

**SWOT Analysis of Utilization of Non-Timber Forest Products by Rural
Farm Households - A Case Study of Xaybouathong District, Central Laos**

By

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ABBREVIATIONS

DAAD	German Academic Exchange Service
DAFO	District Agriculture and Forestry Office
DoF	Department of Forestry
EC	European Commission
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GTZ	Gesellschaft für Technische Zusammenarbeit GmbH
HH	Household
ICEM	International Centre for Environmental Management
IUCN	International Union for Conservation of Nature and Natural Resources (World Conservation Union)
Kip	Lao currency (1 US\$= 9.660 Kip in January 2007)
MAF	Ministry of Agriculture and Forestry
NAFRI	National Agriculture and Forestry Research Institute
NTFPs	Non-Timber Forest Products
PAFO	Provincial Agriculture and Forestry Office
SNV	Stichting Nederlandse Vrijwilligers (Netherlands Development Organization)
SUFORD	Sustainable Forestry and Rural Development Project
SWOT	Strengths Weaknesses Opportunities and Threats
UNEP	United Nations Environmental Program

ABSTRACT

This research is to dispose the current situation regarding NTFPs availability and utilization in Xaybouathong district, Central Laos. The field research was conducted between October 2006 and March 2007. Two villages, Nakhamchouang and Kasae, were selected for serving this study. The first one is nearby the market. The other one is far way from the market. So, situations are to contrast with each other. Data collection comprises two parts. First part is local use assessment which included RRA, household survey and household in-depth study. Second part is the forest inventory. Two conceptual frameworks: Farming Systems Concept and SWOT analysis are applied to structure the research. 69 and 68 NTFPs are identified by the villagers at Nakhamchouang and Kasae, respectively. From the forest inventory, *Rhapis laoensis* Becc., *Calamus tetradactylus* Hance. and *Ancistrocladus tectorius* Merr. have high abundance in the mixed deciduous forests of the two study villages. Most of the NTFPs can be harvested and sold freely by the villagers in both study villages. This study reveals that total annual household cash incomes are US\$ 324.41 and US\$ 227.58 at Nakhamchouang and Kasae, respectively. NTFPs selling contributes US\$ 114.21 or 35 % and US\$ 8.6 or 4 % to annual household cash income at Nakhamchouang and Kasae, respectively. Consequently, accessibility to the market has essential influence on NTFPs commercialization.

1 INTRODUCTION

1.1 Background

In recent years, forests have been increasingly recognized as rich reservoirs of many valuable biological resources, not just timber. The “non-timber forest product” (NTFP) emerged as an umbrella term to recognize the products derived from these various forest resources as a group. For most of recorded history, people have valued forests not for wood, but for other products. The ancient Greeks prized ancient writing from China, Egypt and India record a wide variety of uses for forest plants, and compilation of botanical knowledge from Western Asia. Whereas timber-based products have become major international commodities in modern times, NTFPs rank among the oldest traded commodities (FAO, 1995:1).

The key point of distinction between NTFPs and timber is that the latter is managed on an industrial scale by and for interests located well outside forest boundaries. While certain NTFPs may ultimately become inputs in large-scale urban-based industries, all of them share the characteristic that they are extracted using simple technologies by rural people living in or near forests (De Beer *et al.*, 1996: 24).

Products used as industrial raw materials are often subject to competition from cultivated supplies or substitutes. This partly explains the boom-bust cycle of many NTFPs that enter international markets. As domestic economies grow, markets for NTFPs are likely to shift from being supply driven (where producers influence the market with low quality products) to demand driven (where demands are diversified and quality requirements are high) (FAO, 1995:11).

Laos has a poor, predominantly rural population that relies on NTFPs for an important part of their diet, especially after bad harvests in agriculture, and cash income generation. Recent estimates suggest that local subsistence uses of NTFPs, taking place outside the cash economy, may be equivalent to a very significant 20 % or more of GDP (FAO, 2002:117). Laos produces many of NTFPs with commercial value, including cardamom, eaglewood, bamboo, rattan, yang oil, benzoin, damar resin, sugar palm, and malva nuts. Between 1994 and 1998, recorded exports of NTFPs were worth an average

of US\$ 31.8 million a year.

1.2 Problem Statement

The Sustainable Forestry and Rural Development Project, SUFORD, is a joint effort between the Government of Laos, Finland and the World Bank. The project has lunched since 2003. It currently covers 528,000 ha of natural forests in 18 districts in four Central and Southern provinces: Khammouane, Savannakhet, Salavan and Champasak. The project area contains about 290 villages and an estimated 100,000-105,000 villager. Many of whom will benefit either directly or indirectly from the project (SNV, 2004:9).

One aim of the project is to enhance the contribution of forestry to local economic development in a sustainable way. The status of forests in many of the project sites is such that timber harvesting will not be feasible over the project period. NTFPs will be the only source of income from the forest. Therefore, one task of the project is to identify how NTFPs could be incorporated in sustainable production forest management and village development programs.

Xaybouathong district in Khammouane province is one of the project sites. The project has recently carried out forest inventory and formed a plan for forest product extraction that so far focuses on commercial trees. In this district, there is limited data of NTFPs concerning species, availability, utilization, harvested quantities, and their contribution to rural farm household income generation. However, those data are required for serving the project to achieve its aim. This study is to dispose the current situation regarding NTFPs availability and utilization. Moreover, the district is represented by two villages, which stand for situation near and far away from the market places.

2 RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

2.1 Objectives of the Study

The general objective of this study is to provide an assessment of NTFPs utilized by farm households in two villages within SUFORD project area. The outcomes of the research are to contribute useful arguments for NTFPs utilization planning and management by SUFORD project.

Based upon this general objective the specific objectives of the study are:

- 1) To assess the availability of NTFPs in the study villages;
- 2) To investigate the contribution of NTFPs to rural farm households in terms of consumption and commercialization;
- 3) To identify Strengths, Weaknesses, Opportunities and Threats to selected NTFPs commercialization.

2.2 Research Questions

Pursuing to attain the objectives of this study particular research questions are formulated. Various indicators have been identified and pre-tested to answer following questions.

- 1) Which NTFPs are available in the study villages?
 - ❖ Indicators:
 - Numbers and species of NTFPs listed by villagers;
 - Results of the forest inventory.
- 2) To what extent do NTFPs contribute to households?
 - ❖ Indicators:
 - Share of NTFPs in household income;
 - Other sources and amount of income;
 - Percentage of values of harvested NTFPs in household consumption (non-cash income) and selling (cash income).
- 3) Which factors influence selected NTFPs utilization with regard to commercialization?

- ❖ Indicators:
 - Internal factors (availability, accessibility and harvesting season of NTFPs, nature of product, NTFP processing required and customary village NTFPs and trees use regulation);
 - External factors (market accessibility, middlemen, market price, market demand and Government NTFPs use regulation).

3 LITERATURE REVIEW

3.1 What are NTFPs?

NTFPs are defined as products of biological origin other than wood derived from “forests”, other “wooded land” and “trees outside forests”. NTFPs may be gathered from the wild, or produced in forest plantations, agroforestry schemes and from trees outside forests (www.for.gov.bc.ca/hre/ntfp/). NTFPs are a collection of biological resources derived from both natural and managed forests and other wooded areas. NTFPs are culturally important, cheap and often accessible to local people. Gathering NTFPs can be both opportunistic and casual, or alternatively planned expeditions (www.quin.unep-wcmc.org/forest/ntfp/ntfps.cfm?displang=eng).

NTFPs include all the materials, excluding timber extraction, collected from forest and riverine habitats that are used to support local livelihoods. This includes items such as forest and aquatic vegetables, fruit, traditional medicine products, wild animals (wildlife) and aquatic organisms (aquatic animal) such as fish, mollusks, insects and crustaceans. While the term NTFP implies non-timber items, it does include woody products for home construction like bamboo poles and grasses for roofs and handicraft products. The term NTFP can even include non-organic items like scrap metal from bombs and airplanes, an important and potentially dangerous NTFP collected in areas along the Lao-Vietnamese border (Mollot *et al.*, 2004:3).

3.2 The Importance of NTFPs for the Lao Rural Household Economy

For the majority of rural Lao households, NTFPs are by far the most important resource from the forests. They constitute a wide variety of goods including food, medicines, construction materials, firewood and a variety of tradable items (ICEM, 2003:39). MAF (2004:20) reviewed that NTFPs play a central role in the rural household of the Lao PDR by providing the following items, among others:

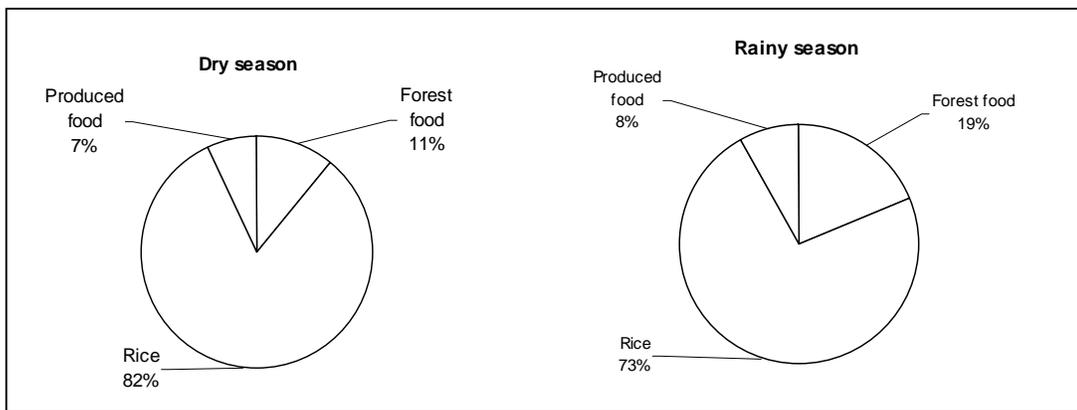
- Protein (wild meat, fish, frogs, shrimp, soft-shelled turtles, crabs and molluscs);
- Calories, vitamins and dietary fibre (mushrooms, bamboo shoots, fruits and vegetables, honey);
- Materials for house construction and handicraft production (bamboo, rattan, pandanus, broom grass, paper mulberry);
- Traditional medicines;
- Cash income (from sale of NTFPs or product there from).

Proceeds from NTFP sales may account for more than a third of village cash income, rising as over a half in forest-rich areas. It has been estimated that NTFPs collected are worth some US\$ 320 per household per year in rural areas (MAF, 2004:20). ICEM (2003:39) identified that a rural household consumes US\$ 280 equivalent per year in NTFPs including fuel wood, providing on average 55 % of household cash income. It was also estimated that NTFPs provide 50% of incomes in rural villages, where 80% of the population lives. Moreover, local subsistence use of NTFPs may account for 20-30% of the Gross National Product (GNP) (UNEP, 2001). All these data base upon case studies in selected locations or represent very rough estimations on contribution of NTFPs to the rural household economy.

3.3 Contribution of NTFPs to the Lao Rural Household Food Security

NTFPs contribute significantly to the welfare and livelihoods of rural households especially in periods of stress (droughts, post floods, etc.) (ICEM, 2003:8). Forest food

resources occupy a central place in the food system of the Lao people. Rural communities who are most vulnerable to food insecurity traditionally obtain food from natural forests, fallow swidden, agro-forests, and rice fields and associated aquatic environments. Seasonally available fish, frogs, bamboo shoots, plants, tree leaves, insects, wild meat and mushrooms are essential components of the daily diet of forest dwellers and upland shifting cultivators. Because they provide food year-round and can also be sold and exchanged to obtain rice during times of drought, flood-induced crop failure and economic hardship, forest foods make a vital contribution to the otherwise nutritionally poor and bland diets of rural households (Clendon, 2001:7). The result of a research carried out at three villages in Saravan province (Southern Laos) are shown in Figure 3.1.



Source: Clendon, 2001: 24

Figure 3.1: Household food consumption

The food system is based on the staple glutinous rice. As such, this dominates the diet, at an average proportion by weight of approximately 82 % and 73 % of total consumption during the dry and rainy seasons, respectively. Second to rice, forest foods are an essential component of the diet, accounting on average for 11% and 19 % of total household consumption in the dry and rainy seasons, respectively. Produced food, vegetables and animals that are cultivated and reared on farmlands, have shares of 7 % and 8 % of total household consumption in the dry and rainy seasons, respectively (Clendon, 2001: 24). Moreover, SNV (2007) reviewed that 44 % of household subsistence accounted for NTFPs. Rice and other foods contributed 42 % and 14 %, respectively, to household subsistence.

