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		Second middlemen
	First middlemen		End customer

## EA 2.2 Product

### *Quality, appearance and size:*

The completely dried slices are preferably uniformly 3-5 mm thick, of yellow colour, and without ramenta (hair) or fungi traces. The majority of informants in Tan Quang commune in Hung Yen, as well as two wholesalers around Tan Lac, mostly require raw rhizome. This is because the quality would not meet the demand, in particular, of Chinese customers. However, if the rhizome is processed into 10 cm long, thin slices using a special cutting machine, Chinese demand could be satisfied.

### *Packing and branding:*

Unless the dry rhizome is further processed into remedies with different components, as described by the contacted medicinal companies, there is no need to package or brand the product.

### *Substitutes:*

The species which produce usable rhizome, and that have an international and domestic customer demand, are *Cibotium barometz*, *Stemona tuberosa* and *Smilax glabra*. A Chinese demand exists for *Stemona tuberosa* and *Smilax glabra* (TRAN VAN ON and NGUYEN QUOC HUY, 2004). Even in Laos, Chinese customer demand for *Smilax glabra* is identified (SHINYA TAKEDA, 2004). The liana of the dioecious species *Sargentodoxa cuneata* is also imported by Chinese customers (CAO JIAQUAN, 2001).

The liana *Celastrus hindsu* is currently the research object of Professor Le The Trung at 103 hospital in Ha Dong, Ha Tay province, who is attempting to prove the species' positive impact on cancer. Due to the sale of two remedies (UT1 and UT2) mainly composed of *C. hindsu*, which began in early 2004, customer demand for this species is steadily increasing. Dried slices of *C. hindsu* are offered in packed and branded one kilogram plastic bags at the Phuong Lam market in Hoa Binh. The ratio of active elements is higher in the leaf than in the stem. The ratio is also influenced by soil and climate conditions. In Kim Boi, Hoa Binh province, where the species naturally occurs, the plant material shows a higher active ratio. Research and possible applications for cultivation are currently being undertaken by the silvicultural centre of DARD, and by a private medicinal company in Hoa Binh.

Substitutes with a similar medicinal impact to *D. fortunei* are not researched herein.

## EA 2.3 Price

### *Demand and Supply:*

The demand at each market level is generally high throughout the year. Shop owners in Lan Ong street experience a lower demand before and after TET as well as in May and October, which is related to crop work. A shop keeper in Lan Ong street is able to sell 100 kg dry/ month on average. Processors in Tan Quang commune sell 2-3 tons dry/ month on average.

The supply is basically related to the providers' labour allocation and urgent need of a cash income. Higher supply is experienced in October to May. The supplied quality and the product value of different actors are indicated in table EA2.

**Table EA 2: Supply and selling price at different market levels in 2004**

Actor (number)	Location	Supplied quantity	Selling price
2 large-scale wholesalers	Tan Lac and Lac Son district, HB	6-8 tons raw/ month	7'000-12'000 VND/ kg dry
Shop owners (20-30)	Lan Ong street in Hanoi	-	12'000-20'000 VND/ kg dry
Traditional medicinal village	Nghia Trai village, Tan Quang commune, Van Lam district Hung Yen province	around 40 tons raw/ month	10'000-15'000 VND/ kg dry
1 cross-border trader	Lang Son province	15 tons raw/ month	14'000-15'000 VND/ kg dry

*Fluctuations:*

The product prices are stable throughout the year, and have remained at the same level for the last five years. Nevertheless, prices can fluctuate up to 1'000 VND/ kg raw in a year. This is mostly related to the supplied quantity and the transport distance.

The buying price of 9'000 VND/ kg raw in 2004 is double of that one five years ago in Tan Quang commune. A further comparison is that of a medicinal company in Hoa Binh that paid 4'000 VND/ kg dry seven years ago. This corresponds to one third of the product value in 2004. In general, price increases result from resource decline.

*Marketing costs and profits:*

Table EA3 shows the trade benefit, which includes or excludes applied processing methods.

*Commissions, taxes and informal rules:*

Forest products such as medicinal plant species are subjected to the resource tax of 10 % and the value added tax of 5 % (VU VAN DUNG et al., 2002). However, there are no tax demands at the local tax stations in Tan Lac district. Some medicinal plant species are listed in the tax document (*Provincial People's Committee Hoa Binh, No. 1024/QD-UB, of 9 July 2003*), but *Drynaria fortunei* is not one of them. Medicinal plant transfers principally happen without transportation certificates. Fees are mostly paid for overloading.

**Table EA 3: Benefit of market actors, who trade without or with processing the commodity**

Actor (number)	Location	Trading without processing	Trading including processing	Remarks
2 large-scale wholesalers	Tan Lac and Lac Son district, HB	2'000-3'000 VND/ kg dry	5'300 VND/ kg dry or 1'300 VND/ kg raw	<ul style="list-style-type: none"> <li>- Selling price: 9'000 VND/ kg dry.</li> <li>- Weight reduction: 75 %.</li> <li>- Processing costs: 100 VND/ kg dry.</li> </ul>
Traditional medicinal village	Nghia Trai village, Tan Quang commune, Van Lam district, Hung Yen province	4'000 VND/ kg dry	6'000 VND/ kg dry or 2'000 VND/ kg raw	<ul style="list-style-type: none"> <li>- Selling price: 12'000 VND/ kg.</li> <li>- Quality: sun dried and without hair.</li> <li>- Processing costs: labour, storage and transportation costs are irrelevant</li> </ul>
1 wholesaler	Lang Son province	1'400 VND/ kg raw	2'900-3'900 VND/ kg dry or 960-1'200 VND/ kg raw	<ul style="list-style-type: none"> <li>- Buying price: 2'700 VND/ kg raw.</li> <li>- Selling price: 14'000-15'000 VND/ kg dry</li> <li>- Weight reduction: 65 %.</li> <li>- Transportation costs (Hanoi-Lang Son): 1'000 VND/ kg raw.</li> </ul>

### EA 3 Influencing factors

#### EA 3.1 Social and cultural

According to TRAN HUNG (1999), the rhizome invigorates the kidneys, strengthens tendons and bones, promotes blood circulation, eliminates blood stasis, stops bleeding, dispels wind, removes damp and is antiseptic and analgesic.

#### EA 3.2 Economic frame

##### *Development of medicinal plant processing activities:*

The Ministry of Health promotes traditional medicine with several regulations, such as the *Certification of Special Status on Traditional Pharmaceuticals* (05/BYT-TT of 15 May 1993), and the *Statute on Assessing Safety and Effectiveness of Traditional Medicines* (371/BYT-QD of 12 March 1996) (JHA V., 2001).

In addition, in 1995 the government ratified the *Convention on Biodiversity* (CBD), the objectives of which are to conserve the biological diversity, to sustainably use biological resources and to fairly and equitably share the benefits from genetic resource utilisation. However, JHA V. (2001) concludes that governmental regulations to encourage the development of medicinal plants are lacking. Suggestions for improvement include the instruction of relevant state and private agencies, institutions and enterprises in order to research stable outlets. The focus should be on evaluating the potential of investment and cooperation with foreign partners.

According to the *Law on Domestic Investment Encouragement* (revised on 20 May, 1998), land use tax for the plantation of perennial crops throughout the project duration does not have to be paid (PHAM XUAN PHUONG, 2001). Investment loans for projects in processing

forest products, or in enriching forests show an annual interest rate of 5.4%, which was adopted in 2000 and valid for a maximum loan period of ten years. Households which like to deal with commercial production, processing and trade of forest products, can borrow up to 10 mio VND for a certain period. This period is defined by the life cycle of the product if the security requirements from the bank are fulfilled.

#### *International regulations:*

In order to globally enhance the safety and quality of traded medicinal products, the World Health Organisation (WHO) developed guidelines in 2001. These aim to 1) ensure quality, 2) provide guidelines for national standards, and 3) encourage and support cultivation and sustainable harvesting activities of medicinal plant species (WHO, 2003).

At the 12<sup>th</sup> meeting of the Conference of the Parties of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the participants established a list of animal and plant species, which are used for traditional medicinal purposes (CITES, 2002). However, the purpose and conservation benefits need to be identified before data is collected. This list contains, among others, the herein mentioned *Cibotium barometz*, *Dendrobium nobile* and *Nervilia fordii*, as well as *Anoectochilus formosanus* and *A. roxburghii* as relatives of *A. setaceus* (website G).

#### EA 3.3 Technological improvements

According to LE VAN TRUYEN and NGUYEN GIA CHAN (1999), the rhizome of *Drynaria fortunei* may be cultivated year-round. The species is already cultivated in home gardens in Tung Ba commune, Ha Giang province (TRAN VAN ON and NGUYEN QUOC HUY, 2004). Information on appropriate processing methods has not been collected.

#### EA 3.4 Consumer movement

The demand for herbal-based pharmaceuticals has been increasing since Vietnam experienced market liberation in 1986 (JHA V., 2001). As a consequence, the Vietnamese Ministry of Health licensed 1047 traditional medicinal products for free market circulation.

In the international context, the WHO estimates that more than 80% of the Asian population relies on traditional medicine (SWITZER C. et al., 2003). In India, more than 2000 plant species are used. The annual demand for fresh material is estimated at 24 mio m<sup>3</sup> with an annually increasing rate of 20% (KARKI M., 2001). These increases are explained by the fact that traditional medicinal products are 'natural', non-narcotic and show no side-effects (MALAISAMY A. and RAVINDRAN C., 2003). Furthermore, they are affordable and often the only source of medicine for the poor.

SWITZER C. et al. (2003) indicates that the annual growth rate of medicinal plant demand is 10-15 % in South Asia, as well as globally. The demand from European Union countries represents the biggest share, even though these customers require certified and chemically safe products. However, the average annual growth rate in Europe as the largest global market, is likely to slow down to 5-10 % compared to the rate of 10 % between 1985 and 1995 (VAN POEDEROOIJEN E., 2000). In contrast, the supply of medicinal plants from

Yunnan province in China, rose tenfold over the last ten years (PEI SHENGIJ, 2002b; in HAMILTON A., 2002).

### EA 3.5 Political and legal conditions

#### *Species protection status:*

*Drynaria fortunei* is classified as a threatened species in the Red Data Book of Vietnam (TRAN VAN ON and NGUYEN QUOC HUY, 2004).

#### *Regulation on exploitation:*

Article 5, clause 1b of *Decree 17/2002/ND-CP* of 8 February 2002, reveals that medicinal plant species are illegally exploited in protection forests if the commodity value exceeds 300'000 VND. According to the local market value of 7'000-12'000 VND/ kg in Tan Lac in 2004, illegal exploitation occurs if more than 35 kg is traded. Article 4, clause 2 of *Decision 178/2001/QD-TTg* of 12 November 2001, states that exploitation of secondary forest products in protection forests is assigned to households as part of their management, protection and regeneration responsibilities.

#### *Regulation on trade:*

Article 1, clause 6 of the *Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products* (issued with *Decision 47/1999/QD-BNN-KL* of 12 March 1999), identifies raw as well as semi-processed material of tubercles, leaves and roots of forest plants, as forest products. If these products are economically exploited (article 9, clause 2), a transportation certificate from the nearest forest ranger station and the sale receipt or purchase list are required, which are issued by the nearest forest rangership or the local commune People's Committee or township within ten days.

Up to now, no transportation certificates for medicinal plants have been issued by the forest ranger station in the district. This is because medicinal plants are mainly self-consumed and traded in low quantities.

Medicinal plants, excluding species ranked in group IIA, are not subject to export tax in the period 2001-2005 (*Decision 46/2001/QD-TTg* of 4 April 2001, appendix 01). There are indeed no export fees for medicinal plants, and legal and even illegal border crossing activities of medicinal plant traders should not exist according to the members of the customs office in Lang Son province. The main reason for illegal border crossing are high import taxes imposed by the Chinese customs office.

## **EA 4 Conclusion and recommendations**

### EA 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

*Natural conditions:*

Although the regeneration ability of *Drynaria fortunei* is relatively high (TRAN HUNG, 1999), the availability in Ngo Luong commune has declined remarkably due to unsustainable harvesting activities. As an option, the species might be cultivated locally. However, implementation on a larger scale has yet to occur in northern Vietnam. A cost-benefit analysis should first be developed and adapted to the current local conditions in each instance.