3.4 NTFPs Availability in Laos

Villagers can easily enumerate large numbers of products collected from the forest. So far, 507 species of NTFPs in Laos have been mentioned by villagers as being used (Foppes *et al.*, 1997: 4).

There is considerable uncertainty in how to classify NTFPs and no uniform system has been adopted in Laos yet. It is sometimes argued that this may not be possible because it depends much on specific importance of NTFPs, stage of processing or even where they are wild or domesticated. However, Table 3.1 shows NTFPs grouped according to what they are primarily used for (livelihood and development context), and then divided into plant parts used (conservation context) when necessary (SNV, 2007).

Table 3.1: Most important NTFPs and use groups in Laos with some examples

A. Plant foods	B. Fibres
Fruits: <i>Baccaurea ramiflora</i> Lour. Shoots: bamboo and rattan shoots Tubers/roots: <i>Dioscorea hispida</i> Dennstedt. Leaves: <i>Melientha suavis</i> Pers. Nuts/seeds: <i>Arenga westerhoutii</i> Griff. Flowers: <i>Markhamia stipulate</i> Wall. Spices: <i>Zanthoxylum rhetsa</i> DC. Mushrooms: <i>Lentinus</i> spp. Fodder (for animals): <i>Albizia procera</i> Benth.	Bamboo: canes Rattan: canes Leaf fibre: <i>Pandanus</i> spp. Bark fibre: <i>Broussonetia papyrifera</i> Vent. Grass: <i>Thysanolaena maxima</i> O.K.
	D. Extractives
	Gums: <i>Boehmeria malabarica</i> Webb. Gum resin: <i>Garcinia</i> spp. Resin: <i>Shorea</i> spp. Oleoresin: <i>Dipterocarpus</i> spp. Latex: rubber Tannin: <i>Pentace burmanica</i> Kurz. Dye: <i>Diospyros mollis</i> Griff. Essential oil: <i>Aquilaria</i> spp. Stimulants: betel nut Insecticides: <i>Azadirachta indica</i> Juss.
C. Medicinal plants	E. Ornamentals
Fruits: <i>Rhus chinensis</i> Mill. Stems/roots: <i>Cosciniun fenestratum</i> Gaertn. Tubers/roots: <i>Smilax grabra</i> Wall. Leaves: <i>Plumbago indica</i> L. Nuts/seeds: <i>Strychnos nux vomica</i> L. Flowers: <i>Clerodendrum paniculatum</i> L. Bark: <i>Clausena harmandiana</i> P. Wood: <i>Draceaeana loureiri</i> Gagnep.	Orchids, ferns and curcuma flowers
	F. Charcoal and (fuel) wood
	G. Animal products (separate group)

Source: SNV, 2007

NTFPs in Laos are classified into seven groups as following (SNV, 2007):

- **Plant foods** are edible plant products such as forest fruits and seeds, flowers, rhizomes, tubers, roots, barks, etc. which have a primary purpose to be consumed, to flavour foods (spice) or to facilitate food preparation (edible oil). Fodder that is edible for cattle is placed in this group as well.
- **Medicinal plants** have the primary purpose to treat people and their animals or to make and keep them healthy. Aphrodite is also put in this group. Besides a healthy diet from NTFPs, many local people directly depend on medicinal plants and knowledge to use them appropriately. Often specialized people, older women, in the village have a wealth of knowledge on numerous forest plants used in medicinal formulas, which they have acquired over generations. Many medicines, both traditional and ‘western’, are based on wild plants or compounds extracted from them.
- **Fibres** from plants are materials used to build (e.g. bamboo canes) or finish constructions (e.g. thatch), or for clothes, paper and household implements (e.g. broom) and mainly derived from plants in the families of Tiliaceae, Sterculiaceae, Bombacaceae, Moraceae, Leguminosae, Urticaceae, Palmae and Gramineae. Grasses are used for fodder, matting, roping, thatching (*Imperata cylindrica* Beauv.) and manufacturing of furniture, basketry and screens.
- **Extractives** are chemical substances (liquid or not) derived from plant parts, with specific characteristics used in a variety of products, like essential oils for their fragrance in perfumes, resins for their ability to act as a carrier for paint or tannins for their preservative capacity. Cosmetics are put in this group as these are often extracted from plants. Non-edible oils such as wood oil or leaf oil that are often essential oils or oleoresins and stimulants depend on chemicals which have an arousing effect on people or insecticides chemically able to prevent or kill insects are included in this group as well.

- **Ornamentals** and greenery are for beautification of human surroundings. A variety of orchids is the main ornamentals.
- **Charcoal and fuel wood** for heating or food preparation. All trees or bamboos are used for fuel wood and charcoal. Common tree species used in charcoal production are *Irvingia Malayana* Oliv. or “Mai bok” and *Cratoxylum formosum* Benth. or “Mai tiou”.
- **Animals** or animal products require a group and classification by itself.

4 THEORETICAL SETTING

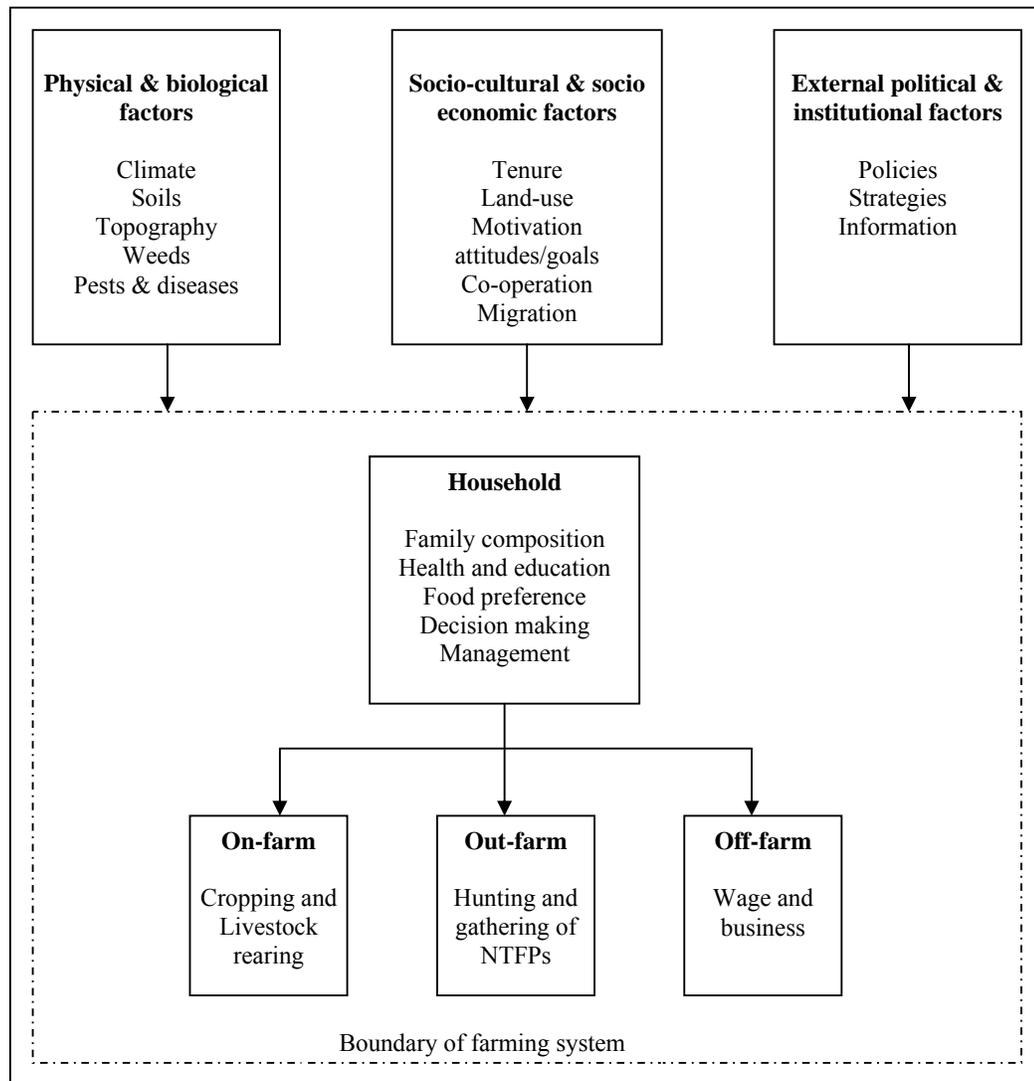
4.1 Farming Systems Concept

Farmers typically view their farms, whether small subsistence units or large corporations, as systems in their own right. A typical farm system has the structural complexity and interrelationships between various components of a smallholding. It consists of the variety of natural resources available to farm households. These resources normally include different types of land, various water sources and access to common property resources including ponds, grazing areas and forest, which includes various products, e.g. NTFPs. To these basic natural resources may be added climate and biodiversity, as well as human, social and financial capital (FAO and World Bank, 2001: 7).

Upon (1996:20) reviewed that farming systems are complex; firstly because there are many fundamentally different components such as plants, animals, people, tools and wells (or sources of water), which means that a multi-disciplinary approach is needed to study them; and secondly there are many different ways in which the components can be combined.

Inside the boundary of farming systems, the household component is a somewhat flexible concept. It can consist only of the farm's nucleus family but more often includes extended-family members. It also includes some number of more or less permanent domestic, farm workers, and miscellaneous dependents (FAO, 1997:47). Besides household, farming systems often consist of a range of interdependent gathering, production and post-harvest processes, so that besides cropping and livestock rearing, household livelihoods can encompass fishing, agro-forestry, as well as off-farm incomes, which make a significant contribution to the livelihoods of many poor rural households (Beets, 1990: 163; FAO and World Bank, 2001: 9). Hunting and gathering activities are also included (FAO and World Bank, 2001: 9). Household component, various household's activities, and variety of natural resources mentioned above can be viewed as internal factors.

Farming system is strongly influenced by the external rural environment, including policies and institutions, markets and information linkages (FAO and World Bank, 2001: 9). Beets (1990: 163) has pointed out three main factors which influence the farming system as following: physical and biological factors, socio-cultural and socioeconomic factors, and political and institutional factors. These factors are presented in Figure 4.1.



Source: Modified from Beets 1990: 163

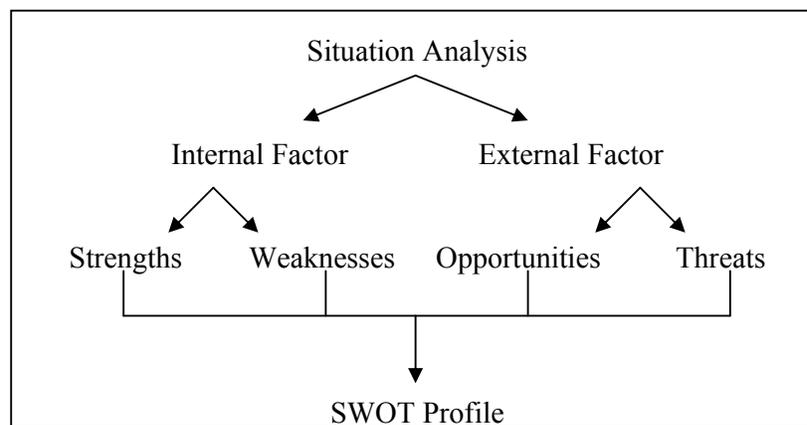
Figure 4.1: Model of common determinants and interactions in a farming system

Many components inside farming system contribute to the livelihoods of farm households as mentioned above. In this research, it is focused on out-farm which includes hunting and gathering of NTFPs in areas, which do not belong to the individual household, within the village boundary. The researcher attempts to underline the contribution of NTFPs to household consumption and cash income. The extent of the contribution of these out-farm activities to household cash income depends on various determinants or factors that influence NTFPs commercialization. These determinants are to be identified forming a major force of this study.

4.2 SWOT Analysis in Farming System

As has been mentioned above this research is to identify and analyze the factors that influence NTFPs commercialization. It requires a suited tool that can be applied in the situation regarding commercialization. Therefore, SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is assessed as applicable to this study since it frequently appears to be applied in marketing or commercialization plans (www.netmba.com/strategy/swot/).

Figure 4.2 shows a SWOT analysis diagram for a situation analysis.