*Economic conditions:*

Domestic and international customer demand is permanently high for raw and dried products of *Drynaria fortunei*. The species is apparently one of the most traded medicinal plant species in northern Vietnam.

Compared to other frequently traded medicinal plant species at Tung Ba commune, Ha Giang province, the product value of *D. fortunei* is 1'400 VND/ kg raw at the upper range (TRAN VAN ON and NGUYEN QUOC HUY, 2004). Similarly, the dried product with a value of around 7'000 VND/ kg at the gate of Tam Dao National Park has a higher economic value than other identified species (unpublished data, 2004). The data collected during this study confirms the relatively high product value of *D. fortunei* compared to other species.

In Ngo Luong commune the selling price is 500-800 VND/ kg raw or 4'000-5'000 VND/ kg dry for sun dried and manually cut slices. This value at the forest gate is around one third of the end customers' value. Producers of sun-dried products will only break even if the cost sun drying is lower than 2000 VND/ kg. This is based on the assumption that 1 kg raw rhizome costs 500 VND, the dry matter is 25%, and that the price of dried rhizome is 4000 VND/ kg.

A more lucrative value might be achieved if the method of semi-processing is improved as is applied in the processing village in Hung Yen province. This includes the use of a special cutting knife and the removal of the rhizome hair. Such processing leads to higher quality and a certain price increase of 250 %. The net-profit could be 1'000-1'100 VND/ kg raw if the commodity is sold for 7'000-8'000 VND/ kg dry. This includes processing costs for oven-drying of 30 VND/ kg raw as it was calculated for drying *Geranium nepalense*. The return from advanced semi-processing matches the profit for *Geranium nepalense*, which is supported through Programme 135.

The collection and sale of raw material of *D. fortunei* to first buyers in the commune provides cash income for mainly poorer households in Ngo Luong commune. The rhizome is sun-dried by the first buyers in the commune or mostly by the first middlemen in Tan Lac district.

*Legal conditions:*

Although *Drynaria fortunei* is listed as a threatened species, exploitation and trade activities are unlimited. Furthermore, frequent export activities to China occur.

#### EA 4.2 Recommendations

The rhizome of *Drynaria fortunei* shows an ensured national and international long-term demand. The trade favourably contributes to the cash incomes of less wealthier households in Ngo Luong commune. Improved semi-processing after collection enhances the product

quality and therefore the product value. Farmers reported a clear decline of the resource base, which justifies its classification as an endangered species (Red Data Book of Vietnam). The protection of *Drynaria fortunei*, however, is difficult, as existing laws are difficult to enforce as long as market demand and poverty levels are high. Recommendations to improve locally added value, to ensure sustainable exploitation and to facilitate legal application are given below.

*At village level:*

- A farmer interest group, in cooperation with the district extensionists, should clarify the options for cultivating *Drynaria fortunei* and acquiring the respective knowledge and skills, while setting up small-scale experiments.
- Producers should form an interest group to evaluate the options for locally added value and to clarify the opportunity and economics for oven-drying.
- Farmers should try to exploit the rhizome sustainably. This includes the development of guidelines on exploitation, which should be agreed and enforced by all villagers.

*At commune level:*

- Village collaboration should be sought to successfully add value on a larger scale. This also includes to ensure a sustainable production of the rhizome. These objectives should be integrated into forthcoming community forest management activities.
- Collaboration with the existing customers of *Geranium nepalense* should be sought to establish a market channel for *Drynaria fortunei* or at least to benefit from the customer's knowledge of the market network.

*At district level:*

- Information on existing cultivation projects of *Drynaria fortunei* should be collected and assessed based on local conditions, such as climate and natural occurrence. Possible interventions could include trainings on appropriate cultivation, harvesting, local semi-processing and marketing features. Ideally, customers that have a solid base and a long-term vision should have already been identified and linked to producers in Ngo Luong commune.

*At provincial level:*

- In order to successfully monitor exploitation and trade activities of medicinal plants, trainings on identifying frequently traded raw and semi-processed medicinal plant material should be organised.
- Potential processors of *Drynaria fortunei* should be located to add value locally and to be in position to better monitor exploitation activities.

*At national level:*

- Research on convenient semi-processing methods applied by foreign countries, in particular China, should be initiated.
- Packing and branding of processed medicinal plant products should be in accord with international guidelines, like those of the World Health Organisation (WHO).



## EB Case study of the medicinal plant species: *Nervilia fordii*

The results of the field survey (PRA), market analysis (RMA) and literature review of *Nervilia fordii* are presented in this case study. A short overview is given in the SWOT table EB1. Conclusions and recommendations can be found in chapter EB4.

**SWOT table EB 1: Medicinal plant species *Nervilia fordii***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>– Relatively high product price (-&gt; EB2.3)</li> <li>– High market demand (-&gt;EB2.3)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>– Declining availability (-&gt; EB1.3)</li> <li>– Weak law enforcement (-&gt; EB3.5)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>– Cultivation can be applied (-&gt; EB3.3)</li> <li>– Higher requests for traditional medicine (-&gt; EB3.4)</li> <li>– Locally added value seems to support livelihood improvements (-&gt; EB4.1)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>– Resource depletion (-&gt; EB1.2/3.5)</li> </ul>



**Picture EB 1: *Nervilia fordii* with tuber and flowers, but without leaf**

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Củ 1 lá
Popular Vietnamese name:	Cây một lá
Latin name:	<i>Nervilia fordii</i>
English name:	Ford orchid

## **EB 1 Availability and cultivation/ collection practices for the medicinal plant species *Nervilia fordii* in Ngo Luong commune**

### **EB 1.1 Product characteristics and growth habitat**

*Nervilia fordii* is a perennial terrestrial orchid species. One individual possesses one single leaf, which is round or heart-shaped and 5-7 cm long by 8-10 cm wide. The leaf appears after the flowering period, which is from March to April (TRAN TOAN, 1999).

As a hygrophilous and slightly sciophilous species, the most convenient growth conditions are found in nutrient and humid soils under the shade of evergreen forests in Vietnam at an altitude of 700-1'600 m above sea level. *N. fordii* occurs in the northern mountainous areas of Ha Giang, Cao Bang, Lang Son, Lai Chau, Hoa Binh, Thanh Hoa and Nghe An provinces. As previously described, the species is found in Ngo Luong commune at places with humid soil conditions under big trees in the lower parts of the valley. In addition, the species grows at the edge of maize fields, where the proportion of stones in the soil is high. As a rule of thumb, a cluster of up to ten plants normally occurs at one site.

### **EB 1.2 Local knowledge and practices**

The inhabitants of Ngo Luong commune are aware of the medicinal use of *Nervilia fordii*, in particular for curing kidney related disease. Its tubers are even added to locally made rice wine to improve its taste. Leaves and often the tubers are collected from May to August.

In order to increase the product value, the leaves are sun-dried, which generally takes three days. The water reduction is around 90 %, whereas smaller leaves show a slightly higher output. The raw and dried products are usually sold immediately.

Although the informants are conscious of the potential to cultivate the species, cultivation is not applied because of a lack of information. The interviewed farmers expressed their interest in cultivating *N.fordii* mainly because of its high economic value.

### **EB 1.3 Availability and quantity traded out of villages in Ngo Luong commune**

The availability is low and has steadily declined over the last decade as tubers are frequently collected. As a result, harvesting time is high. The traded quantity of both villages was about 200 kg raw in 2003. There was no clear statement of the sold quantity of dried leaves, even though a number of farmers dry the leaves.

### **EB 1.4 Economics for villagers**

The sixteen studied households are not involved in trading *Nervilia fordii*. The product value at the forest gate is 2'000 VND/ kg raw. The benefit for sun-dried leaves considering the dry matter ratio would be around 20'000-30'000 VND/ kg, which is equivalent to 2'000-3'000 VND/ kg raw.

### **EB 1.5 Similar products or substitutes in Ngo Luong commune**

Other medicinal plant species frequently collected for economic purposes in Ngo Luong commune are *Drynaria fortunei* (see case study EA), *Anoectochilus setaceus* (see case

study EC), *Geranium nepalense* and two *Dendrobium nobile* subspecies. Another high benefit species seems to be *Paris polyphylla* with customer demand beginning in June 2004. The occurrence of all mentioned wild substitutes, excluding both *Dendrobium* subspecies, is low.

## EB 2 Market assessment

### EB 2.1 Market place

#### *Market actors:*

*Nervilia fordii* is principally used in the North traditional medicine, which is applied in China. Exports to China are documented in BIEN QUANG TU (2000). The different Vietnamese stakeholders are described in table EB1, and the product chain is shown in figure EB1.

#### *Transportation:*

Raw and dry products are transported in nylon bags by motorbikes or lorries.

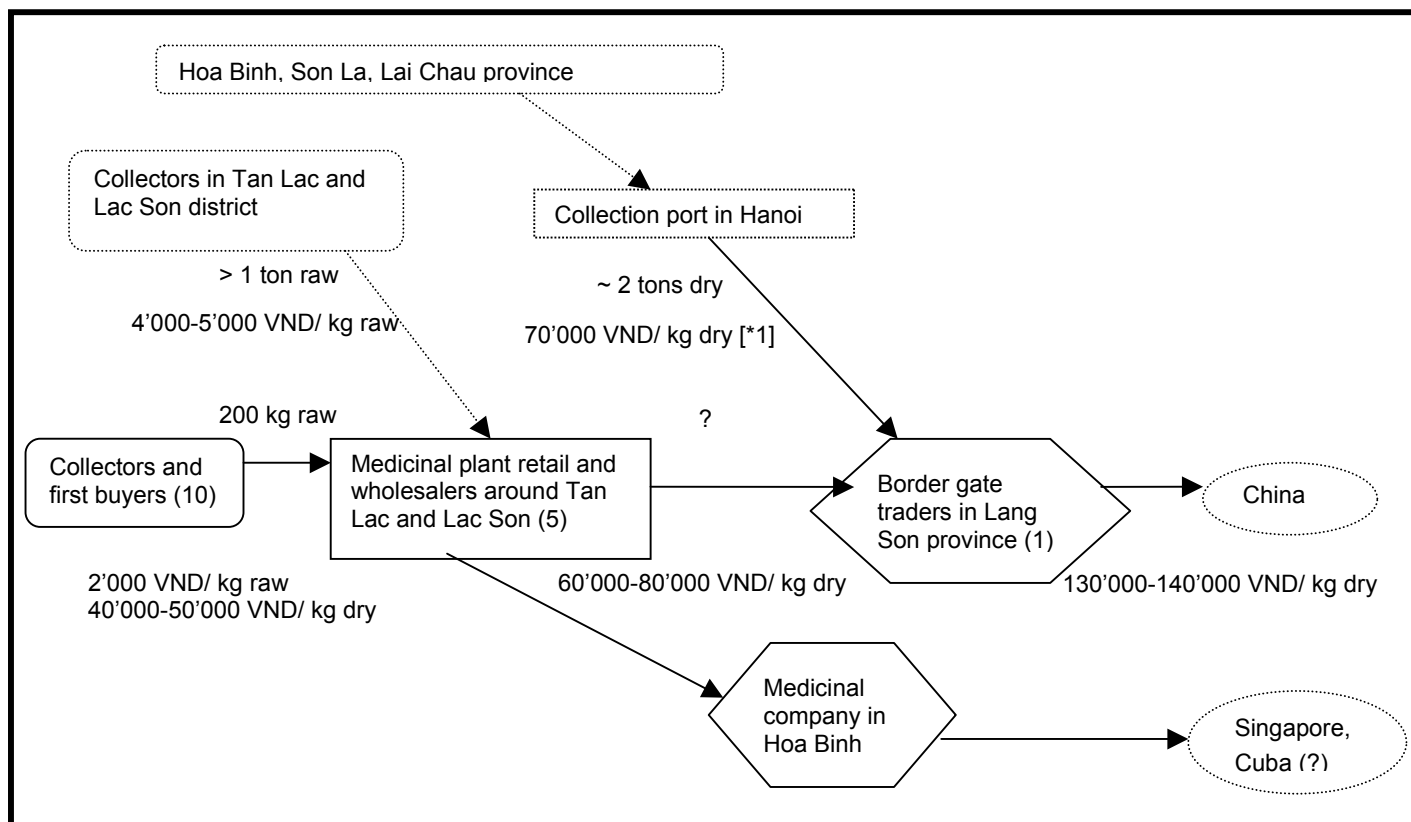
#### *Storage:*

Raw material should only be stored for about 4-5 days, before it is dried. Further information about storage conditions is unknown to the author.