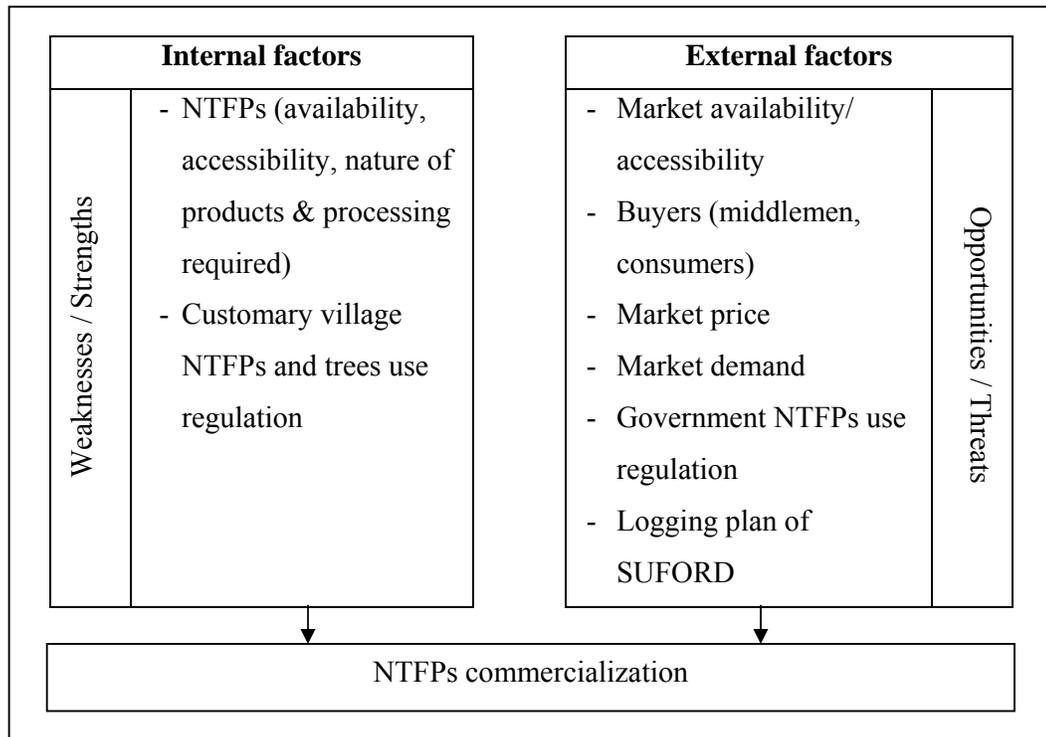


Source: Modified from www.netmba.com/strategy/swot/

Figure 4.2: SWOT analysis diagram

SWOT analysis is to find out internal and external factors that influence a situation. The internal factors are viewed as strengths or weaknesses and the external factors are viewed as opportunities or threats.

In this research, the situation is defined as the utilization of NTFPs, which focuses on commercialization. To carry out SWOT analysis of this situation, it requires pointing out internal and external factors. Those determinants or factors of the farming system as pointed by Beets (1990:163) are narrowed down for fitting with this situation. By combining the determinants or factors of the farming system and SWOT analysis diagram, SWOT analysis framework for this research is formed (Figure 4.3).



Source: Modified from Beets (1990: 163&309), FAO and World Bank (2001: 16), and www.netmba.com/strategy/swot/

Figure 4.3: SWOT analysis framework for this research

Strengths and opportunities are encouragement or positive internal and external factors that support NTFPs commercialization. On the other hand, weaknesses and threats are barriers or negative internal and external factors that limit or reduce NTFPs commercialization.

Outcomes of this SWOT analysis will provide information that is helpful in planning of NTFPs commercialization in the study villages in particular. Strengths and opportunities are to be maximised or further developed. Weaknesses and threats are to be minimised or overcome.

5 RESEARCH METHODOLOGY

5.1 Study Village Selection

Two representative villages were chosen for serving this study based on the following criteria:

- The villages have accessible forests in their surroundings;
- One village is near to the market and another one is far from the market;
- The villagers in both villages speak Lao Loum language*;
- The villages have easy access or are close to the road.

5.2 Assessment of Local Use of NTFPs

5.2.1 RRA

RRA emerged in the 1970s as a more efficient and cost-effective way of learning by outsiders, particularly about agricultural systems, than was possible by large-scale social surveys or brief rural visits by urban professionals. It drew on many of the insights of field social anthropology of the 1930s-1950s, emphasized the importance and relevance of situational local knowledge, and the importance of getting the big things broadly right rather than achieving spurious statistical accuracy. It developed a style of listening research, and a creative combination of iterative methods and verification, including "triangulation" of data from different sources - using two different methods to view the same information (www.iisd.org/casl/CASLGuide/RapidRuralAppraisal.htm).

There is no generally accepted definition of RRA. RRA is more commonly described as a systematic but semi-structured activity in the field and designed to obtain new information and to formulate new hypotheses about rural life. A central characteristic of RRA is that its research teams are multidisciplinary (www.fao.org/docrep/W3241E/w3241e09.htm#rra%20definition).

* Lao Loum language is official national language of Lao PDR.

RRA is a method of grassroots research used to identify situation, problems, goals and strategies of households, groups and communities. It is devised to meet the special needs of development-oriented research when decisions have to be made in a time-frame of months rather than years (Pratt *et al.*, 1992). Tools of RRA applied in this research are as follows:

- **Key Informant Interviews**

The objective of interviewing key informants is to collect data and gain useful insights into issues in a short period of time. Such data and insights can be used to develop a checklist for further investigation (DoF; IUCN 1997:5). The key informants are individuals who are able to provide relevant data, ideas, and insights on a particular subject (Casley *et al.*, 1992: 24).

Key informants in this research are district foresters who have been working in the study area for long time, chief of villages, elder villagers, traders or middlemen, and other project staffs. These people understand local customs, traditions, and social economic conditions such as main occupation of villagers, source of income. They are able to express those conditions to the researcher to understand. District foresters and Chief of villages provide data regarding use regulation of NTFPs. Key informants such as traders or middlemen provide data regarding to price and destination of selected NTFPs that they purchase from the villagers.

- **Focus Group Discussion**

Focus group discussion has a small number of participants who have been selected according to what they are expected to contribute to a particular subject, and the stress on spontaneous interaction between the participants (Casley *et al.*, 1992: 34).

In this research, focused group discussion is organized in the morning before villagers are leaving the village for their works or in the evening after they have come back from their works. The main objective of the discussion is to obtain the short list of NTFPs available in the study villages. Therefore, participants both men and women are those who know about NTFPs and they are selected by chief of villagers. Other aspects

concerning to NTFPs, e.g., availability, collection period, types of utilization, part of use, etc., are also discussed in this activity.

- **Transect Walk**

A way to gain hands-on experience in a community is to take an observational walk, i.e., a walk paying attention to people, activities, resources, environmental features, etc. Observational walks may be taken in a meandering way, following a particular feature of the landscape or the interests of the observers. The walks can also be structured as transect, i.e., a straight line cutting across the terrain in a given direction. Walks of these kinds help to verify the information provided on maps, both through direct observation and in discussions with people met along the way. Ideally the walk is organized for a small group, so as to maximize the opportunities for interactions ([www.mekonginfo.org/mrc_en/doclib.nsf/0/554C85F73D6CA1D6472568D40010B407/\\$FILE/FULLTEXT.html#Annex15](http://www.mekonginfo.org/mrc_en/doclib.nsf/0/554C85F73D6CA1D6472568D40010B407/$FILE/FULLTEXT.html#Annex15))

For this research, transect walk is conducted with a small group that includes researcher, village chief and another villager. Transect walk is used to gain data regarding to condition and distribution of forest and habitat of NTFPs. Other main land uses in the study villages are also observed.

- **Secondary Data Sources**

Typical secondary data sources both published and not published are academic books and articles, annual reports, official statistics (Allan *et al.*, 1993). The objective of using secondary sources is to supplement data gathered from other tools in order to provide a richer picture of local condition (DoF; IUCN 1997:8).

For this research, reports and draft papers produced by DAFO, PAFO, SUFORD, other project reports and various websites on internet are the major sources for secondary data. Reports and draft papers produced by DAFO, PAFO and SUFORD provide data regarding to social economic condition of the study villages including NTFPs availability and utilization including NTFPs use regulation, etc. Other project reports and various

websites on internet provide data regarding market demand, market price, harvesting and processing techniques, etc. of NTFPs.

5.2.2 Household Survey

A great deal of valuable data can be obtained by talking with people about their situation and the things that interest them. This can be done with or without questionnaires. In essence, a survey involves asking a series of formal questions of selected people, writing down their responses, and subsequently analyzing them (Pratt *et al.*, 1992).

In this research, face-to-face interview (Czaja *et al.*, 1995: 42) with one set of structured questionnaire is employed to ask 30 % individual sampled households, selected randomly, in each study village.

Questionnaire applied in the interviews containing both open and close questions (Appendix 1). It contains two parts. The first part is household information that includes household member, on-farm activities (agricultural production and livestock rearing), income (including income from off-farm) and expenditures. The second part is NTFPs utilization by households (out-farm activity) which includes species, consumed quantities, sold quantities and selling. Draft questionnaire is prepared based on the research objectives and questions and followed other research have been done before. It is tested with some households during the first visiting in the study villages. Later on, refined questionnaire is formed based on the feedback of the test.

The respondents are head of household, which can be men or women, or other relation to head of household such as spouse, children, etc. who can give the answers.

Interviews are carried out by visiting household by household in early morning and during the daytime. There is a problem concerning to recording the answers by writing in the nighttime due to there is no electricity available in the study villages. Villagers mainly use petrol lamp or Dipterocarpus wood resin torch for lighting. However, petrol lamp or Dipterocarpus wood resin torch provide weak light. Researcher carry out the interviews by visiting households that residents are present. Although the questionnaires

are tools of the interviews, the researcher does not ask those questions directly. Once visiting a sampled household, the researcher tries to talk to the respondents in general. The researcher does not try to act as an interviewer but as a visitor from other region who comes and wants to learn about their village. The questions are gradually asked during the conversation. By doing so, interviewing a household takes at least one and a half hour and some times more than that.

5.2.3 Household in-depth Study

Household in-depth study involves examination of a few people, organizations, or groups over time. The intensive observation can be for a relatively short time (e.g. few days) or a relatively long one (e.g. many years) (Neuman, 1994).

Household in-depth study is to obtain some specific data, particularly quantity of NTFPs consumed and sold by household, which are not achievable or not precised during the household survey. In this research, households are classified into three categories based the number of household members such as <5 people, 5-8 people, and >8 people in each village. A representative household in each category is randomly selected for household in-depth study.

Household in-depth study takes around one week per household in each village. During this period, harvested NTFPs observation, including weighing, counting and recording the quantities, is done. The quantity for household consumption and selling are separately recorded. Besides direct observation in households, interviews are also employed to gain data concerning to NTFPs such as the availability, utilization, selling, etc. The researcher does not stay with the selected household whole day. The researcher tries to learn about the time they normally go out for collecting, hunting or trapping and the time they come back. Observation is immediately done when they are back from the harvesting sites. Participating of the researcher in gathering sites are done as well. This is to observe the habitats, e.g. the site condition and the distance from the village, the abundance of harvested NTFPs, harvesting technique, etc.

5.3 Forest Inventory

5.3.1 Sampling and Sample Plot Design

The objective of the forest inventory in this research is to crosscheck the availability of NTFPs that are listed by the villagers. At the same time, the inventory is to gain data, which cannot be precisely given by the villagers, e.g. the abundance. The sample plots are established in four forest areas in each study village. Two forest areas are nearby the village (around 30 minutes). Other two areas are far away from the village (at least 2 hours). Each forest area comprises a group of four sample plots. An interval between the adjacent sample plots is 100 m as presented in Figure 5.1. This sampling design is employed by DAFO. It is used for gaining data regarding tree species composition in the forest (SUFORD, 2006: 23). A group of sample plots, which are included in a forest area, is called a cluster. Thus, this sampling establishment is consistent with cluster sampling design (Shiver *et al.*, 1996:232).