**Table EB 1: Characteristics of market actors**

Actor (number)	Location	Special feature
Wholesalers (5)	Tan Lac and Lac Son district	- Small-scale trade: 3 people who trade other medicinal plants or NTFPs as extra work for around ten years.
		- Large-scale trade: 2 people who process plant materials as their main work. Equipment: ovens to dry the raw product to a higher standard.
		- Cultivation: knowledge is present, but no interest due to low return.
		- Destination: border crossings to China in Tan Thanh, Chim Ma and Huu Nghi in Lang Son and Mong Cai in Quang Ninh province.
		- Binding agreement: One trader has one with a Chinese customer.
Medicinal companies (2)	Hoa Binh	- Customer: One company exports to Cuba and Singapore.
Border gate trader (1)	Lang Son province	- Border gate: Ba Son, because no custom station.
		- Supply: Hoa Binh, Son La and Lai Chau province. The reason is the low availability in Lang Son province.

**Figure EB 1: Product chain of *Nervilia fordii* (field work, summer 2004)**



Explanation: Quantity and price refer to 2003. The number in parenthesis indicates the size of stakeholders. [\*1] The buying price was indicated by 70 VND/ dry leaf. If the dried leaf weighs one gram, the buying price is 70'000 VND/ kg dry.

**Legend EB 1: Explanation for figure EB1**

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		Second middlemen
	First middlemen		End customer

## EB 2.2 Product

### *Quality, appearance and size:*

TRAN TOAN (1999) states that the processed leaf is fragrant and deep grey or blue. The leaves are either sun-dried until they shrink, briefly boiled in water, or crushed twice a day and completely dried. In the second case, the leaves are steamed or dipped in boiling water, crushed and dried. One resource person cooks the leaves like rice and dries them. This procedure is repeated three times.

### *Packing and branding:*

There is no information about this issue apart from companies, which announce their products through the internet, like the HST company of Singapore (HST = Traditional

Chinese Medicinals; website C, 2004). According to HST, the leaves of *Nervilia fordii* make up 5 % of a tea mix called 'wild guava tea'. The YCY Better Health Centre in Vancouver promotes leaves for 1.85 \$ per 10 gram bags (website D, 2004).

*Substitutes:*

There was no focus on medicinal plants with the same impact as *Nervilia fordii*. Species with an exclusively Chinese demand are *Anoectochilus setaceus* (see case study EC), subspecies of *Dendrobium nobile* (CAO JIAQUAN, 2001) and probably *Paris polyphylla* with a significant declining availability in China (SHAN-AN HE and NING SHENG, 1995). According to VU VAN DUNG et al. (2002) *Paris polyphylla* is mainly used locally rather than nationally or internationally.

## EB 2.3 Price

*Demand and Supply:*

Chinese demand is high and is likely to remain so. Data concerning the effective demand is lacking. In China, daily consumption in form of a tonic ranges from 10 to 20 gram of dried leaves (TRAN TOAN, 1999).

The single involved cross-border trader sells around 2 tons of dried leaves throughout the year. The availability in production areas in Hoa Binh, Son La and Lai Chau provinces is reducing significantly.

The current product value in the surroundings of Tan Lac and Lac Son is 60'000-80'000 VND/ kg dry. At the border crossing in Ba Son in Lang Son province, the product value is almost double (see figure EB1).

*Fluctuations:*

According to the cross-border trader, the product value declined by 20'000 VND/ kg dry in 2004 compared with the perennially stable price of 130'000-140'000 VND/ kg dry in previous years. The purchase price has reduced by 30'000 VND/ kg dry.

*Marketing costs and profits:*

A small-scale wholesaler in Tan Lac receives a net income of 1'000 VND/ kg raw if the commodity is bought and sold as a dry product. In the cases where the leaves are processed, the calculated net profit is 1'000-3'000 VND/ kg raw. This includes processing costs of 1'000 VND/ kg raw. The cross-border trader receives a maximum net profit of 40'000-50'000 VND/ kg dry, which is equivalent to 4'000-5'000 VND/ kg raw in 2004. This includes expenses of 1'000 VND/ kg raw for transportation and value added tax from Hanoi to the frontier in Lang Son province.

*Commissions, taxes and informal rules:*

The situation is the same as for *Drynaria fortunei* in case study EA.

## **EB 3 Influencing factors**

### **EB 3.1 Social and cultural**

According to TRAN TOAN (1999), the inhalation of dried leaves is used as a depurative, especially in the case of mushroom intoxication in Vietnam. In southern provinces of China, dried leaves serve for invigorating the lungs, removing heat-evil, alleviating coughs and relieving pain. Raw leaves, on the other hand, are transformed into a poultice to treat painful inflammation.

### **EB 3.2 Economic frame**

For national and international regulations for medicinal plant species see case study EA.

### **EB 3.3 Technological improvements**

The contacted market actors reported that the knowledge of cultivating *Nervilia fordii* is available. The species is cultivated by individual households in Tung Ba commune, which is embedded in the karst mountains of Ha Giang province (TRAN VAN ON and NGUYEN QUOC HUY, 2004). However, detailed information on wider cultivation as well as a cost-benefit analysis, has been unavailable up to now.

### **EB 3.4 Consumer movement**

A general overview about the current market demand for traditional medicine is reported in case study EA.

### **EB 3.5 Political and legal conditions**

#### *Species protection status:*

*Nervilia fordii* is listed in the 1996 Red Data Book of Vietnam, as well as in the national Decree 48/2002/ND-CP of 22 April 2002, where it is classified into group IA which represents strictly forbidden plant species. The farmers are unfamiliar with this regulation and treat the species as a common species. The large-scale wholesalers in Tan Lac district and the cross-border trader in Lang Son province are aware of the specie's protection status and carry on a rather risky trade.

As long as market demand and the poverty rate are high and the awareness of farmers and salaries of forest rangers are low, it is difficult to effectively protect *N. fordii* from overexploitation.

## **EB 4 Conclusion and recommendations**

### **EB 4.1 Conclusion**

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

*Natural conditions:*

The availability in Ngo Luong commune is low and is declining. Instead of only collecting the leaves, which would enable a sustainable resource base in the long run, the tubers are often dug up. This leads to quick resource decline. Knowledge and application of cultivation methods are present in different areas in northern Vietnam, but there are no business plans to cultivate *Nervilia fordii* in projects implemented at village level.

*Economic conditions:*

Leaves of *Nervilia fordii* are harvested and largely traded to meet foreign demand, particularly Chinese demand. Chinese demand for the valuable dry product is high and quite steady.

The dried product is sold for 70'000 VND/ kg at Tung Ba village in Ha Giang province to middlemen with Chinese trade relations (TRAN VAN ON and NGUYEN QUOC HUY, 2004). This value corresponds to the product value of wholesalers in Tan Lac and Lac Son district. In comparison, the inhabitants of Ngo Luong commune dispose of the product for 40'000-50'000 VND/ kg dry.

The net income of locally added value is 3'000 VND/ kg maximum for raw leaves. Therefore, ten kilogrammes of raw leaves with a total product value of 20'000 VND are dried to one kilogramme with a product value of 40'000-50'000 VND/ kg. Therefore, locally added value is effective for raising product value and increasing storage duration.

*Legal conditions:*

Although collection of this perennial species is strictly forbidden and therefore banned from commercial trade at national level, there is no proper implementation. This is because of the low traded quantities and the difficulty of appropriately monitoring exploitation and trade activities.

#### EB 4.2 Recommendations

In order to consider the legal conservation status of this highly valuable species, the only option is to implement cultivation activities on a larger scale and to label those products to allow legal trade activities. As shown, the collection ban is unsuccessful because farmers see a real opportunity to enhance their incomes, or at least to cover their subsistence needs in emergency situations. In order to conserve *Nervilia fordii* and to benevolently support people's livelihoods in upland areas, recommendations are given below.

*At village level:*

- In order to ensure sustainable collection, the leaf should be cut from the stem instead of removing the entire plant. As the species is perennial, the remaining tuber will produce leaves year after year.
- Locally added value in the form of drying is effective in increasing product value and storage time. Therefore, farmers should attempt to dry more material as this results in a higher quality product.
- Farmers should establish cultivation experiments under the guidance of extensionists and with the support of researchers.

*At district level:*

- In order to become aware of the micro habitat and current occurrence of the species, forest rangers should conduct inventories at commune level.
- Forest rangers should support efforts to cultivate the species and assist in the labeling of cultivated products.
- Forest rangers should create awareness of the legal framework and the list of endangered species. Furthermore, rangers should take the responsibility to conserve biodiversity in their area. This includes the regular updating of local forest protection regulations.
- Forest rangers should focus on more purposeful monitoring in the period of May to August to counter illegal harvesting and trade activities.
- The district People's Committee should attract projects which aim to conserve local biodiversity and to stimulate the *in situ* conservation of endangered species.

*At provincial level:*

- Feasibility studies on appropriate cultivation locations should be implemented, and collaboration with the private medicinal company in Hoa Binh should be sought to enable a direct link between producers and processors.
- The implementation of cultivation projects to enrich forests and agroforestry gardens should be conducted at village level. Therefore, extensionists and farmer groups should cooperate to develop business plans to cultivate economically valuable medicinal plants as part of community forestry management activities.

*At national level:*

- Plant material from cultivated areas should be clearly labelled, which should require little administrative effort. Therefore, the relevant ministry should develop comprehensive standards to label products that originate from cultivation areas and that are harvested in a sustainable way.
- In order to stabilise prices, cultivation of *Nervilia fordii* should be well planned and restricted to areas where it naturally occurs. As the demand for several medicinal plant species and other non-timber forest products is high, measurements of cultivation or locally added value should be equally distributed within the provinces.



## EC Case study of the medicinal plant species: *Anoectochilus setaceus*

The results of the field survey (PRA), market analysis (RMA) and literature review of *Anoectochilus setaceus* are presented in this case study. A short overview is given in the SWOT table EC1. Conclusions and recommendations can be found in chapter EC4.

**SWOT table EC 1: Medicinal plant species *Anoectochilus setaceus***

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>- Highest found product price (-&gt; EC2.3)</li> <li>- High market demand in China (-&gt; EC2.3)</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>- Short storage duration at forest gate(-&gt; EC1.2)</li> <li>- Strongly declining availability (-&gt; EC1.3)</li> <li>- Not yet domesticated (-&gt; EC3.3)</li> <li>- Weak law enforcement (-&gt; EC3.5)</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>- Improved storing method at the forest gate (-&gt; EC2.1)</li> <li>- Improved transportation (-&gt; EC2.1)</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- Resource depletion (-&gt; EC1.2/3.5)</li> </ul>



**Picture EC 1: Cultivation experiment of *Anoectochilus setaceus* in Ngo Luong commune**

<b>SPECIES NAMES</b>	
Local Vietnamese name:	Cỏ sên
Popular Vietnamese name:	Lan kim tuyến
Latin name:	<i>Anoectochilus setaceus</i>
English name:	Jewel Orchid

## **EC 1 Availability and cultivation/collection practices for the medicinal plant species *Anoectochilus setaceus* in Ngo Luong commune**

### EC 1.1 Product characteristics and growth habitat

*Anoectochilus setaceus* is a terrestrial orchid species with velvety leaves, which are metallic white veined (website E, 2004). The species is classified into the group of jewel orchids because of its leaves. *A. setaceus* is only encountered in undisturbed parts of mountainous rain and dry forests in Sri Lanka (website F, 2004). In Ngo Luong commune, the species grows in the rocky mountains, where primary forests still exist. It is often found in crevices under the shade of tall trees. The species is neither domesticated in Vietnam nor in the international context.

### EC 1.2 Local knowledge and practices

This perennial species is collected between May and August. The complete individual, including the rhizome, is exploited. The yield is very low in relation to the high harvesting time. For example, four full days and the knowledge of collections sites are required to collect 3 kg of raw material. The raw plant material can be stored in a pot without water for a maximum of one week before the plant material slowly desiccates.

Cultivation experiments have been conducted by one household. The longest period of cultivation was three months as the farmer did not have the appropriate knowledge. Commercial trade of this species began three years ago, but farmers are unaware of its medicinal value and use.

### EC 1.3 Availability and quantity traded out of villages in Ngo Luong commune

As a result of unsustainable exploitation and high commercial value, availability has significantly reduced over the past three years. The indicated collected quantity for both villages was 5-10 kg raw material in 2003.

### EC 1.4 Economics for villagers

The sixteen studied households are not involved in trading *Anoectochilus setaceus*. The product value of *A. setaceus* is the highest among the studied NTFPs with 40'000-50'000 VND/ kg raw at the forest gate. Regarding the high harvesting effort, returns could be low.

### EC 1.5 Similar products or substitutes in Ngo Luong

Substitute species traded to China are described in case study EB.

## **EC 2 Market assessment**

### EC 2.1 Market place

#### *Market actors:*

The product chain for *Anoectochilus setaceus* is identical to that of *Nervilia fordii* (see figure EC1). The only difference is that the raw product is traded to China through the border gates in Lang Son and probably Quang Ninh provinces without further semi-processing. Chinese

customers probably use the product as an antidote for snake bites as reported by one of the two cross-border traders in Lang Son province. As the availability in Lang Son province is very low, cross-border traders receive the commodity from Nghe An, Thanh Hoa, Hoa Binh, Bac Kan and Ha Nam provinces.

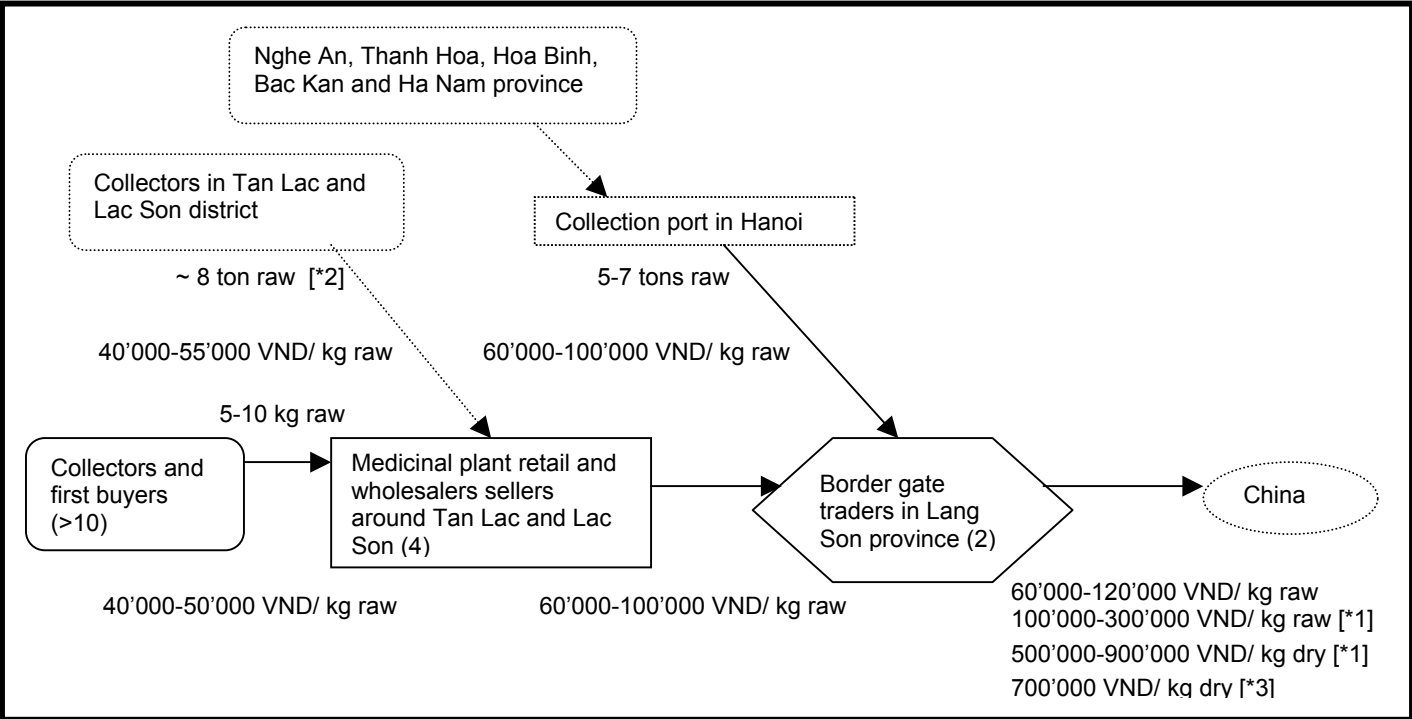
*Transportation:*

Raw leaves are put in small baskets with different layers to allow air circulation, and to avoid the leaves becoming crushed.

*Storage:*

Raw leaves need to be exposed on the ground without touching each other. From time to time the leaves are slightly humidified. The leaves are usually stored for no longer than ten days to enable a gradual supply to China and thus a stable product value. However, under the described conditions it seems possible to store leaves without major quality loss for several months.

**Figure EC 1: Product chain of *Anoechochilus setaceus* (field work, summer 2004)**



Explanation: Quantity and price refer to 2003. The number in parenthesis indicates the size of stakeholders. [\*1] Providers in Tan Lac area and Hung Yen province are aware of the product value at the Chinese border. [\*2] The quantity is extrapolated by the individual supply of two of five traders in the Tan Lac area. [\*3] It is the product value if it is sold to Chinese customers.

**Legend EC 1: Explanation for figure EC1**

Sign	Signification	Sign	Signification
	Producer and first buyers at place of production		Second middlemen
	First middlemen		End customer

## EC 2.2 Product

### *Quality, appearance and size:*

Chinese customers require an entire raw, clean leaf. However, Vietnamese processors are unable to meet the Chinese quality requirements. If the leaves are dried, the weight reduces by 90 % (see also TRAN VAN ON et al., 2002). There are different subspecies with specific product values, and the subspecies with red plotted on the upper leaf side provides a high quality. A lower quality is extracted from subspecies which have two white nerves per leaf.

### *Packing and branding:*

There is no information about this topic.

### *Substitutes:*

Other medicinal plant species traded to China are described in case study EB.

## EC 2.3 Price

### *Demand and Supply:*

Chinese demand is permanently high and apparently stable. The traded quantity of one contacted cross-border trader was around 5-7 tons of raw material in 2003. Selling prices to China range from 60'000-120'000 VND/ kg raw up to 300'000 VND/ kg raw (see figure EC1). The latter value is based on the experience of resource persons who trade with medicinal plant products, though not with *Anoectochilus setaceus*. If the leaves are appropriately dried in Vietnam, the commodity can be sold for 500'000-900'000 VND/ kg dry.

### *Fluctuations:*

Price fluctuations are related to quality which in turn results from trading with different subspecies. If supply is temporarily too high, product prices decline immediately. Therefore, it is vital to offer the commodity regularly in moderate quantities.

### *Marketing costs and profits:*

Stakeholders in Tan Lac area receive around 30'000-50'000 VND/ kg when transportation costs for petrol (maximum 500 VND/ kg from Tan Lac district to Lang Son province) and informal fees are excluded. The cross-border trader in Lang Son province earns around 25'000-40'000 VND/ kg raw. This includes total expenses of 1'000 VND/ kg raw for value added tax and transportation between Hanoi and the frontier in Lang Son province.

### *Commissions, taxes and informal rules:*

The information is analogous to the findings for *Nervilia fordii* (see case study EB).

## **EC 3 Influencing factors**

### EC 3.1 Social and cultural

The species might be used as an antidote for snake bites by Chinese customers, but this use is unknown in Vietnam.

### EC 3.2 Economic frame

For national and international regulation of medicinal plant species see case study EA.

### EC 3.3 Technological improvements

There are currently no methods for cultivating this species in the international context. The species is mainly exported as raw material, although nearly 1'000 private traditional medicinal enterprises and pharmacies, 170 of which have industrialised and semi-industrialised processing chains, exist in Vietnam (JHA V., 2001).

### EC 3.4 Consumer movement

A general overview of the current market demand of traditional medicine is reported in case study EA.

### EC 3.5 Political and legal conditions

*Anoectochilus setaceus* is subject to the same legal regulations and implementations as *Nervilia fordii* (see case study EB). *A. setaceus* is listed in the 1996 Red Data Book of Vietnam and in the national *Decree 48/2002/ND-CP* of 22 April 2002, where it is classified into group IA, which represents strictly forbidden plant species.

## EC 4 Conclusion and recommendations

### EC 4.1 Conclusion

In order to reply to objectives (4) and (5) of the study, the conclusion is structured according to natural, economic and legal elements. It shall outline the potential for improving the livelihoods of farmers in Ngo Luong commune.

#### *Natural conditions*

The occurrence of *Anoectochilus setaceus* is very low in Ngo Luong commune. As an example of the significant decline, the collection distance to the *Anoectochilus* species in a village in Khanh Yen Ha commune, Lao Cai province, was half an hour in 1990 compared to five hours in 2002 (COX S. and TRAN MANH HUNG, 2002). In respect to the fact that this species cannot be domesticated, conservation initiatives are urgent.

#### *Economic conditions:*

The entire raw plant material of *Anoectochilus setaceus* has a high demand in China, where its medicinal use is commonly unknown (LONG B. et al., 2000). Chinese customer demand began in Khanh Yen Ha commune, Lao Cai province, in 1992 (TRAN VAN ON et al., 2002). The selling price was 80'000-100'000 VND/ kg raw to Chinese customers in 2002. Another reference is the selling price in Tung Ba village, Ha Giang province, at 140'000 VND/ kg raw for *Anoectochilus* species (TRAN VAN ON and NGUYEN QUOC HUY, 2004). The forest gate price in Ngo Luong commune was 40'000-50'000 VND/ kg raw in 2004. In comparison to Ha Giang province, farmers in Ngo Luong commune sell at a lower price. This could be explained by the distance to the Chinese border. Another influencing factor could be that

producers in Ha Giang and Lao Cai provinces became aware of the high product value, and could therefore negotiate and increase the selling price.

*Legal conditions:*

Exploitation and trade issues of *Anoectochilus setaceus* are subject to the same regulations as *Nervilia fordii* (see case study EB).

#### EB 4.2 Recommendations

As *Anoectochilus setaceus* is not domesticated and shows the highest product value at each market level, the pressure on this natural resource is very high. Although trade with this species can help in emergency situations, exploitation and trade are legally prohibited. In order to conserve the species and to find ways to explore its economic value, the following recommendations are given.

*At village level:*

- If farmers exploit the species despite the collection ban, entire plants should be singly exposed on the ground, regularly slightly humidified and transferred in small boxes. This could provide a higher product value.
- Small-scale experiments (PTD) should be initiated in order to test domestication methods. This should include detailed observations of the species' natural habitat and growth factors. Such experiments could also be supported by training on different cultivation techniques, and the knowledge of relevant cultivation aspects such as habitat, diseases and other features.

*At district level:*

- The relevant service provider should conduct an inventory at commune level to increase awareness of the micro habitat and the current occurrence of the species.
- With respect to the law and the forthcoming establishment of the Ngo Son Ngo Luong Reserve, areas of *Anoectochilus setaceus* could be separately segregated, documented on a map, inventoried and clearly sign-posted in the forest.
- Illegal harvesting and trade violations need to be rigorously punished. This requires an improved monitoring system.

*At national level:*

- Research on habitat and biological characteristics should be initiated at different places in northern Vietnam. Collaboration with Chinese and other Southeast Asian researchers should be sought. This should include the sharing of knowledge resulting from cultivation trials.
- In order to successfully conserve this species at national level, the government needs to seek alternative income sources at specific harvesting locations. An option would be to initiate cultivation projects of other non timber forest products such as bamboo, medicinal and ornamental plant species.

## **4 General discussion**

Each of the nine case studies gave insights into the natural, economic and legal conditions, and provided recommendations for enhancing the livelihoods of upland farmers in Ngo Luong commune. The present chapter discusses the main research question with respect to the presented case studies. It asks whether identification and promotion of sustainably used NTFPs with a commercial value can contribute to the livelihood improvement of poorer households in Ngo Luong commune.