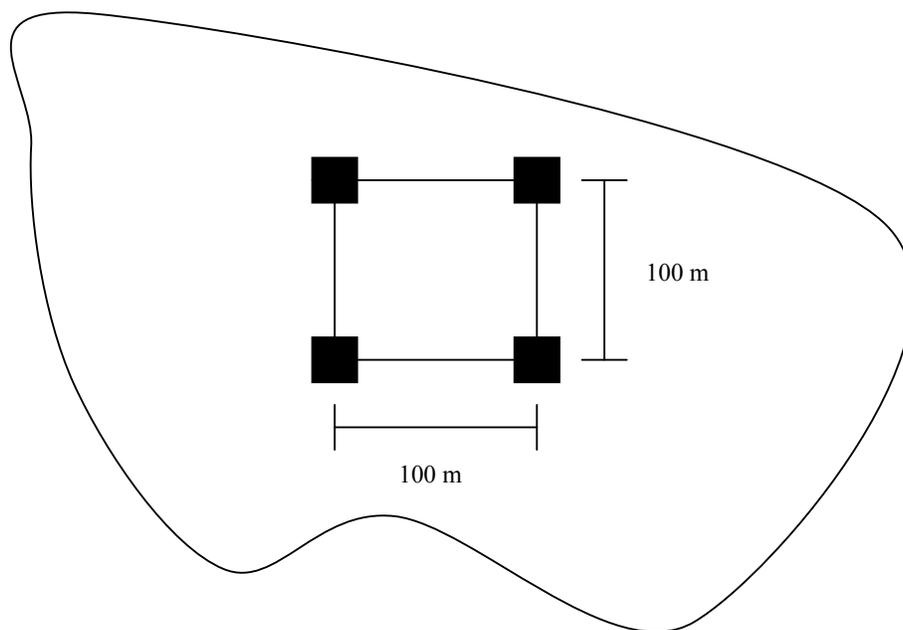


Figure 5.1: Layout of sampling

Sample plot applied by DAFO in forest inventory is 20 m x 30 m or an area of 600 m² in size (SUFORD, 2006:12). The plot is quiet large and had been proved suited for the

inventory that focuses on timber tree species and established by a work team that has many staffs. In contrast, this research focuses on small NTFP species and some trees species that produce NTFPs. At the same time, researcher has only a small work team. Hence, the sample plot for this research is revised. The shape of the applied sample plot is square with a side length of 20 m with an area content of 400 m².

Total 16 sample plots, which cover an area of 6,400 m², are set up in each study village.

5.3.2 Field Data Recording

All kinds of NTFP species found in the plot are counted and recorded. Commercial tree species and tree species, which produce NTFPs, are measured and recorded. The site condition such as crown coverage, soil moisture, streamlines, etc. is also remarked. Villagers, who are the forest users, assist identification of NTFP species. Therefore, employed villagers in the team are those people who are knowledgeable about NTFP and tree species, particularly people who frequently enter the forests for gathering and have settled in the village for long time.

5.4 Data Processing and Analysis

Data processing involves transforming recorded data in form of hard copy to soft copy by entering into the computer software such as Microsoft Excel.

Both qualitative and quantitative data are used in this research. Tables, figures and descriptions are used to analyze qualitative data. Quantitative data are analyzed through descriptive statistics. Mean, minimum, maximum, frequency and percentage are produced in normal Excel worksheets for the data gained from households. For data regarding NTFPs recorded from forest inventory, abundance, relative abundance and frequency are calculated in Pivot-table worksheets. Formulas applied in Pivot-table are as follows:

$$A_i = \frac{\sum_{i=1} N_i}{nP} \times 10000$$

Where,

A_i = abundance of NTFP species i

N_i = number of NTFP species i found in each sample plot

n = total number of sample plot

P = area of a sample plot

$$R.A_i = \frac{A_i}{N} \times 100$$

Where,

$R.A_i$ = relative abundance of NTFP species i per hectare

A_i = abundance of NTFP species i per hectare

N = grand total or sum of abundance of every NTFP per hectare

$$F_i = \frac{n_i}{n} \times 100$$

Where,

F_i = frequency of NTFP species i

n_i = number of sample plot which NTFP species i is presented

n = total number of sample plot

Abundance is number of a given species per hectare. Relative abundance is percentage of each species of the total number per hectare. Frequency is the occurrence of a given species in all sample plots and it is expressed as a percentage.

The entire research process is summarised in Figure 5.2.

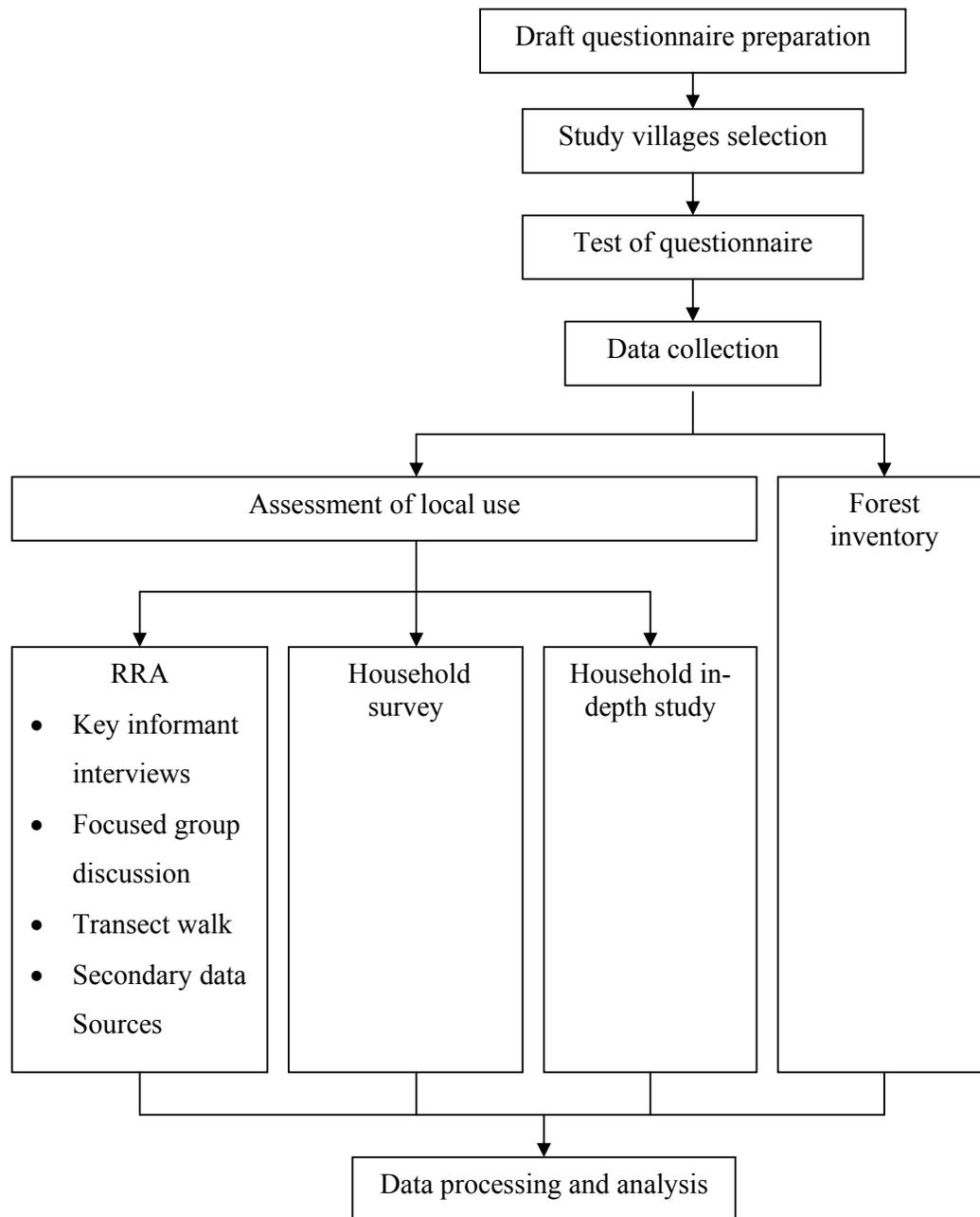


Figure 5.2: Overview of the research process

6 BRIEFING ON THE STUDY AREA

6.1 Geographical Location and Topography

Xaybouathong is one of 8 districts in Khammouane province located in central Laos (Figure 6.1) and established in 1994. Prior to 1994, it was a part of Mahaxay district. The district has an area of 84,975 ha and shares border with Mahaxay district in the north, Viraboury district (Savanakhet province) in the south, Burapa district in the east, Xebangfai district in the west. There are 44 villages with a total population of 19,266 (as per the year 2006).

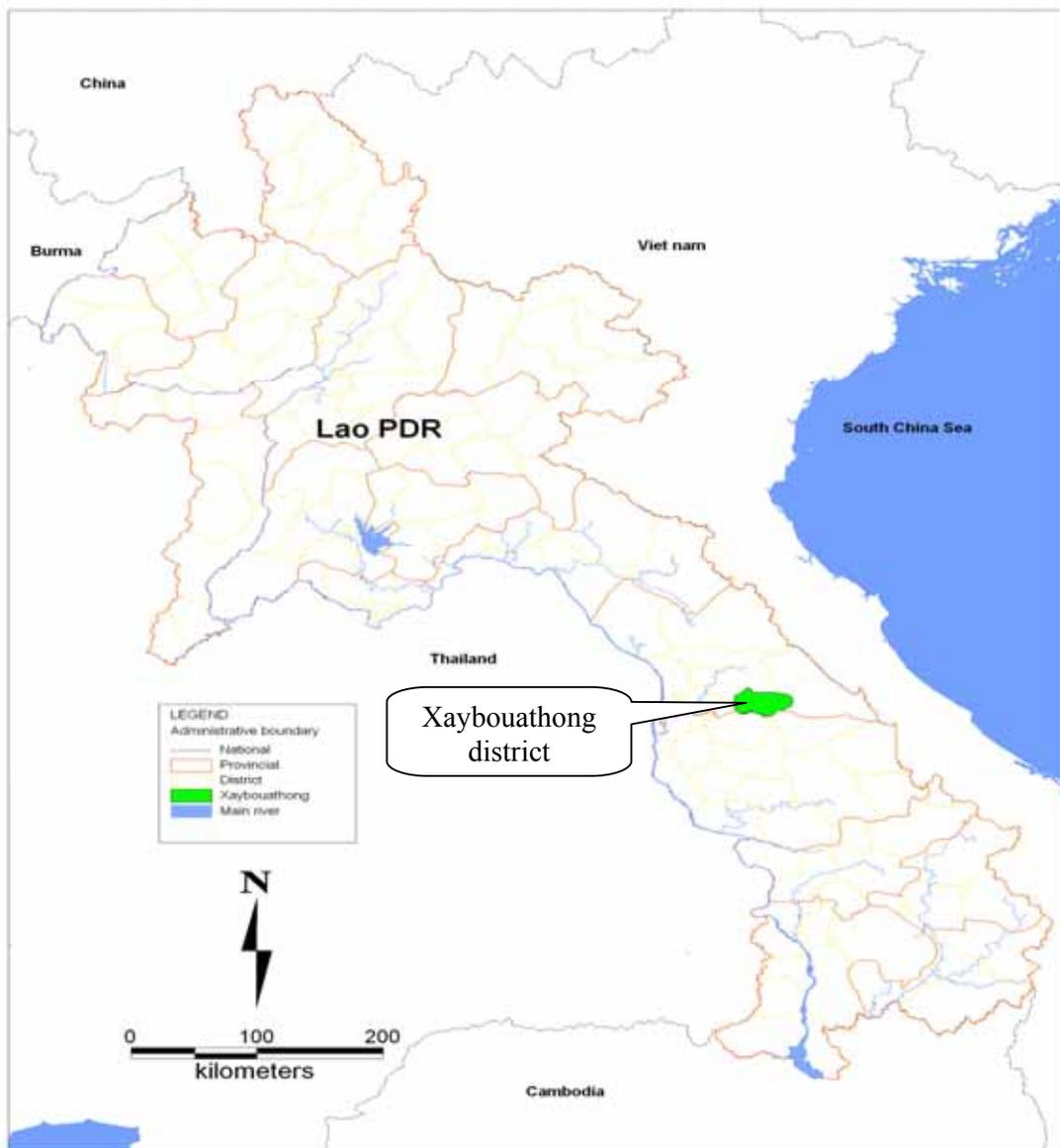


Figure 6.1: Location of the study area

Topography of the district is mostly flat. 20 % of the area is classified as mountain and limestone. The average altitude is around 260 m above the sea level ranging from 172 m to 567 m.

6.2 Bio-physical Environment

6.2.1 Climate

The climate of this region is influenced by tropical monsoon. It consists of 2 seasons: Dry season (November to April) and Rainy season (May to October). The mean annual rainfall is 2840.7 mm. The maximum rainfall is 931.1 mm in August and the minimum rainfall is 0.2 mm in November. The mean temperature is 18.5 °C. The maximum temperature is 36.1°C and the minimum temperature is 0.9°C (Khammouane Department of Meteorology and Hydrology from 2003 to 2005).