### **4.1 Social aspects**

Whether NTFP activities in Ngo Luong commune succeed or fail can be attributed to social aspects such as education, assistance of mass organisations and the commune, information sharing, land allocation, and the market behaviour of NTFP producers.

A fact that may influence the success or failure of NTFP activities concerns forest land allocation. In Ngo Luong commune, forest land allocation of 1996 did not exactly follow guidelines according to household size, and led to unequal land allocations. Residents who already enriched parts of the state forest were able to assert their rights. Another fact is that farmers and commune authorities are unaware of Programme 661, which has been implemented at national level since 1996. This programme aims to eradicate famine and poverty of rural people in upland areas, and to supply raw material for the paper industry and other special forest products. Another social aspect regarding NTFP activities is that updated market information of relevant NTFPs is only partially available, and mainly restricted to commune traders. As the majority of farmers take a passive role in reaching markets, potential customers have to explore the economic potential of NTFPs in Ngo Luong commune themselves.

### **4.2 Household economy**

#### **Overview of income contribution of short-listed NTFPs at commune level:**

The cash incomes of seven of the nine NTFPs surveyed at the markets contributes around 5.8 % to household cash incomes of Luong Tren and Bo villages together. On one hand, the percentage results from the sum of the cash incomes of seven NTFPs at the forest gate (see table 12). On the other hand, the sum of the cash incomes of all 83 households in Luong Tren and Bo village is extrapolated (see chapter 2.5), and used to calculate NTFP contribution. In comparison, the average NTFP percentage of all sixteen studied households is 12.46 %. The higher value is explained by the interviews being conducted with the households with the highest probable NTFP dependency in the studied villages. Although the survey focused on the most economically valuable NTFPs in Ngo Luong commune, the cash-income contribution is low.

A low NTFP contribution to the cash incomes of households in both villages can nevertheless signify that a potential might exist for strengthening commercialisation of useful NTFPs to increase cash incomes at commune level. It equally might reveal that the majority of NTFPs are used as subsistence income, which is usually an indicator for poorer

**Table 12: Key dimensions for household strategies concerning NTFP activities in both studied villages**

Case studies	A	BA	BB	BC	C	D	EA	EB	EC
Product	Edible shoot	Paper	Handicraft items and construction	Comb	Conical hat	Ornamental orchid	East and North Traditional Medicine	North Traditional Medicine	North Traditional Medicine
Species	<i>Dendrocalmus asper</i>	<i>Dendrocalmus asper</i>	<i>Bambusa textilis/ B. blumeana</i>	<i>Indosasa angustata</i>	<i>Indosasa angustata</i>	<i>Aerides odorata</i>	<i>Drynaria fortunei</i>	<i>Nervilia fordii</i>	<i>Anoectochilus setaceus</i>
Used part	Shoot	Culm	Culm	Culm	Sheath	Entire plant	Rhizome	Leaf	Entire plant
Subsistence (S) or commercialisation (C) [*1]	S + C	Rather S (construction, hedges, ...)	Rather S (construction, hedges, ...)	Only C	Only C	C (also kept as decoration)	Only C (no knowledge of medicinal use)	S + C, but rather C	Only C (no knowledge of medicinal use)
Safety net (SN) or regular income (RI)	SN: seasonal supply	SN: only in urgent situation (still transport difficulties)	Minor trade activities	RI: binding agreements, several times throughout the year	SN: seasonal trade, product value depends on availability	SN: accidental customers	SN (-RI): usually traded outside cropping season (depends on time availability and need of cash)	SN: high collection time, short storage duration (-> poverty trap?)	SN: very high collection time (-> poverty trap?)
Traded quantity out of LT and Bo village in 2003	8'000 kg boiled shoots	No indications. It is traded.	No indications. It is traded.	1-1.5 mio sticks	1 mio sheaths	1'000 kg plant material	40'000 kg raw rhizome	200 kg raw leaf	7 kg raw plant
Price at forest gate in 2003	2'000-2'500 VND/ kg boiled	No indications (around 600 VND/ culm benefit after transportation)	Around 400 VND/ m	Ø 20 VND/ stick	Ø 20 VND/ stick of medium quality	Ø 5'500 VND/ kg	500-800 VND/ kg fresh 4'000-5'000 VND/ kg dry	2'000 VND/ kg fresh 40'000-50'000 VND/ kg dry	40'000-50'000 VND/ kg fresh
Calculated income/ product (VND) [*2]	16-20 mio	Rather low	Promising	30 mio	20 mio	5.5 mio	20-32 mio	0.4 mio	0.315 mio
Product contribution to household income in LT and Bo village (%) [*3]	1.08	Rather low	Promising	1.61	1.08	0.35	1.7	0.02	0.02
Potential returns (harvesting effort, transportation, product value): Low (LR), medium (MR) and high (HR)	HR: high harvesting efficiency, high selling price/ unit	LR: transportation costs, low selling price/ unit	MR: transportation costs, higher selling price/ unit, locally added value	HR: high labour input, no need of transportation, satisfactory selling price/ unit	HR: low labour input, no need of transportation, high selling price/ unit	MR: high harvesting effort, high selling price/ unit	Fresh product: LR: relatively high harvesting effort, low selling price/ unit Dried product: HR: high selling price/ unit, medium processing input	Fresh product: LR: high harvesting effort, low selling price/ unit (light product), Dried product: simple processing with high added value	MR: very high harvesting effort, highest selling price/ unit (light product)

[\*1] Participants in Ngo Luong commune short-listed NTFPs according to their commercial activities.

[\*2] The sum of the calculated income of all short-listed NTFPs in the two studied villages in Luong Tren (LT) and Bo village was around 100 mio VND in 2004 (see chapter 2.5).

[\*3] The cash incomes of all households in Luong Tren and Bo village is around 1'775.9 mio VND (see chapter 2.5). Based on this amount, the NTFP contribution to the incomes of all 83 households in Luong Tren and Bo villages together is around 5.8 %.



households. Participants in Ngo Luong commune named various NTFPs for daily use and emergency situations (see annex 3). Subsistence NTFPs, which are only vaguely identified in terms of money, still tend to play an important role for the livelihoods of these upland farmers.

Among the short-listed products with a commercial value, the rhizome of *Drynaria fortunei* and the sticks of *Indosasa angustata* contribute the most to the incomes of the two studied villages (see table 12). In both cases, the product is traded throughout the year, has a clearly identified market chain and still has, at least for sticks, sufficient availability. Locally added value is often rudimentary for the rhizome, and must be applied for sticks to prevent browning reactions.

Bamboo shoots take an intermediate position in the cash incomes of households in both villages. This might be explained by seasonal availability and its frequent use for self consumption. Locally added value is less frequently applied. The calculated income benefit from sheaths is equal to the shoots trade. The profit is mainly associated with the yearly availability based on weather conditions, and farmers' availability and labour allocation.

The orchid species, either for medicinal or ornamental use, account for the lowest contribution to the cash incomes of households in both villages. Although product value and customer demand are high, the strongly decreasing resource availability prevents a more positive influence on household cash incomes. However, the ornamental orchid species in particular has the potential to support the livelihoods of the poor if relevant points are carefully considered. Next to a strategy of cultivating the species in nurseries and applying vegetative reproduction to encounter resource decline, special attention must be given to involve poorer households in this activity. Empirical evidence from other NTFP case studies shows a tendency that better off households gain more from cultivation and vegetative reproduction, depriving poorer households of the resource and product (BELCHER B. and KUSTERS D., 2004).

#### **Role of NTFPs for poorer households:**

The focus of this study is to identify the potential for livelihood improvement of poorer households in Ngo Luong commune. The results show, however, that NTFPs as a cash income source are rather unimportant for both poorer as well as for richer households in Ngo Luong commune. In other words, there is no statistically significant relation between wealth class and NTFP contribution. The average NTFP contribution is 12.5% for poorer, and 13.9% for richer households. Or in other terms, NTFPs account for around one third of the cash incomes of the poorest as well as two of the richer households (see figure 2 in chapter 3.1).

However, a clear relation exists between wealth classes and type of NTFP used if wealth classes are compared with NTFP types. Forest species are found to be more important than cultivated bamboo species for the household cash incomes of the poor (see figure 3 in chapter 3.1). There are some plausible explanations for this. First, forest species are common property. Second, poorer people usually have less allocated forest land. Third, poorer people frequently have less access to support programmes and/ or to credit, which would enable them to cultivate bamboo species. And fourth, these identified forest species serve poorer households as cash products compared to bamboo, which is often used for subsistence products.

Therefore, an enhanced commercialisation of a specific NTFP type supports a certain wealth group. Improvements in bamboo products tend to positively stimulate the cash incomes of richer households. On the other hand, poorer households seem to be favoured when trade conditions for wild NTFPs are enhanced. However, a crucial point is the long term impact. As the resource availability of wild NTFPs with a high commercial value and enhanced market access significantly declines, the cash income contribution reduces as well. This adversely affects the livelihoods of the poor.

In contrast, domesticated and cultivated NTFPs under sustainable resource management might provide long-term benefits. Therefore, forest NTFPs ought to be cultivated if domestication is possible in order to prevent resource and income depletion. However, access to land and funds might be restricted to wealthier households. In this case, development strategies should especially focus on poor households. As long as poor households depend on wild NTFPs under an open access regime and with a low regeneration ability, there is no guarantee for securing an income in the long run and improving poverty mitigation effects through NTFPs.

### **Household economy strategy:**

As presented in chapter 1.3, three household strategies are identified in the literature, based on a great number of empirical case studies conducted in three continents. Here, the three household strategies are used to group the interviewed households and studied NTFPs accordingly. The aim is to understand which NTFP supports which household strategy in Ngo Luong commune. This should help to make purposeful recommendations for mitigating poverty and levelling social imbalances within a village.

**A) Coping strategy:** Seven of eight studied households in Bo village represent characteristics of this strategy: 1) they live in a more remote area, 2) have mostly a household income lower than the village's average income, and can be classified as poorer households, and 3) depend on different wild NTFPs. These NTFPs are common property, weakly managed and not domesticated in Ngo Luong commune. Herein belong the ornamental orchid species *Aerides odorata* and the medicinal plant species *Drynaria fortunei*, *Nervilia fordii* and *Anoectochilus setaceus*. All species are exploited for economic use, act principally as a safety net, and show a low or medium return (see table 12). Despite the relatively high product value, returns are currently lower than expected. Reasons for this are 1) short storage duration of fresh material, 2) wrong storage and transportation methods, in particular for ornamental orchid species, 3) inadequate locally added value especially for *D. fortunei*, 4) illegal trade regarding species protection status, and 5) black and volatile market channels to China for the medicinal orchid species *N. fordii* and *A. setaceus*.

**B) Diversified strategy:** Seven of eight interviewed households in Luong Tren belong to the diversified strategy with the following characteristics: 1) they are wealthier than the commune average, 2) have a cash income above 50%, and 3) depend mostly on agricultural and off-farm activities. The principal NTFP type is bamboo, which is cultivated on allocated land. Bamboo shoots and sheaths are seasonal products, whereas sticks are requested throughout the year and might provide regular income. Returns for the three mentioned products are rather high thanks to 1) high product value per unit for shoots, 2) high yield productivity, 3) no transportation costs for sticks and sheaths, and 4) stable and mature, but still expandable markets for shoots and sheaths.

**C) Specialised strategy:** The remaining two interviewed households (Bo-4 and LT-5) are traders of NTFPs and agricultural products at the commune and fit most readily into this economic group. Consequently, NTFPs contribute the most to the cash incomes of these wealthier households. One trader deals with bamboo shoots and the other with wild NTFPs. Wild NTFPs like *Drynaria fortunei* are sometimes semi-processed. These NTFP traders have a good knowledge of the local markets and have the most up to date information, such as for newly required medicinal plant species. The trader of forest NTFPs can further estimate which products lead to high returns.

### 4.3 Resource management

According to the literature, resource management is an important attribute to the three household economy strategies. Relevant points include the degree of domestication, property rights, exploitation intensity and monitoring. All short-listed bamboo species are cultivated on allocated land and are private property. Usually one third of bamboo shoots or culms are exploited. This level of exploitation is, however, hardly respected in emergency situations, although the owners of cultivated NTFPs are responsible for monitoring and resource protection.

On the other hand, wild NTFPs on allocated forest land belong to each villager. This significantly influences the act of harvesting. Although the farmers are aware of sustainable exploitation, the resources' value for cash or subsistence is predominant, and leads to overharvesting. In addition, medicinal and ornamental plant species are often completely exploited, including the rhizomes, due to their market value. Forest rangers at commune level are responsible for monitoring forest NTFPs, but it is weakly implemented. Domestication and cultivation of wild NTFPs with a high commercial value may provide a way to overcome overexploitation by addressing a direct beneficiary. Implementation for sustainable management of cultivated species still needs to be conducted to a higher standard. Cultivations might at least lessen the danger of overexploitation of wild resources. The same aim could be pursued with mechanisms, such as special harvesting periods or harvesting licences. These operations, however, require a relatively high administrative effort and effective monitoring in order to lead to resource conservation.

### 4.4 Legal regulations

There are few relevant national legal regulations on the exploitation and trade of NTFPs that apply in Ngo Luong commune. All of them are generally linked to timber issues.

- 1) Article 1, clause 6 of the *Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products* of 12 March 1999. It contains a legal definition on NTFPs.
- 2) Article 9, clause 2 of the *Regulation on Inspection of the Transportation, Production and Business of Timber and Forestry Products* of 12 March 1999. It requires a certificate from the nearest forest protection station and a sale receipt of the NTFP for legal transportation.

- 3) Article 5, clause 4 of the *Decision 178/2001/QĐ-TTg* of 12 November 2001. It regulates the exploitation intensity of bamboo forests assigned as protection or production forest.
- 4) Group IA and IB in the *Decree 48/2002/ND-CP* of 22 April 2002. Plant species are listed which are strictly forbidden or which collection is limited. The Vietnamese Red Book classifies plant species into levels of endangerment.

Apart from point 3 and 4, there are no further regulations on intensity, period or method for exploiting cultivated or wild NTFPs.

Based on the findings during the market chain survey, the enforcement of the current legal framework for NTFPs in Ngo Luong commune is almost nonexistent. This research reveals that among the studied NTFPs some forbidden ones are exploited and traded without transportation permission. This is associated with unclear attributed responsibilities between producers and customers, the time consuming procedure to acquire permission, and a lack of incentives due to existing informal fees. Moreover, local forest rangers are often unfamiliar with efficient monitoring systems for relevant NTFPs.

## 5 Conclusion and recommendations

The present report started from the question concerning whether and which NTFPs may contribute to an improvement of livelihoods of the poor in Ngo Luong commune, Tan Lac district, Hoa Binh province. Based on the results generated from PRA, RMA and interviews at household, commune, district and provincial levels, this report finds that NTFPs can contribute to the cash incomes of households in Ngo Luong commune only to a marginal or moderate extent. In particular, poorer households harvest wild NTFPs for cash income. Consequently, a strategy to improve livelihoods of poorer households by commercialisation of specific NTFPs needs to pay special attention to: 1) that NTFP marketing benefits the poor, and 2) that natural resources are conserved.

The following section assesses the market situation of nine NTFPs, which are classified into three groups of 'usefulness' for poorer households. The subsequent section points out the NTFP importance and responsibilities at different administrative levels. The final section summarises the recommendations for livelihood improvement of the poor through NTFP marketing and commercialisation.

### 5.1 'Useful and less promising' NTFPs for livelihood improvement of poorer households

#### 'Useful' NTFPs with potential:

'Useful' NTFPs have a potential to improve the livelihoods of poorer households. The most promising and simplest applicable NTFPs are bamboo shoots in Ngo Luong commune. Mature shoot markets do exist, although they could be enlarged by promoting diverse species to allow an year-round supply. The findings of this report reveal that enhanced storage conditions and processing quality, which can be achieved with relatively little effort in Ngo Luong commune, lead to higher product value. However, the beneficiaries of the shoot trade will be mostly wealthier households, which opt for a diversified strategy. It is thus crucial to consider strategies and measures to introduce bamboo shoot marketing among the poorer households.

The rhizome of *Drynaria fortunei* is also a valuable NTFP, mainly thanks to three conditions. It has a stable domestic market, it offers high returns if local value is adequately added and it can be cultivated. These three aspects support the livelihoods of poorer households. This is reflected by the fact that poorer people usually collect the rhizome. They sell it to the commune trader who often dries the rhizome by rudimentary methods, as improved locally added value for achieving a higher product quality demands more labour and monetary input. Collaboration among villagers is a strong asset for harvesting, and marketing of the rhizome of *D. fortunei* and also conserving the species. This includes sustainable exploitation, the search for cultivation methods and implementation in the field.

Another promising NTFP in Ngo Luong commune is the ornamental orchid species *Aerides odorata*, which supports poorer households. However, as a consequence of the steadily increasing market demand and the high product value, the species resource is almost depleted in the forest of Ngo Luong commune. If ornamental orchids are to be commercially used in the medium and long term, it is necessary to investigate opportunities to establish an

orchid nursery at the forest gate. At the moment it is not clear who would be able to invest in such a project at village level. There may be the trend that rather well-off households will invest in such operations. Orchid cultivation could therefore adversely affect the livelihoods of poorer households, who are currently the main collectors of wild ornamental orchid species. A strategy would be to elaborate a proposal for cultivating orchid species, a precondition of which would be that inputs and outputs are fairly shared among all interested households.

#### **‘Useful’ NTFPs with some reservations:**

‘Useful’ NTFPs with some reservations primarily contribute to the cash incomes of richer households in Ngo Luong commune. Referring to the question of how to improve livelihoods of the poor, it therefore only seems appropriate to promote the commercialisation and marketing of these NTFPs with some reservations.

Among these species, bamboo sticks currently show the highest return at commune level (see table 12). However, slowly declining customer demand, and increased competition between producers, are signs that this NTFP may lose its high commercial value for the commune in the near future.

Another useful product with reservations are sheaths. They have a mature domestic and even international market. In comparison to bamboo shoots or ornamental orchids, the return for one sold truck load of sheaths is usually lower.

The two bamboo species, *Dendrocalamus barbatus* and *Bambusa blumeana* for handicraft items and the construction sector, have a low availability in Ngo Luong commune and need to be regarded with reservation. Moreover, farmers in Ngo Luong commune have no direct trade relations with processors from Dan Hoa commune, Thanh Oai district, Ha Tay province, as they do for the sticks and sheath trade. Thus, trade relations, including middlemen in Tan Lac district, would need to be created.

#### **‘Less promising’ NTFPs:**

The remaining three NTFPs, the culms of *Dendrocalamus asper* and the medicinal orchid species *Nervilia fordii* and *Anoectochilus setaceus*, are listed as ‘less promising’ NTFPs, because their current potential to improve the livelihoods of poorer households is generally very low.

Although the demand of the paper industry is increasing, returns for culms are rather low. Therefore, it is more convenient to commercially trade the shoots of *Dendrocalamus asper* than the culms.

The exploitation of both medicinal orchid species is legally forbidden. A commercial trade of these economically valuable species only makes sense if they are cultivated and clearly branded with a certificate of origin. However, there is no cultivation knowledge for *A. setaceus* neither in the locality, nor in the national and international context. In the case of *Nervilia fordii*, the species is cultivated at village level in Ha Giang province. Larger scale cultivations are not yet been realised there because the market behaviour, especially of Chinese customers, seemed to be rather unpredictable.

## 5.2 NTFP-relevant factors at commune, district, provincial and national level

The market chain analysis of the short-listed NTFPs reveals that a potential improvement of livelihoods of NTFP producers in Ngo Luong commune also depends on various direct and indirect factors at the commune, district, provincial and national level.

At the commune level, the **commune** authority acts as an intermediary between residents and higher level authorities. With regard to NTFPs, the commune normally has the responsibility to sustainably manage natural resources together with the communal forest rangers. It is also responsible for the implementation of national rural development programmes, such as 135 and 661, that include access to credit, infrastructure and extension service schemes. Within this framework, credit requests by farmers for NTFP-related aspects, such as cultivation or locally added value, should be favourably supported. Another point is to support producers to make transportation permission for NTFPs easier to attain. These schemes might equally serve as a monitoring instrument for sustainable exploitation. In order to fulfill these and other NTFP-related activities, the implementation of 'Forest Community Management' might be a promising tool to strengthen the interests of authorities and residents.

An essential feature at **district** level to improve benefits for NTFP producers would be to strengthen the commodity and knowledge transfer of NTFPs. An improved commodity and knowledge transfer would include the expansion and maintenance of infrastructure, to release informal fees and to clearly determine resource and value added taxes. Another issue would be to build up a market information system, which could generate up-dated and precise information about NTFP activities for NTFP producers and stakeholders at each administrative level. This is not only related to current product characteristics, such as price and quality, but also to legal revisions, technological trends and other issues. Information could be passed by radio and newspaper. Moreover, it would be appropriate to have persons in charge who work like a NTFP market information platform at district level. Training on topics such as cultivation, locally added value, understanding of market behaviour, sensitisation for sustainable resource exploitation, and other features could be provided.

The improvement of livelihoods for poor households through NTFPs also implies the development of guidelines and the organisation of training for specific NTFP activities at **provincial** level. Such a strategy includes a potential reconsideration and transformation of existing national legal frameworks for NTFPs in the provincial context. Propositions on inventory systems of economically valuable NTFPs, including effective monitoring methods to conserve the natural resources, should be equally taken into account. It would be also important to strengthen the collaboration between state enterprises, local communities and NTFP processors in order to ensure production and sale with benefits for poor households, such as in Ngo Luong commune. Further research would be needed on domestication, improved processing technologies, product promotion, product design and packing, product safety and other relevant issues. Findings ought to be disseminated in workshops and field implementation not only to district and commune authorities, but also to NTFP producers, traders and processors at household level.

A central feature at the **national** level that influences the importance of NTFPs for NTFP producers in Ngo Luong commune is NTFP market regulation with regard to the international context. A revision of the national legal framework in terms of NTFP commercialisation, conservation and livelihood improvement may be required to ensure NTFP production and

utilisation related to poverty mitigation of disadvantaged people in the long run. A further point is the international collaboration in trade, knowledge and technology transfers, conservation issues and development aid. Herein, special attention needs to be given to the global strong growth of traditional medicinal plant commercialisation. There seems to be a high potential for enhancing the livelihoods of rural people through traditional medicinal NTFPs. At the same time, there is also the risk of unsustainable resource exploitation, a lack of knowledge of domestication and cultivation that comes with a rather weak institutional framework that is unable to prevent biodiversity depletion.

### 5.3 Recommendations

The report reveals that the short-listed NTFPs studied in Ngo Luong commune, Tan Lac district, Hoa Binh province have a market potential at national, and sometimes at international level. However, returns are rather modest and address often only a specific household group. Cultivated NTFPs generally support the cash incomes of wealthier households, whereas wild NTFPs mostly provide cash incomes for poorer households. As a consequence, improving NTFP commercialisation is not per se an instrument to mitigate poverty. It would have to include strategies to strengthen commune and household development, resource management and the legal framework on NTFPs. Moreover, a strong focus is required on poor households in order to achieve poverty mitigation and not to avoid generating poverty traps.

The most important recommendations for livelihoods improvement of poor households in Ngo Luong commune through NTFPs are the following, which are classified into 'useful' NTFPs, and different specific addressees.

#### 'Useful' NTFPs:

Three of the nine short-listed NTFPs currently seem to be valuable cash income sources for poor households in Ngo Luong commune. Improvements on production, processing and trade need to be undertaken and consistent strategies developed.

- **Bamboo shoots** of *Dendrocalamus asper* need a few rather cost-extensive improvements in storing and processing to enable shoot sale in the species' off-shoot sprouting season. In order to also favour poor households, investigations should be conducted to explain why this wealth group currently has a low cash income from bamboo shoots. As a consequence, methods to enhance this situation should be urgently sought. As soon as Programme 661 is implemented in Ngo Luong commune, the residents should apply for cultivation funds. Poorer households should be especially encouraged to apply. Furthermore, the commune authority ought to be active in encouraging field experiments for different bamboo species which provide shoots, especially in autumn and winter.
- The rhizome of the **medicinal plant** species *Drynaria fortunei* experiences improved processing to achieve higher returns. As a high quality product, it needs to be thinly sliced and completely sun- or oven-dried. As poorer households mostly harvest this rhizome species, they should share labour and costs for these processing activities. Another point is to ensure the resource availability in the long run by introducing village rules for sustainable exploitation, or by providing technical knowledge of cultivation.