6.2.2 Forest Types

The district is divided into two production forests: Nongkapad-Nakating and Dongphouxoy. Main forest type is roughly classified as mixed deciduous forest. The rest are bamboo forest and open land or grassland. However, there is no particular information on the percentage of each forest type.

6.3 Study Villages

According to SUFORD management plan, the district has been divided into ten forest sub-management zones: Dongnakham, Nakhong, Paakasa, Namakmi, Kaengchon, Nakhamchouang, Naphao, Phasong, Kasae, and Namu.

Two villages, Nakhamchouang and Kasae, are selected for the study based on the set criteria. Nakhamchouang is located in Nakhamchouang forest sub-management zone and Kasae is located in Kasae forest sub-management zone (Figure 6.2).

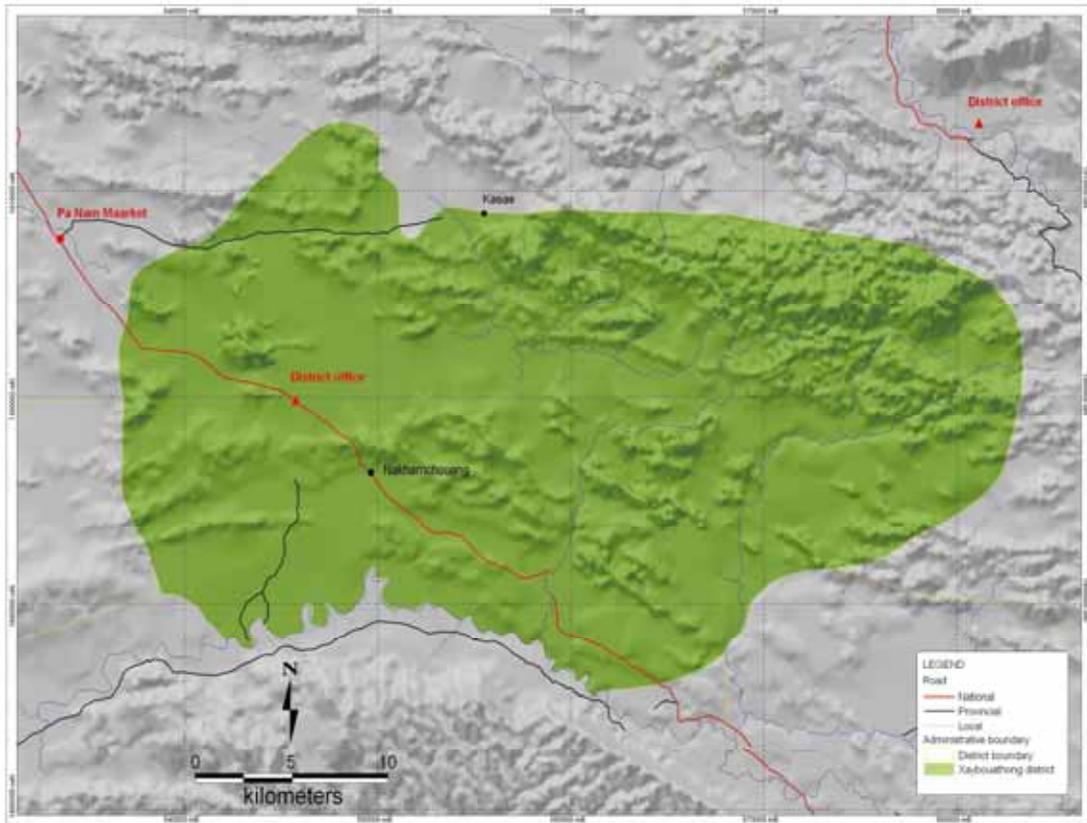


Figure 6.2: Location of Nakamchouang and Kasae villages

Socio-cultural conditions and ethnic affiliation of the households of the two study villages is similar. Characteristics of the villages selected for the study is presented in Table 6.1.

Table 6.1: Characteristics of the two study villages

Attributes	Nakhamchouang	Kasae
Access/season	Road from district centre 5 km/ year-round	Road from district centre (passed Ban Nakhong) 15 km/dry (available only for motorbike and hand tractor)
		Road from district centre (passed Nanoi Thong) 20 km/dry (available all vehicles)
		Road from Pa Nam (Mahaxay district) 25 km/year-round
Population/HHs	520/84	245/46
Village areas (ha)	2,885.61	3,137.99
Agricultural land (ha)	132.81	116.50
Forest (ha)	2,664.49	2,814.28
Ethnicity	Lao Loum	Lao Loum
Education	Primary school	Primary school 1-3 (No teachers since 2004)
Health facilities	Xaybouathong district hospital 5 km	Health centre at Ban Nanoi Thong 9 km
Market accessibility	Xaybouathong district market 5 km	Xaybouathong district market by 2 roads mentioned above
		Pa Nam market (Mahaxay district) 25 km
		Burapa district market 30 km

Source: Field survey 2006/2007

Nakhamchouang is located not too far from Xaybouathong district centre; hence it has better opportunity to access to the market than Kasae. Xaybouathong market is situated in the city centre. Thus, Nakhamchouang villagers can get to the market on foot or by vehicles such as bicycle, hand tractor* and motorbike. It takes around half an hour on foot from Nakhamchouang to the market. Kasae has low access opportunity to the market places because of the distance. However, three market places which can be accessed by vehicles for Kasae villagers are Xaybouathong market, Pa Nam market and Burapa district markets. Due to the road condition that is impassable in rainy season, Xaybouathong market is accessible only in dry season. The other two market places are accessible all the year round.

* Hand tractor is small farm machine. It is used not only for soil ploughing and raking but also for generating electricity, travelling and transportation.

Nakhamchouang covers the total area of 2,885.61 ha with 520 inhabitants or 84 households. The village is situated around 5 km from Xaybouathong district centre and has only a year-round available and rather well constructed access. Kasae covers the total area of 3,137.99 ha with 245 inhabitants or 46 households. The village is located far away from Xaybouathong district centre in contrast to Nakhamchouang. It has three accesses: 1) A road from Xaybouathong district passing Nakhong, around 15 km, which is available only in dry season. Since this road is cut by a big stream at around 6 km far from Kasae, normal two-wheel drive pick-up or car cannot take it. Thus, vehicles such as motorbikes, hand tractor and off-road or four-wheel drive vehicles can take this road. 2) A road from Xaybouathong district passing Nanoi Thong, around 20 km, which is also available only in dry season but better prepared than the first one. Thus, it is available for all vehicles except heavy loaded trucks. 3) Road from Pa Nam (Mahaxay district), 25 km, which is well prepared and year round available for all vehicles. This road extends to the Lao-Vietnamese border in Burapa district.

Nakhamchouang has a primary school but Kasae has poor access to schooling facilities. Although there is a primary school at Kasae, there has been no teacher since 2004. Therefore, Kasae school kids have to attend primary school at Thongkouang that is 6 km far away from the village. Secondary school is available at Xaybouathong town.

The nearest health care service of Nakhamchouang is Xaybouathong district hospital. For Kasae, villagers normally go to the health centre at Nakhong Thong if they have some health problem. In case of more than basic treatment required which cannot be handled by the health centre, then Xaybouathong district hospital would be the option.

The forest of the two study villages extends into a range of villagers' habitats. In the study villages, land allocation was carried out in 2005. Thus, village boundaries and forest areas are recognised by the villagers among the study villages and neighbouring villages. Nakhamchouang and Kasae cover forest areas of 2,664.49 ha and 2,814.28 ha, respectively. The rests of village area are agricultural land, bamboos, open areas or grasslands, which are also sources of many NTFPs beside the forests.

7 RESULTS AND DISCUSSION

7.1 Farming System in the Study Villages

Since the research was focused on “rural farm households”, it was required to learn about the farming system in the study villages. The components of farming system in the study villages are on-farm, out-farm and off-farm activities.

- On-farm activities:

On-farm activities comprise agriculture and livestock rearing. The main household agricultural production component in the study villages is rain fed paddy cultivation for being self-sufficient in the household. Other components are home garden, cash crop plantation, and swidden rice cultivation (Table 7.1).

Table 7.1: Agricultural activities in the study villages

Village	Attribute	Agricultural production			
		Rain fed paddy	Swidden rice	Cash crop	Home garden
Nakhamchouang (26 sampled HH)	Average area (ha)	0.82	0.04	0.17	0.002
	Min/max (ha)	0.20/4.00	0.20/0.50	0.02/2.00	0.0016/0.02
	No. of households	26	3	9	7
Kasae (14 sampled HH)	Average area (ha)	0.79	0.04	0.08	0.008
	Min/max (ha)	0.30/2.00	0.50/0.50	0.25/0.60	0.0016/0.04
	No. of households	13	1	3	10

Source: Field survey 2006/2007

Rain fed paddy cultivation is the most important component of the farming system that every sampled household at Nakhamchouang and 13 of 14 sampled households at Kasae are practicing. Swidden rice cultivation or shifting cultivation is still practiced by very few households only. This is resulting from the governmental encouragement of the farmers to eliminate this practice. Home garden that has the main components of various vegetables, chilli, sugar cane, bean, etc. is more practiced at Kasae, where water source is

more available than Nakhamchouang. Other cash crop plantations of banana, pineapple, sugar cane are also occupied by villagers in the study villages. The critical point regarding household agricultural activities is the differentiation of “home garden” and “cash crop plantation”. Home garden and cash crop plantation have more or less the same components of crops grown. By the name, home garden is a part of homestead whereas cash crop plantation is outside homestead. Cash crop plantation is mostly located far away from home or nearby water sources. It is sometimes located close to home but separated by fence.

Livestock is as important as agricultural crop production for household food security. Livestock commonly reared in the study villages are cattle, buffaloes, pigs and poultry. Goats and fish raised in artificial pond are rarely found (Table 7.2).

Table 7.2: Livestock raised by households in the study villages

Village	Attribute	Livestock					Total
		Cattle	Buffalo	Poultry	Pig	Goat	
Nakhamchouang (26 sampled HH)	Total livestock	77	14	273	43	8	407
	Average livestock	3	1	11	2	0	17
	Min/max	1/15	1/5	2/40	1/10	3/5	-
	No. of households	13	5	18	15	2	-
Kasae (14 sampled HH)	Total livestock	11	56	326	16	5	409
	Average livestock	1	4	23	1	0	29
	Min/max	1/4	1/35	5/100	1/5	5/5	-
	No. of households	5	7	13	7	1	-

Source: Field survey 2006/2007

Average livestock of a household at Nakhamchouang and Kasae is 17 and 29, respectively. Among these livestock, large numbers of poultry such as hens, cocks and ducks are found. At Nakhamchouang, average poultry of a household is 11. At Kasae, average poultry of a household is 23. Noticeably, poultry is more reared at Kasae than at Nakhamchouang. It is often sold for cash income besides other commodities that have low opportunities to sell. Poultry is normally purchased by foresters and project staff who work in this region, and traders who travel within Mahaxay, Burapa and Xaybouathong districts. A hen costs around US\$ 2.07 to US\$ 2.58 or 20,000 kip to 25,000 kip. A duck

costs US\$ 5.17 to US\$ 6.21 or 50,000 kip to 60,000 kip. Big livestock such as cattle and buffalo are also preferably raised in this region. These big livestock are not mainly reared for household consumption but for selling to fulfil cash requirement of the household. Cattle costs about US\$ 186.33 to US\$ 207.03 or 1,800,000 kip to 2,000,000 kip. On important occasions, such as wedding party, village festival, cattle is the major source of meat.

- Out-farm activities:

Out-farm activities, which involve NTFPs gathering and hunting/trapping in areas that do not belong to the individual farm household within the village area, also play an important role in the farming system of the study villages. At least one person in each household is engaged in collection of NTFPs for subsistence. NTFPs harvesting and selling in the two study villages is individually practiced by households. No NTFPs harvesting and selling groups are formed.

There is a variety of NTFPs available in forests and other surrounding areas in the two study villages. The collection period of NTFPs available in the study villages is presented in Figure 7.1.