- The **ornamental orchid** species *Aerides odorata* needs to be more carefully harvested, correctly stored and transported. Moreover, an orchid interest group, preferably created by current collectors, could be asked to elaborate a proposal on the basis of a SWOT analysis that clearly identifies the pros and cons for establishing an orchid nursery at the forest gate. Cost and benefit sharing among group members should be carefully assessed in order to prevent poorer households from becoming excluded from this activity. Commune authorities should help to evaluate the proposal, take responsibility to support livelihood improvement of poor households, and seek investment opportunities.

#### **Local NTFP users:**

- **Market understanding:** NTFP users should become more aware of market mechanisms and which NTFPs are useful or less promising for their livelihood improvement in the long run. This would allow them to react more flexibly in case of market failure or sudden customer demand of a relevant NTFP. For this information, product leaflets for each of the nine short-listed NTFP species should be distributed by Helvetas.
- **Interest groups:** Interest groups which also include poor households should be established at village level to initiate and strengthen commercialisation of relevant NTFPs. Group activities should contain information exchange of production, processing, trade and other relevant NTFP issues. Another point ought to be practical application, such as labour sharing, requesting group credit for small projects and others.
- **Resource management:** Harvesters of wild NTFPs should consider resource sustainability as a part of their livelihood existence. Potential cultivation of wild NTFPs with a high commercial value is a promising method to conserve natural resources. This study refers to the medicinal plant species *Drynaria fortunei* and the ornamental orchid species *Aerides odorata*. Poor households that already depend on these wild NTFPs should be integrated into cultivation efforts, especially if they experience a lack of land or money.

#### **Extension service:**

- **Technical background:** District extensionists ought to provide workshops and training on relevant NTFP issues such as domestication, cultivation, and locally added value to representatives of local interest groups. A central point should be to evaluate possible impacts on the poor, and to elaborate solutions which are also in accord with the poor. This should be organised inter-communally to allow information exchange between different localities.
- **Market understanding:** District extensionists should teach farmers to understand the market mechanism and how to appropriately react to market changes. The aim of this is to ensure that farmers might independently bring new products to the market and that they are able to analyse demand changes.
- **Market platform:** Workshops should be held at district level to strengthen trade relations and to discuss the current and future situation of different NTFP-relevant features such as production, processing, transportation and trade. Target audiences should include producers, especially from poor households, traders and state representatives, such as forest rangers.

**Authorities:**

- **Niche NTFPs:** As NTFPs are mainly niche products and subject to volatile markets, authorities should attempt to use a bottom-up strategy to locally improve livelihoods of poor households in rural areas. This means that basic conditions such as the legal framework, infrastructure, access to market information (newly required commodities, quality standards and so on), fund and training opportunities are provided and transparently disseminated. It should be the responsibility of the producers, however, to take the decision in market promotion of relevant NTFPs at the local level.
- **Internationally traded NTFPs:** State programmes like 661 could help to satisfy the national and international market demand of relevant NTFPs like bamboo shoots. In order to guarantee availability and product quality of these NTFPs, strategies at grassroots level should be implemented. This would include the following points: 1) the relevant NTFP is propagated and cultivated at places where it naturally occurs, 2) the product valorisation should take place as close as possible to the forest gate, and 3) to prevent poverty traps, the relevant NTFP should serve as an additional income source and not become the only cash income source of involved households. Poor households as the target audience of such programmes should indeed be the main beneficiaries. This requires effective strategies and coherent implementation at commune level through trained staff members.

**Development agencies:**

- **Capacity building:** Development agencies should provide training and workshops on relevant NTFP issues and should strengthen capacity building. Target audience should be private and state actors. Authorities should become more familiar with the specific characteristics of NTFPs within the governmental strategy for poverty reduction, and should appropriately provide guidelines for NTFP users related to market development and resource management.
- **Biodiversity conservation:** In order to conserve natural resources and equally provide an income opportunity to mostly poor NTFP users, technical knowledge on domestication and cultivation should be disseminated through field implementation and training. This requires further study to evaluate the existing monitoring concept and to develop more effective strategies for long-term resource conservation in collaboration with the forest protection authority.

**National and international traders:**

- **Certification:** Trade agencies need to assess the potential to label commercially valuable NTFPs. In Ngo Luong commune, bamboo shoots could be a promising product for certification because they have 1) an increasing international market demand, 2) the option to guarantee sustainable production thanks to the reforestation Programme 661, 3) a positive impact as a carbon sequestrator (CO<sub>2</sub> sink), 4) a species diversity, which might favour year-round shoot production, and 5) a promising cash income for producers. Moreover, bamboo shoots should be processed at district or lower levels, which should increase locally added value. Shoot processing companies equipped with ISO standards could be a next step to shoot certification.

This report shows that NTFPs contribute to the cash incomes of the studied households in Ngo Luong commune to a marginal or moderate extent. However, useful NTFPs might help to mitigate poverty if consistent strategies are developed 1) to strengthen the position of poor households within a community, 2) to improve resource management, and 3) to adapt the legal framework on NTFPs. Moreover, NTFP markets and its mechanisms need to be made transparent and understood by the producers to improve their livelihoods. Herein it has to be considered that an enhanced commercialisation of a specific NTFP might support households of a certain wealth group to a greater or lesser extent.

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## Annex

### Annex 1: Resource persons for species identification

Name	Profession	Institute
Nguyen Van Nghia	Teacher of Management & Protection Department	Forestry University of Vietnam - Xuan Mai - Ha Tay province
Le Mong Chan	Teacher of Management & Protection Department	Forestry University of Vietnam - Xuan Mai - Ha Tay province
Tran Ngoc Hai	Teacher of Management & Protection Department	Forestry University of Vietnam - Xuan Mai - Ha Tay province
Mai Van Xinh	Assistant	Cuc Phuong National Park - Nho Quan - Ninh Binh province
Mr.Quang	Assistant	Cuc Phuong National Park - Nho Quan - Ninh Binh province

**Annex 2: Cash income of the sixteen studied households in Luong Tren (LT) and Bo village (Bo) in 2003**

Household code	LT-1		LT-2		LT-3		LT-4		LT-5		LT-6		LT-7		LT-8		Average of 8 HHs	
Wealth classification	Very rich		Rich		Medium		Rich		Medium		Medium		Very Rich		Very rich			
Household size	3		4		5		7		5		6		9		8		Average 5.875	
Estimated income in	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%
Animal husbandry	14.00	38.2	5.70	14.2	4.00	18.9	9.90	27.4	13.00	32.8	6.00	39.9	18.86	33.1	13.17	31.2	10.56	29.46
Food crop	5.00	13.6	3.75	9.3	4.00	18.9	5.00	13.8	3.00	7.6	4.65	30.9	7.15	12.5	6.18	14.6	4.84	15.17
Cash crop	7.00	19.1	12.75	31.8	7.60	35.9	11.50	31.8	5.00	12.6	2.25	15.0	5.10	8.9	1.68	4.0	6.61	19.89
NTFP	2.65	7.2	5.00	12.5	2.55	12.1	1.45	4.0	11.62	29.3	0.65	4.3	0.90	1.6	3.20	7.6	3.45	9.82
Other	8.00	21.8	12.92	32.2	3.00	14.2	8.30	23.0	12.00	17.7	1.50	10.0	25.00	43.9	18.00	42.6	10.47	25.66
Total	36.65	100	40.12	100	21.15	100	36.15	100	39.62	100	15.05	100	57.01	100	42.22	100	35.99	100
Other are	Own and his father's commune salary		Honey, shop, retirement salary		Timber sawing		Commune salary, business (product collector)		Benefit for trading, sawing machine		Sawing/ house building, peeling machine		Commune salary, teacher salary		Teacher salary			

Household code	Bo-1		Bo-2		Bo-3		Bo-4		Bo-6		Bo-7		Bo-8		Bo-9		All 8 HHs	
Wealth classification	Very rich		Very rich		Poor		Rich		Medium		Rich		Medium		Rich			
Household size	6		6		6		6		5		3		5		4		Average 5.125	
Estimated income in	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%	Mio VND	%
Animal husbandry	3.50	21.5	9.20	47.1	0.27	8.1	12.60	34.1	5.20	51.1	2.80	39.0	0.70	15.3	4.00	27.6	4.78	30.5
Food crop	8.51	52.3	1.60	8.2	1.84	54.9	3.63	9.8	3.15	30.9	3.90	54.3	1.98	43.2	4.70	32.4	3.66	35.8
Cash crop	2.85	17.5	5.25	26.9	0.23	6.9	4.98	13.5	0.79	7.8	0.09	1.3	0.40	8.8	0.30	2.1	1.86	10.6
NTFP	1.42	8.7	1.73	8.9	1.01	30.1	12.77	34.5	1.05	10.3	0.40	5.5	0.54	11.8	2.98	20.6	2.73	16.3
Other	0.00	0.0	1.75	9.0	0.00	0.0	3.00	8.1	0.00	0.0	0.00	0.0	0.96	21.0	2.52	17.4	1.02	6.9
Total	16.26	100	19.53	100	3.35	100	36.96	100	10.19	100	7.19	100	4.58	100	14.50	100	14.07	100
Other are			Shop		Timber sawing		Honey						Village police		Commune salary			

### Annex 3: Overview of the identified NTFPs in Ngo Luong commune

Source:

[1]: VU VAN DUNG and LE VIET LAM (2004): Re-identify and update scientific names of some bamboo species in Vietnam. NTFP Newsletter 1, July 2004, pp 9-10.

[2]: PHAM HOANG HO (2000): Cây cỏ Việt nam, quyển I-III, an illustrated Flora of Vietnam.

[3]: TRIEU VAN HUNG (2000): Ten cây rừng Việt Nam, the names of forest plants in Vietnam. Ministry of Agriculture and Rural Development, Department of Science Technology and Product Quality. Agriculture Publishing House, Hanoi.

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[5]: Vietnamese Red Book.

Other information is collected by field work of the study team.

Legend:

1) A= fibre products, B= food products, C= medicinal products, D= extracted products, E= other products, P= potential products, which were identified by the market analysis.

2) blank fields = species was not collected in that village

Code	Local Vietnamese name	Popular Vietnamese name	Latin name	Family name	Bo village				Luong Tren			
					Used parts	Use	Availability	Cultivation	Used parts	Use	Availability	Cultivation
C3	Phởn phiến (Cam thảo)	Cam thảo nam	Abrus precatorius	Fabaceae	string	daily tea, trade, medicine	low	no (knowledge)	string (leaves)	daily tea, medicine (cough)	low	no (knowledge)
E1	Lan quế	Quế lan hương	Aerides odorata Lour.	Orchidaceae	entire plant	trade	low	yes (store before selling)	entire plant (with rhizome)	trade	-	-
C5	Cây mỡ bò	-	Aglaia sp. [2]	Meliaceae	stem	-	-	-	-	-	-	-
C17	Cây bo	Sẹ	Alpinia sp	Zingiberaceae	fruit	trade	-	-	-	-	-	-
C10	Khuông khụ	Gội nếp	Amoora gigantea Pierre	Meliaceae	stem	daily tea	-	-	-	-	-	-