NTFPs		Months											
Name	Scientific Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dipterocarpus wood resin		√	√	√	*	*	*	*	*	*	*	*	√
Damar/ Shorea wood resin		√	√	√	*	*	*	*	*	*	*	*	√
Burma mahogany	<i>Pentace burmanica</i> Kurz.	√	√	√	*	*	*	*	*	*	*	*	√
Berberine	<i>Cosciniium fenestratum</i> Gaertn.	√	√	√	*	*	*	*	*	*	*	*	√
Broom grass	<i>Thysanolaena maxima</i> (Roxb.) O.Ktze.		√	√									
Roof grass	<i>Imperata cylindrica</i> Beauv.	√	√										√
Cardamom	<i>Amomum longigulare</i> T.L.Wu								√	√			
Khon khaen	<i>Dracaena angustifolia</i> Roxb.			*	√	√	*						
Mushrooms	<i>Lentinus</i> spp.				*	√	√	*			√	√	*
Laos lady palm	<i>Rhapis laonensis</i> Becc,	√	√	√	√	√	√	√	√	√	√	√	√
Hardy sugar cane	<i>Saccharum arundinaceum</i> Retz.	√	√	√	√	√	√	√	√	√	√	√	√
Bamboo shoots					*	√	√	√	√	*			
Bamboo canes		√	√	√	√	√	√	√	√	√	√	√	√
Rattan canes and shoots		√	√	√	√	√	√	√	√	√	√	√	√
Wild vegetables			*	√	√	√	*						
Aquatic animals		√	√	√	√	√	√	√	√	√	√	√	√
Wildlife		√	√	√	√	√	√	√	√	√	√	√	√

Months: May- October is the rainy season; November- April is the dry season

√ Main collection period

* A lesser collected degree outside the main collection season

Source: Field survey 2006/2007

Figure 7.1: Working calendar for NTFPs collection in the study villages

Wildlife, aquatic animals, bamboo culms, rattan canes and shoots, Laos lady palm shoot and hardy sugar cane are available all seasons. They are harvested for both household consumption and selling throughout the year. Other NTFPs such as Dipterocarpus wood resin, damar, bark of Burma mahogany tree and berberine are also available all seasons but villagers prefer to harvest them mainly in the dry season. These NTFPs are mainly harvested for selling rather than household consumption. Except

damar, these NTFPs require processing after harvesting. Therefore, villagers normally collect them in the dry season that is the off-rice cultivation season or the season when people have time for other activities than rice production. Apart from these year-round NTFPs, broom grass, roof grass, bamboo shoots, mushrooms, wild vegetable (leaf parts) and shoots of *Dracaena angustifolia* are seasonally available.

- Off-farm activities:

Off-farm activities that offer opportunities to gain income in cash or kind are broadly classified into two types. The first is small business that means that the villagers have commodities placed in the house or kept in a separate hut as a shop such as salt, seasoning, fish sauce, sugar, petrol, utensils, etc. These goods are mainly sold to people within the village. Its income is mostly cash. The second is wages from various activities. The common activities in the study villages include tree-planting, rice replanting and harvesting, cleaning and slashing along the main road, collecting the branches of harvested trees for furniture, house post making and house building. The income derived from these activities can be cash or kind, e.g., the hired labour for rice harvesting gain rice as a return in case the farm owner does not have sufficient cash to pay. The cost of wages depends on activities, e.g., US\$ 1.55 or 15,000 kip per daily hired labour for rice replanting and harvesting; US\$ 1.86 or 18,000 kip per daily tree planting labour; US\$ 8.2 or 80,000 kip per one made house post, etc.

7.2 NTFPs Availability

7.2.1 NTFPs Listed by the Villagers

Total 69 and 68 NTFP species were identified at Nakhamchouang and Kasae, respectively (Appendix 2). At Nakhamchouang, it includes 4 aquatic animals, 59 plants and 6 wildlife species. At Kasae, it includes 4 aquatic animals, 58 plants and 6 wildlife species. Most of NTFPs are found in both study villages. Some of them are found only at Nakhamchouang and some are found only at Kasae.

NTFPs in the study villages are classified into seven main use groups according to SNV (2007) as presented in Table 7.3 and Appendix 3.

Table 7.3: NTFP use groups in the study villages

A. Plant foods	B. Fibres
Algae: (1)	Bamboo canes: (7)
Flowers: (1)	Leaf fibre: (2)
Fruits: (14)	Grass: (2)
Leaves: (11)	Rattan canes: (5)
Mushrooms: (5)	D. Extractives
Shoots: (17)	Resin: (2)
Tubers/roots: (2)	
C. Medicinal plants	E. Plants for other uses
Fruits: (1)	Bark: (1)
Stems: (1)	F. Charcoal and fuel wood
Stems/roots: (1)	Bamboo: (8)
Tubers/roots: (1)	Tree: (19)
	G. Animal products (separate group)
	Aquatic animal: (4)
	Wildlife (wild animal): (6)

() = Number of species

Note: Some NTFPs species produce more than one part of use (e.g. bamboo produces shoot as food and cane as fibre).

Source: Field survey 2006/2007

Plant foods include algae (*Spirogyra* spp.), flowers (flower of *Azadiracta indica* Juss.), fruits (fruit of Burma grape tree, etc.), leaves (leaf of *Careya sphaerica* Roxb., etc.), mushrooms (*Lentinus kurzianus* Gurr., etc.), shoots (bamboo shoots, etc.) and tubers/roots (*Dioscorea hispida* Venn, etc.). Fibres include products used as materials for house construction (e.g. bamboo culms used for walling and flooring; roof grass used for roofing), household utensils production (e.g. rattan canes used for making baskets), handicrafts production (e.g. leaf of pandanus used for making mats). Medicinal plants include fruit of cardamom and stem/root of berberine. These two products are mainly

used for selling (export to other countries) and very rarely consumed by households in the study villages. Other two medicinal plants that are consumed by households only are *Smilax glabra* Roxb. and *Pothos scandens* L.. *Pothos scandens* L. is locally used for treating stomachache. Extractives include Dipterocarpus wood resin and damar or Shorea wood resin. Dipterocarpus wood resin is used to produce torch for lighting. This torch is found to be traded within Nakhamchouang village and it is sometimes sold to people from neighbouring villages. Damar is not consumed by households. It is an export product. Charcoal and fuel wood are products derived from all bamboo and tree species. However, number trees presented in Table 7.3 are only those trees that produce NTFPs (bark, fruit, leaf and resin). It does not include other trees that grow in the forest of the study villages. Animal products include aquatic animal and wildlife as mentioned above. These products are used for household consumption (food) and selling as well. Noticeably, group of ornamentals, which is identified by SNV (2007), is not included in the list of NTFPs given the villagers. This is due to the plants such orchids and ferns are very rare in the study villages. Nevertheless, group of plants for other uses, which is not identified by SNV (2007), is found in this study. This group include bark of Burma mahogany tree that is used for chewing mainly by old people.

7.2.2 NTFPs Recorded from the Forest Inventory

NTFPs found in the forest inventory include only plant species. Wildlife and aquatic animals were not found in the sample plots. The forest inventory was carried out in mixed deciduous forest. Many species listed by the villagers were not found in the forest inventory. Since the forest inventory was conducted in the forested areas, non-forested areas, grassland and fallow land or abandoned shifting cultivation land are not included. Nevertheless, many plants grow on non-forested areas and grassland such as roof grass, hardy sugar cane, *Azadiracta indica* Juss., *Acacia pennata*, *Centalla asiatica* Urban., *Eugenia zeylanica* Wight., *Careya sphaerica* Roxb., etc. Fallow land is habitat of NTFP like broom grass. Mushroom species, only available in the rainy season, were not recorded since the forest inventory was carried out in the dry season. NTFPs which occur in streams, e.g. algae could not be recorded either. NTFP like *Dioscorea hispida* Venn., a perennial climber which produces tuber, has no leaf in the dry season. This makes difficult for recording this plant in the sample plot.

At Nakhamchouang, 20 NTFPs were recorded from the forest inventory and they are shown in Table 7.4.

Table 7.4: NTFPs recorded from the forest inventory at Nakhamchouang

No	Lao/ English Name	Scientific Name	Abundance	Relative abundance	Frequency
			N/ha	%	%
1	San/Laos lady palm	<i>Rhapis laoensis</i> Becc.	1,300	40.25	100.00
2	Tong kuang/-	<i>Ancistrocladus tectorius</i> Merr.	877	27.15	100.00
3	Wai hang noo/rattan	<i>Calamus tetradactylus</i> Hance.	489	15.14	93.75
4	Mak naeng/cardamom	<i>Amomum longigulare</i> T.L.Wu.	227	7.02	50.00
5	Tao kai/palm	<i>Didymosperma caudatum</i> W.	124	3.84	87.50
6	Wai khaet/rattan	<i>Calamus palustris</i> Griff.	65	2.02	43.75
7	Khon khaen/-	<i>Dracaena angustifolia</i> Roxb.	58	1.80	75.00
8	Wai khom/rattan	<i>Calamus viminalis</i> Willd.	49	1.51	31.25
9	Mai ka saen/bamboo	<i>Neohouzeana mekongensis</i> Buse.	16	0.50	12.50
10	Mak fai/ Burma grape	<i>Baccaurea ramiflora</i> Lour.	9	0.28	25.00
Sub-Total			3,213	99.50	
10 Others*			16	0.50	
Grand Total			3,229	100	

Note: total number of sample plot is 16.

* See Appendix 5

Source: Field survey 2006/2007

At Nakhamchouang, the total abundance of NTFPs is 3,229 plants per ha or 3,229 NTFP plants occupy in one hectare of the forest of this village. Laos lady palm has the highest abundance of 1,300 plants per ha or it occupies 40.25 % of the total abundance. *Ancistrocladus tectorius* and *Calamus tetradactylus* occupy 27.15 % and 15.14 %, respectively, of total abundance. Thus, among NTFP species, these three NTFPs dominate the mixed deciduous forest of this village. Laos lady palm and *Ancistrocladus tectorius* have the frequency of the occurrence of 100 % or they are found in all sample plots. *Calamus tetradactylus* has the frequency of the occurrence of 93.75 % or it is found in 15 out of 16 sample plots. Hence, it can be stated that three NTFPs Laos lady palm, *Ancistrocladus tectorius* and *Calamus tetradactylus* are widely distributed over the mixed deciduous of this village. Noticeably, two NTFPs *Didymosperma caudatum* and *Dracaena angustifolia* do not occupy high abundance as compared to three NTFPs that

have been mentioned before. However, they have the frequency of the occurrence of 87.5 % and 75 %, respectively. Thus, they are rather widely distributed in the mixed deciduous of this village. Other NTFPs are classified as low abundance species and they are not widely distributed in the mixed deciduous of this village.

At Kasae, 20 NTFPs were recorded from the forest inventory and they are presented in Table 7.5.

Table 7.5: NTFPs recorded from the forest inventory at Kasae

No	Lao/ English Name	Scientific Name	Abundance	Relative abundance	Frequency
			N/ha	%	%
1	San/Laos lady palm	<i>Rhapis laoensis</i> Becc.	2,213	54.54	100.00
2	Wai hang noo/rattan	<i>Calamus tetradactylus</i> Hance.	853	21.03	100.00
3	Tong kuang/-	<i>Ancistrocladus tectorius</i> Merr.	751	18.52	100.00
4	Mak naeng/cardamom	<i>Amomum longigulare</i> T.L.Wu.	75	1.85	43.75
5	Khon khaen/-	<i>Dracaena angustifolia</i> Roxb.	59	1.45	62.50
6	Tao kai/palm	<i>Didymosperma caudatum</i> W.	22	0.55	56.25
7	Mai hia/bamboo	<i>Schizostachyum zollingeri</i> Steud.	21	0.52	37.50
8	Wai khaet/rattan	<i>Calamus palustris</i> Griff.	16	0.39	43.75
9	Teay/pandanus	<i>Pandanus fibrosus</i> Gagnep.	12	0.28	12.50
10	Mak fai/ Burma grape	<i>Baccaurea ramiflora</i> Lour.	4	0.11	25.00
Total			4,029	99.34	
10 Others*			29	0.66	
Grand Total			4,058	100	

Note: total number of sample plot is 16.

* See Appendix 5

Source: Field survey 2006/2007

At Kasae, the total abundance of NTFPs is 4,058 plants per ha. From the first 10 lists of NTFPs, three NTFPs Laos lady palm, *Calamus tetradactylus* and *Ancistrocladus tectorius* occupy 54.54 %, 21.03 % and 18.52 %, respectively, of the total abundance. Therefore, among NTFP species, these three NTFPs dominate the mixed deciduous forest of this village. Laos lady palm, *Calamus tetradactylus* and *Ancistrocladus tectorius* have the frequency of the occurrence of 100 %. Thus, they are widely distributed in the mixed

deciduous forest of this village. Other NTFPs are classified as low abundance species and they are not widely distributed in the mixed deciduous of this village.