C15	Cỏ sên (Lan kim tuyến)	Lan kim tuyến	Anoetochilus setaceus Blume	Orchidaceae	entire plant	trade	low	yes (shrub), no (lack of seeds)	entire plant (with rhizome)	trade (not aware of costumer's use)	low	no (lack of knowledge)
C12	Sung máu	Gội gác	Aphanamixis grandifolia Bl	Meliaceae	stem	daily tea					low-medium	
C18	Tần		Ardisia florida Pitand [2]	Myrsinaceae	stem							
C42	Ngải cứu	Ngải cứu	Artemisia vulgaris	Asteraceae	leaves	for medicine, food	high		leaves	for medicine, food	high	
C21	Cây chay	Chay	Artocarpus sp	Moraceae	Bark of rhixome	trade						
B2	Mộc nhĩ	Mộc nhĩ	Auricularia polytricha Sacc.	Auriculariaceae	entire mushroom	food	medium-high	no (lack of knowledge)				
A2	Tre gai	Tre gai	Bambusa blumeana J. A et J. H Schult [1]	Poaceae					shoot, culm	food (s), construction, trade (c)	medium?	yes
A2	Tre (Hóp)	Hóp	Bambusa textilis McClure [3]	Poaceae	shoot, culm	food (s), construction (c), trade (c)	medium ?	yes				
A7	Mây	Mây nếp	Calamus tetradactylus Haecce	Arecaceae	string	handicraft	medium (3 years ago overexploited, 2-3 years to regenerate)					
C14	Nắng nước		Callicarpa sp. [2]	Verbenaceae	shrub	daily tea						
C15	Bộ bạc		Callicarpa sp. [2]	Verbenaceae	shrub	daily tea						
D1	Trám	Trám trắng	Canarium album (Lour.) Raeusch.	Burseraceae	fruit	food, trade	different (weather condition, mast years]	no (lack of seeds)	fruit	trade	high	

A8	Cây móc	Móc	<i>Caryota ureus</i>	Arecaceae	stem	making string for crop works		-				
C22	Củ cu li (Vỏ vàng)	Cấu tích	<i>Cibotium barometz</i> (L.) J. Sm.	Dicksoniaceae	rhizome	trade	low-medium	-	rhizome	trade	low-medium	
D2	Quế rừng	Quế trên	<i>Cinnamomum burmanami</i> (Ness) Bb	Lauraceae	bark	trade	high (not exploited because no costumers)	yes				
C4	Bưởi rừng	Hồng bì rừng	<i>Clausena excavata</i> Burm.f var. <i>villosa</i> Hook.f	Rutaceae	shrub (without rhizome)	daily tea, medicine (cough)	low	yes (one HH)				
B1	Nấm (nấm vú)	Nấm mối	<i>Collybia albuminosa</i> (Berk.) Petch	Trichotomataceae	entire mushroom	food	medium	-				
E3	Lan đũa		<i>Corymborchis veratrifolia</i> Blume (?)	Orchidaceae	entire plant	trade	medium	-				
E4	Lan thảo	Lan Hoàng thảo	<i>Dendrobium nobile</i> Lindl.	Orchidaceae	entire plant	trade	high	-	entire plant	trade	high	
P3	Phi điệp	Phi điệp	<i>Dendrobium transparens</i>	Orchidaceae	entire plant	trade	very low	no				
A1	Bương đền	Bương	<i>Dendrocalamus asper</i> Backer ex. Heyne [1]	Poaceae	shoot, (culm)	food, (trade)	high	yes	shoot, culm	food, construction, trade (c, s)	high?	yes
A3	Luồng Cuốc	Luồng Thanh Hoá	<i>Dendrocalamus barbatus</i> Hsueh et D. Z. Li [1]	Poaceae	shoot, culm	food (s), handicraft (c)	low-medium	yes (start cultivating)				
A9	Bương cươc		<i>Dendrocalamus giganteus</i> Munro ? [4]	Poaceaea	shoot	food	medium?	-				

C3	Tan trong (Tọ khụ)		Desmodium Laxum subsp. Leptopus Ohashi	Fabaceae	stem	daily tea	high					
C8	Cây tan		Desmodium sp.	Fabaceae					shrub (without rhizome)	medicine (women treatment, birth)	low-medium	no (knowledge)
C37	Cây mun	Mun	Diospyros mun A.Chev.	Ebenaceae	timber	handicraft for-making chopstick						
C12	Bện bà	Cốt toái bổ (Tắc kè đá)	Drynaria fortunei (Kuntze) J. Smith	Polypodiaceae	rhizome	trade	high	no	rhizome			
C44	Phong lan quả	Lan hành	Eria glodifera	Orchidaceae	entire plant excludes rhizome	Trade						
C16	Lão quan thảo		Geranium nepalense var. Thunbergii (Sieb. & Zucc.) Kudo	Geraniaceae	entire plant	trade	high	yes (support program)				
C4	Cùn đái dây		Glochidion gamblet Hook, f. Soc Gamble (?)	Fabaceae	string	medicine (stomache ache)	medium-high		string	daily tea, medicine (stomache ache, women treatment)	low-medium	no (knowledge)
C13	Cùn đái quả		Glochidion gamblet Hook, Soc Gamble (?)	Fabaceae	rhizome	daily tea					low	
P4	Da bao	Cam bao	Hygrochilus parishii (Reichb. f.) Pfitz.	Orchidaceae	entire plant	trade	low	no				
B1	Lành hành	Vầu đưng	Indosasa angustata McClure [11]	Poaceae	shoot, culm, bark	food (s), trade (c, b)	high	yes	shoot, culm, bark	food (s), trade (c, b)	high	yes

Clure [1]												
B2	Măng đắng	-	Indosasa parvifolia C. S. Chao et O. H. Dai	Poaceae	shoot, culm	food (s), construction (c), handicraft (c)	low-medium (start cultivating)	yes	shoot, culm	food (s), construction (c), trade (s), depends on market demand	high	yes
C1	Khăng ké	Mẫu đơn trắng	Ixora henryi Lévl.	Rubiaceae	shrub	daily tea	high	yes (not applied)	shrub (especially leaf)	daily tea	low	no
C19	Cây (củ; Thông rừng)	Sam núi đá (Thông đầu đá vôi)	Keteleeria davidiana	Pinaceae	bark	medicine (cough)	-	-	-	-	-	-
C11	Xuốc xe	-	Lasianthus sp (balsansea?) [2]	Rubiaceae	shrub	daily tea	-	-	-	-	-	-
P1	-	Ich mẫu	Leonurus artemisia (Lour.) S. Y. Hu	Lamiaceae	herb	-	high	-	herb	-	high	-
A6	Giang	Giang	Melocalamus sp	Poaceae	shoot	trade	low (5 years ago species flowered)	yes	-	-	-	-
E8	Chuối rừng	Các loại Chuối	Musa sp.	Musaceae	stem, leaves, flowers	food (f), handicraft (s), construction (s), packing material (l)	high	-	-	-	-	-
C20	Khăng lá nửa	Kim giao	Nageia fleuryi (Hick.) de Laub.	Podocarpaceae	stem	daily tea	-	-	-	-	-	-
C17	Củ 1 lá	Cây một lá	Nervilia fordii (Hance) Schlechter	Orchidaceae	rhizome	medicine	low	no	rhizome	food (rice wine), medicine (kidney)	low	no



C41	7 lá 1 hoa	Bảy lá một hoa	Paris polyphylla Smith var. chinensis (Franch.) Hara	Liliaceae	rhizome	trade							
C24	Sâm cau	Sâm cau	Peliosanthes teta Andr.	Liliaceae	stem	trade							
C35	Thuốc xe (Là to)		Phlogocanthus sp. [2]	Acanthaceae	shrub	daily tea							
E3	Lá dong	Lá dong	Phrynium placentarium (Lour.) Merr.	Maranthaceae	leaves	packing material, (trade)	high		leaves	trade			
C6	Máu người	Huyết đằng	Sargentodoxa cuneata (Oliv.) Rehd & Wils	Sargentodoxaceae	string	daily tea	low-medium		shrub (without rhizome)	medicine (blood disease, women treatment)	low-medium		
P2	Khúc khúc	Thỏ phục linh	Smilax glabra Wall. Ex Roxb.	Smilacaceae	rhizome		low		rhizome		low		
C25	Củ 30	Bách bộ	Stemona tuberosa Lour.	Stemonaceae	rhizome	trade							
C29	Khang (vỏ)	Sảng nhung	Sterculia lanceolata Cav.	Sterculiaceae									
C27	Dương đỏ		Strobilanthes cusia (Nees) Kuntze [2]	Acanthaceae	shrub	trade	low-medium						
C7	Tan kha		Syzygium malayanum (Gagnep). I-M Turner [2]	Myrtaceae	stem								
C36	Tan		Trigonostemon thyoideus Stapf. [2]	Euphorbiaceae	shrub	daily tea							
C38	Dây nhắc nháo	Dây nhót nháo	Triumfella sp.	Tiliaceae	bark	trade	low		bark	trade	low		
C28	Trường rừng		Tubocapsium anomalum Franch. et Sav. [2]	Solanaceae	stem								

D2	Trầu	Trầu	Vernicia montana Lour.	Euphorbiaceae	seed	trade	different (weather condition, mast years)	yes	seed	trade	high	yes
C10	Bông bênh đỏ											
C11	Bàng đỏ								bark??	medicine (women treatment, birth)	disappeared	
C14	Dầm tốt									medicine (cough)	low	
C16	Củ cánh bướm								string	medicine (cough), trade (to lace up goods)	low	
C18	Sâm dây					trade			string (mainly rhizome)	medicine (sleeping difficulties)	low	yes (if market is present)
C19	Quỳnh								bark			
C2	Bưởi vọc			Rutaceae					shrub (without stump)	medicine (cough, women treatment)	low	yes (one HH)
C20	Lăng lẹng								string	medicine (stomache ache)		
C21	Bon bò											
C22	Lăng lẹ											
C26	Sên nhung				stem	trade						
C30	Dây pông pên (củ)											
C31	Chu chín				stem	daily tea						
C32	Củn tịu				stem	daily tea, trade						
C33	Dây trống gà (Lấy đốt)											

C34	Bang				stem	medicine for woman after birth						
C40	Chóc noóc				stem	trade						
C43	Tơ lằng											
C7	Thuộc bá đẽ								shrub (without rhizome)	medicine	high (but in stone mountains, difficult to collect)	no (ecological condition)
C9	Bông bành								shrub (without rhizome)	medicine (headache, sleeping difficulties)		yes
E2	Lan đuôi gà			Orchidaceae								
E4	Lan trúc			Orchidaceae	entire plant	trade			entire plant (with rhizome)	trade	low	
E5/ P5	Lan tai trâu (Dai Chau?)		Rhynchostylis gigantea (Lindl.) Ridl. ?	Orchidaceae	entire plant	trade	low	yes (store before selling)	entire plant (with rhizome)	trade		
E6	Lan đuôi chó			Orchidaceae	entire plant	trade						

**Annex 4: Market places around Ngo Luong commune.**

Name of market	Market day (s)	Most crowded time	Distance		Time		Transport mean		Selected NFTP in Luong Tren	Remarks
			Luong Tren	Bo village	Luong Tren	Bo village	Luong Tren	Bo village		
Lỗ Sơn	Monday	8.00-9.00 am	10 km	15 km	2 hrs	3 hrs	On foot	On foot	A1, B1, B2, C1, C4, C8	-
Bò	Tuesday (Friday)	8.00	15 km	25 km	1 hr or 3 hrs	1 hr or 5 hrs	By xeom or on foot	By xeom or on foot	C1, C4, C8, C15, C17, D2	-
Lò	Wednesday, Thursday	8.00	22 km	25 km	1.5 hrs or 4.5 hrs	5-6 hrs	By xeom or on foot	On foot	A1, B1, B2	Most crowded time is around 9.00 am
Chợ Chua	Saturday	8.00-9.00 am	33 km	15 km + 10-12 km	1.55 hrs or 6.5 hrs	3 hrs + 0.45 hr	By xeom or on foot	On foot + by xeom	C1, C4, C8	On foot to Lỗ Sơn, by xeom to Chợ Chua
Phú Cường	Sunday	-	-	-	-	-	-	-	-	-
Mãn Đức (Khén)	Tuesday	8.00	28 km	-	1.40 hrs or 5.5 hrs	-	By xeom or on foot	-	A1, B1, B2, C1, C4, C8	-
Tân Tiến	Thursday, (Saturday/Sunday?)	8.00	-	15 km + 17 km	-	3 hrs + 1.25 hrs	-	On foot + by xeom	C1, C4, C8	On foot to Lỗ Sơn, by xeom to Tân Tiến
Vụ bản	Saturday	-	-	40 km	-	8 hrs	-	On foot	-	-

Explanations: A1 = *Dendrocalamus asper*, B1 = *Indosasa angustata*, B2 = *Indosasa parvifolia*, C1 = *Ixora henryi*, C4 = *Glochidion gamblet*, C8 = *Desmodium Laxum*, C15 = *Nervilia fordii*, C17 = *Anoectochilus setaceus* and D2 = *Vernicia montana*.