The result of the forest inventory shows that NTFPs availability in the mixed deciduous forest of the two study villages is similar. Among NTFP species, Laos lady palm (*Rhapis laoensis*) is the dominating species, regarding the abundance, followed by *Calamus tetradactylus* and *Ancistrocladus tectorius*.

Moreover, from the finding of this study it can be assumed that if the forest area is enlarged by the effect of the SUFORD project such as establishment of tree plantation on non-forested areas and enrichment planting on fallow lands, then NTFPs that grow in the forested areas would be increased in the availability. On the other hand, NTFPs that grow on non-forested area such as roof grass, hardy sugar cane, *Azadiracta indica* Juss., *Acacia pennata*, *Centalla asiatica* Urban., *Eugenia zeylanica* Wight., *Careya sphaerica* Roxb. would most likely be reduced in the availability due to the loss of habitats.

7.3 Role of NTFPs in Households

7.3.1 Share of NTFPs in Household Cash Income

In the study villages, farm products are sold by the villagers to generate cash income that covers the following major types of expenditures:

- Farm inputs (farm machine, petrol, equipments, labour employment);
- Essentials for daily life (clothes, house wares, utensils, etc.);
- Medicine and hospital service;
- Non-farm produced food essentials (salt, seasoning, fish sauce, etc.);
- Miscellaneous stuffs (stationeries, cigarettes, etc.);
- Others.

Villagers often enter to the forest for collecting some NTFPs and sell them to get food essentials such as salt, etc. Moreover, farm products e.g. rice that exceed household consumption are also sold. Household cash incomes are derived from various sources

such as farm products selling (rice, cash crops and livestock), NTFPs selling and off-farm activities (small business and wages) (Table 7.6). NTFPs can be included in both on-farm and out-farm activities. NTFPs harvesting from plantation or home garden is classified as on-farm activities. NTFPs harvesting from natural forest or other lands that do not belong to the individual farm area is classified as out-farm activities. However, domestication of NTFPs on farmland is rare in the two study villages. Therefore, NTFPs that are source of cash income in the study villages is from out-farm activities.

Table 7.6: Annual household cash income from different sources

Income sources	Nakhamchouang (26 sampled HH)		Kasae (14 sampled HH)	
	US\$	%	US\$	%
Rice selling	26.30	8	7.39	3
Cash crops selling	2.81	1	0.00	0
Livestock selling	125.42	39	64.32	28
NTFPs selling	114.21	35	8.60	4
Wage	45.15	14	143.94	63
Small business	10.53	3	3.33	1
Total	324.41	100	227.58	100

Source: Field survey 2006/2007

At Nakhamchouang, total annual household cash income is US\$ 324.41. The main sources of household income are livestock and NTFPs. Livestock contributes US\$ 125.42 or 39 %, and NTFPs contribute US\$ 114.21 or 35 % to annual household income. Apart from those two main sources, household income is derived from wages, rice, small business and cash crops.

At Kasae, total annual household cash income is US\$ 227.58. The major household incomes are wages and livestock. Wage income contributes US\$ 143.94 or 63 % of total annual household income. Livestock income contributes US\$ 64.32 or 28 % of total household income. Noticeably, Kasae villagers gain cash income from wages more than Nakhamchouang villagers do. NTFPs contribute only US\$ 8.60 or 4 % to annual household income. Other minor income sources are rice and small business.

The result of this study indicates the differences of annual household cash income from different sources between the two study villages. Income from selling rice is higher at Nakhamchouang village than at Kaese. The reason is Nakhamchouang villagers mostly

sell rice for cash whereas Kasae villagers often exchange rice with petrol (using for house lighting, vehicles and farm machines). This is due to Kasae is far way from Xaybouathong town where the petrol is available. Cash crops are brought by the villagers to sell in Xaybouathong market or town. No middlemen are seeking to buy these products. Thus, Kasae that is far away from Xaybouathong market or town has low opportunity to sell cash crops. Livestock is purchased by the middlemen or the consumers, mostly from Xaybouathong town, in the villages. Hence, Nakhamchouang villagers have more opportunities to sell this product than Kasae villagers do. This makes the contribution of NTFP selling to annual household cash income at Nakhamchouang is more than at Kasae. Wage in both study villages is derived from rice planting and harvesting, cleaning and slashing along the main road, collecting the branches of harvested trees for furniture, house post making and house building. Annual household cash derived from these activities vary from US\$ 31 or 300,000 kip to US\$ 186 or 1,800,000 kip. At Kasae, 28 % of total sampled households have wage from tree planting (as a daily labour in rubber tree and eucalyptus tree plantation in Hinboune district, Khammouane province that is far away from Xaybouathong district) that is not practiced by Nakhamchouang villagers. Annual household cash derived from this activity vary from US\$ 373 or 3,600,000 kip to US\$ 414 or 4,000,000 kip. This makes the contribution of wage to annual household cash income at Kasae is more than at Nakhamchouang. From the finding regarding wage, it can be stated that due to less opportunities to gain cash income from selling products such as rice, cash crops, NTFPs and livestock as compared to Nakhamchouang, Kasae villagers leave their village for earning cash by other means in other regions. Small business, which includes selling goods such as salt, fish sauce, etc. within the village, contributes less cash to annual household income at Kasae as compared to Nakhamchouang.

NTFPs are traded by two ways (Appendix 5): 1) the villagers bring them to sell in Xaybouathong market or town and 2) middlemen and consumers (mostly from Xaybouathong town and some from neighbouring villages) come to the study villages for purchasing by themselves. At Nakhamchouang, villagers can sell NTFPs by both two ways. At Kasae, villagers can sell NTFPs only to middlemen or consumers who come to the village. Thus, Nakhamchouang villagers have more opportunities to sell NTFPs than Kasae villagers do. This makes the contribution of NTFP selling to annual household cash income at Nakhamchouang is more than at Kasae.

Household cash income derived from NTFPs has been analyzed in several other studies from Nakai district, a neighbouring district of Xaybouathong, Khammouane province. The study in the five villages in 1997 revealed that NTFPs contribute 41 % of total annual household cash income (Foppes *et al.*, 2004). The study in other six villages in 2000 revealed that NTFPs contribute 53 % of total annual household cash income (IUCN, 2000). Therefore, the findings regarding the percentage of NTFPs in total annual household cash income in the two study villages of this study are lower than the findings of other two studies.

From the finding of this study, however, it reveals that NTFPs is significantly important to household cash income generation at Nakhmchouang, which is nearby the market, but not at Kasae, which is far away from the market. The other studies referred to in this study do not elaborate on the situation related to marketing opportunities.

7.3.2 Quantities and Values of Collected Important NTFPs

Quantities of some important harvested NTFPs are shown in Table 7.7. These NTFPs are used for food, except *Dipterocarpus* wood resin that is used for firewood and lighting, and selling.

Table 7.7: Quantity of some important NTFPs collected by households in the study villages

No	NTFPs		Part of uses	Average collected Quantity [kg/year]					
	Name	Scientific Name		Nakhamchouang			Kasae		
				Con- sumed	Sold	Total	Con- sumed	Sold	Total
1	Laos lady palm	<i>Rhapis laoensis</i> Becc.	Shoots	188.0	93.1	281.1	207.1	0.0	207.1
2	Hardy sugar cane	<i>Saccharum arundinaceum</i> Retz.	Shoots	129.4	23.1	152.5	111.5	0.0	111.5
3	Wai khaet	<i>Calamus palustris</i> Griff.	Shoot	10.9	29.3	40.2	6.6	0.0	6.6
4	Wai khom	<i>Calamus viminalis</i> Willd.	Shoot	14.9	48.3	63.2	0.0	0.0	0.0
5	Roof grass	<i>Imperata cylindrica</i> Beauv.	Leaf	198.0	39.73	237.73	243	0.0	243
6	Khon khaen	<i>Dracaena angustifolia</i> Roxb.	Shoot	2.6	2.9	5.5	3.1	0.0	3.1
7	Dipterocarpus wood resin		Resin	23.1	5.5	28.6	42.0	0.0	42.0
8	Damar		Resin	0.0	0.6	0.6	0.0	35.6	35.6
9	Berberine	<i>Cosciniium fenestratum</i> Gaertn.	Root/ stem	0.0	0.0	0.0	0.0	1.1	1.1
10	Cardamom	<i>Amomum longigulare</i> T.L.Wu.	Fruit	0.0	0.3	0.3	0.0	0.4	0.4
11	Broom grass	<i>Thysanolaena maxima</i> (Roxb.) O.Ktze.	Flower	2.0	2.3	5.3	1.9	0.0	1.9
12	Burma mahogany	<i>Pentace burmanica</i> Kurz.	Bark	0.6	0.0	0.6	1.1	0.2	1.3

Source: Field survey 2006/2007

At Nakhamchouang, NTFPs that provide edible shoots and non-edible NTFPs such as Dipterocarpus wood resin are harvested for both household consumption and selling. Notably, the shoots of Laos lady palm and hardy sugar cane are often mentioned by the villagers. The shoot of Laos lady palm is annually harvested 281.1 kg per household. 188 kg or 66.8 % of this quantity is consumed by household. 152.5 kg of the shoot of hardy sugar cane is annually collected by a household and 129.4 kg or 84.8 % of this quantity is consumed by household. The other shoots of rattan such as *Calamus palustris* and *Calamus viminalis* are also gathered for both household consumption and selling. Noticeably, more than a half of harvested rattan shoots are used for selling. 29.3 kg or 72.8 % of harvested shoot of *Calamus palustris* and 48.3 kg or 76.4 % of harvested shoot of *Calamus viminalis* are sold. Rattan shoots that have habitat far away from the village are often gathered by the villagers for selling rather than for household consumption. The reason is that villagers prefer to have a return once they have spent time and their energies to harvest these NTFPs. For household consumption, they can

collect NTFPs such as Laos lady palm, hardy sugar cane, and other wild vegetables which are available nearby the village. Non-edible NTFPs such as broom grass, Dipterocarpus wood resin and roof grass are harvested for both household consumption and selling. Non-edible NTFPs such as damar (Shorea wood resin) and medicinal plant such as fruit of cardamom are also harvested and used for selling only.

At Kasae, important NTFPs are mainly used only for household consumption. They are shoots (of Laos lady palm, hardy sugar cane, rattans, *Draceana angustifolia*), leaf of roof grass, flower of broom grass and Dipterocarpus wood resin. Only few NTFPs that are not consumed by household but they are used for selling only. These NTFPs are damar, bark of Burma mahogany, berberine and fruit of cardamom are traded. Noticeably, 35.6 kg of dammar is sold by a household at Kasae whereas only 0.6 kg of damar is sold at Nakhamchouang.

By combining those quantities with the market prices, the value of the NTFPs collected by household is calculated and presented in Table 7.8.

Table 7.8: Value of some important NTFPs collected by households in the study villages

No	NTFPs		Part of uses	Average value [US\$/year]					
	Name	Scientific Name		Nakhamchouang			Kasae		
				Con-sumed	Sold	Total	Con-sumed	Sold	Total
1	Laos lady palm	<i>Rhapis laoensis</i> Becc.	Shoot	64.44	32.29	96.73	71.80	0.00	71.80
2	Hardy sugar cane	<i>Saccharum arundinaceum</i> Retz.	Shoot	29.76	5.34	35.10	25.78	0.00	25.78
3	Wai khaet	<i>Calamus palustris</i> Griff.	Shoot	2.82	7.62	10.44	1.71	0.00	1.71
4	Wai khom	<i>Calamus viminalis</i> Willd.	Shoot	3.86	12.57	16.42	0.00	0.00	0.00
5	Roof grass	<i>Imperata cylindrica</i> Beauv.	Leaf	7.33	1.49	8.82	9.00	0.00	9.00
6	Khon khaen	<i>Dracaena angustifolia</i> Roxb.	Shoot	0.90	1.01	1.92	1.07	0.00	1.07
7	Dipterocarpus wood resin		Resin	9.58	2.29	11.87	17.48	0.00	17.48
8	Damar		Resin	0.00	0.09	0.09	0.00	5.53	5.53
9	Berberine	<i>Cosciniium fenestratum</i> Gaertn.	Root/stem	0.00	0.00	0.00	0.00	0.44	0.44
10	Cardamom	<i>Amomum longigulare</i> T.L.Wu.	Fruit	0.00	0.42	0.42	0.00	0.62	0.62
11	Broom grass	<i>Thysanolaena maxima</i> (Roxb.) O.Ktze.	Flower	2.08	2.39	1.47	1.13	0.0	1.13
12	Burma mahogany	<i>Pentace burmanica</i> Kurz.	Bark	0.32	0.0	0.32	0.58	0.11	0.69
Total				121.09	65.50	188.09	128.55	6.70	135.24
Percent				65	35	100	95	5	100

Source: Field survey 2006/2007

At Nakhamchouang, the total value based on market prices of NTFPs harvested by a household is US\$ 188.09. US\$ 121.09 or 65 % of the total value is used for household consumption or non-cash income. US\$ 65.50 or 35 % contributes to household cash income.

At Kasae, the total value based on market prices of NTFPs harvested by a household is US\$ 128.55. US\$ 119.67 or 95 % is used for household consumption or non-cash income. Only US\$ 6.70 or 5 % contributes to household cash income.

Percentage of household cash and non-cash income has been analyzed in several studies. The study in the five villages, Nakai district (Khammouane province) in 1997

revealed that NTFPs contributes 39 % and 61 % to household non-cash and cash income, respectively (Foppes *et al.*, 2004). The study in the three villages in Lamam district, Sekong province (the South) in 2003 indicated that 84 % and 16 % of collected NTFPs accounts for household non-cash and cash income, respectively (Rosales *et al.*, 2003). The percentage of NTFPs contributed to household non-cash income at Nakhamchouang of this study is higher than the finding of the study in the five villages, Nakai district (Khammouane province) in 1997. However, it is lower than the findings of study in the three villages in Lamam district (Sekong province) in 2003. The percentage of NTFPs contributed to household non-cash income at Kasae of this study is higher than the findings of other two studies.

From the finding of this study, it is summarized that the contribution of NTFPs to household consumption or non-cash income is more significant than to household cash income in both study villages. By comparing both value and percentage, however, the contribution of NTFPs to non-cash income at Kasae that is far away from the market is higher than Nakhamchouang that is nearby the market.

7.4 Factors Influencing Selected NTFPs Commercialization

In general, there is no restricted regulation regarding NTFPs harvesting and selling in the two study villages. Every forest area and other lands, which are outside the individual farm area within the village, is accessible to the villagers for hunting and gathering without any restriction. All NTFPs, except berberine and some wildlife species such as mammals, can be harvested and sold freely by the villagers. This could currently be a positive factor that supports the villagers to maximise the income from NTFPs commercialization. Berberine can be harvested without permission from the government for household consumption. In case of commercial purpose, it requires quota permitted by the government prior to harvesting due to the trend of rapid depletion of this species (SNV, 2007:50). The process of granting NTFP quotas runs theoretically as follows. A company or trader who is interested in trading NTFPs makes a bid to the provincial administration. The bidder requests approval to buy a specific amount, which they themselves decide upon, taking into account how much of the resource they think is available, and how much of the resource they expect to process and/or trade. The provincial administration then puts the request to the central government. Theoretically, a

process of resource assessment then takes place. This is supposed to refer to information on the location and abundance of the resource, as well as information about extraction methods, prices, and so on. The assessment process supposedly sees Provincial officials gathering information at the village level, including first-hand estimation of forest resources. Quotas are then given not just for provinces as a whole, but for specific areas, even specifying villages. The government may also take into consideration the record of the company in question, among other variables. Once they have a quota, the companies or traders then contract villagers to harvest desired NTFPs (Enfield *et al.*, 1998:16). Quota system is a critical and complicated issue. The quotas are not based on any assessments of natural resources but only on the application of traders (GTZ, 2005: 15). However, it was found that berberine is traded by a household at Kasae during the field research. Villagers who sold berberine gave the explanation that they found this product on their land that was prepared for rice growing. If they did not collect, it would be burnt. Hence, they collected it and asked permission from the village chief before selling to the middlemen who came round the village for seeking to purchase other products.

At Nakhmchouang, 15 NTFPs are traded (Appendix 5). Most of these products are locally consumed. They are mostly sold in the local market or Xaybouathong town. Traded NTFPs at Nakhmchouang are classified into two groups: unprocessed products and processed products. Two products, Laos lady palm shoot (unprocessed product) and broom grass (processed product), were selected for SWOT analysis based on their contribution to annual household cash income.

Laos lady palm shoot was selected since it contributes the most proportion of cash income to household as compared to other unprocessed products at Nakhmchouang (Appendix 5). Factors that influence this product commercialization are presented in Table 7.9.

Table 7.9: SWOT profile for Laos lady palm commercialization at Nakhamchouang

Strengths	Weaknesses
<ul style="list-style-type: none"> -Abundant in the forest -Available nearby the village -Fast regeneration -Available in all seasons -No processing required 	<ul style="list-style-type: none"> -Harvesting the shoot is destructive to the plant
Opportunities	Threats
<ul style="list-style-type: none"> -No restricted rule for harvesting and selling -Near the local market and Xaybouathong town 	<ul style="list-style-type: none"> -Exceed the local market demand resulting in low price -Lack of middlemen

Source: Field survey 2006/2007

Since Nakhamchouang is only 5 km far from Xaybouathong town which is the location of the local market. Hence, villagers have opportunities to bring NTFPs to sell in local market or directly to consumers as “knock the door selling” visiting household by household. Villagers can get to the market on foot or by bicycle. At the same time, consumers who live in Xaybouathong town can come to the village for purchasing NTFPs by themselves.

Laos lady palm has high abundance in the forest as mentioned in chapter 7.2.2. It is available nearby the village. It takes around 10-15 minutes to get to its habitat. One household can gather at least 4 kg of Laos lady palm shoot per day and they would be able to earn US\$ 1.34 or 13,000 kip (300 g cost US\$ 0.104 or 1,000 kip). While a household spends whole day for harvesting 25 shoots, in average, of *Calamus palustris* that has lower abundance as compared to Laos lady palm and they would be able to earn only US\$ 0.52 or 5,000 kip (5 shoots cost US\$ 0.104 or 1,000 kip). However, one household can sell only 1.5 kg (US\$ 0.51 or 5,000 kip), in average, of shoot of Laos lady palm per day. This is due to the fact that it is traded only in Xaybouathong which is a little populated district. Moreover, no middlemen are seeking to purchase it for selling in other districts. Even worse, its price, sometimes, goes down to a half of normal price since its supply exceeds the demand in the local market. Laos lady palm shoot is available throughout the year, villagers can harvest it whenever they want or when they have time.

They can sell it immediately after harvesting since it does not require any processing. Laos lady palm dies after the shoot is harvested since it produces only one shoot in a plant. Nevertheless, it has fast regeneration. It takes one or two years to grow and produce shoot which can be harvested (SNV, 2007:100).

Broom grass was selected since it contributes the most proportion of cash income to household as compared to other processed products at Nakhamchouang (Appendix 5). Factors that influence this product commercialization are presented in Table 7.10.

Table 7.10: SWOT profile for broom grass commercialization at Nakhamchouang

Strengths	Weaknesses
<ul style="list-style-type: none"> -Available in the dry season -Fast regeneration -It can be stored for many years 	<ul style="list-style-type: none"> -Harvesting the flower is destructive to the plant -Trend to reduce in the availability due to loss of natural habitats
Opportunities	Threats
<ul style="list-style-type: none"> -No restricted rule for harvesting and selling -Near the local market and Xaybouathong town -Market demand in Thailand 	<ul style="list-style-type: none"> -Low local market demand -Lack of middlemen

Source: Field survey 2006/2007

The flower of broom grass is available in the dry season that is off rice season. Therefore, villagers have time to be involved in broom grass processing. This is the positive factor supporting this product commercialization. Nevertheless, this NTFP has trend to reduce in the availability. This NTFP normally grows well in fallow lands, abandoned shifting cultivation lands up to 5 years, which have not too dense crown covering. In the study villages, shifting cultivation has been eliminated as mentioned in chapter 7.1. Consequently, abandoned shifting cultivation lands now have dense covering. Thus, the habitat of broom grass has been declining. The flowering stem of the plant, usually half a meter or more, is required to prepare broom. Broom grass is a small plant up to 3 meters. Harvesting some parts of a small plant can destructs whole the plant or the plant even dies. However, it takes only one or two years to grow and can produce flower (SNV, 2007:126). Similar to Laos lady palm selling, there are no middlemen to purchase this product for selling in other districts. One household can harvest flower of broom

grass for producing at least 50 brooms per one season. But, one household produce and sell 16 brooms, in average, per one season to consumers in Xaybouathong district. No middlemen are seeking to purchase this product for selling in other districts. However, villagers can keep this product for selling in many seasons if they cannot sell all products that they produce in one season. Broom grass has market demand in Thailand. SNV (2007:126) revealed that 200 tonnes of brooms were exported to Thailand in 2000.

SWOT analysis in this study is applied only for products that are commercialised by the villagers. At Kasae, Laos lady palm and broom grass are not sold by the villagers due to the distance of the village that is far away from the market as compared to Nakhamchouang. Thus, SWOT analysis of Laos lady palm and broom grass commercialization is not applied for Kasae. Except the location that is far way from the market, Laos lady palm and broom grass at Kasae have similar factors regarding Strengths, Weaknesses and Opportunities. Similar Threats would be assumed at Kasae if these products are commercialized like as Nakhamchouang.

At Kasae, 5 NTFPs are traded (Appendix 5). They are traded through the middlemen. Traded NTFPs at Kasae are classified into two groups: unprocessed and processed products. Two products, damar and cardamom, were chosen for SWOT analysis based on their contribution to annual household cash income.

Damar was selected since it contributes the most proportion of cash income to household as compared to other unprocessed products at Kasae (Appendix 5). It is also sold by Nakhamchouang villagers. Factors that influence this product commercialization in the two study villages are similar as presented in Table 7.11.

Table 7.11: SWOT profile for damar commercialization in the study villages

Strengths	Weaknesses
-Available all seasons -No processing required	-Shorea trees are not abundant in the forest -Damar is slowly produced -Shorea trees are cut by the villagers
Opportunities	Threats
-No restricted rule for harvesting and selling -District middlemen from Xaybouathong, Burapa and Mahaxay -Village middlemen -Market demand in Thailand and Vietnam	- SUFORD has trees harvesting plan that includes Shorea species

Source: Field survey 2006/2007

Although Kasae is far away from the market in contrast to Nakhmchouang, it is crossing by a road from Mahaxay district to Burapa district as mentioned in 6.3. This road is often passed by the traders/middlemen who are seeking to buy products for exports. Nakhmchouang, which is nearby the Xaybouathong town, is also often accessed by the traders. Therefore, these traders/middlemen become an opportunity for NTFPs selling in the two study villages.

Damar is available all the year round. Villagers can collect it whenever they want or when they are not engaged with the rice production. It does not require any processing before selling. Thus, it can be sold immediately after it is collected from the forest. Another attraction for selling this product is the middlemen. Besides the middlemen from Xaybouathong, Mahaxay and Burapa districts, there is one village middleman who has bought all the damar gathered by the villager. The villagers sell damar to this middleman immediately after collection from the forests. In case of cardamom, villagers sell directly to the middlemen from Xaybouathong. Thus, they have to store this product after processing and wait for the middlemen. Damar is product for export using in the manufacture of paper or wood varnishes and lacquers and some paints as well as in printing ink (Nicholson, 1997:5). It is mainly exported to Thailand and Vietnam (SNV, 2007: 118). In the study villages, villagers observed that the quantity of damar is decreasing day by day. This is due to Shorea trees, which are source of damar, are not

abundant in forests (Appendix 4). Moreover, Shorea trees produce damar slowly due to no tapping is practised in the study villages. Damar is naturally secreted from Shorea trees. It is estimated that a single tree, with the height of 15 – 20 m, can naturally produce about 3-5 kg of damar per year (Baird *et al.*, 2004:18). Nevertheless, tapping of damar can be done by making a V-shaped cutting in the bark. This tapping is practiced in Nakai plateau, Khammouane province (www.poweringprogress.org/lao-energy/nt/nt2socecocultural.htm). When tapping is done, a Shorea tree, with diameter of 25 cm or 20 years old, produces around 48 kg of damar per year (www.fao.org/docrep/v9236e/V9236e07.htm). One negative trend of damar production in the study villages is logging. Shorea trees are still cutting down by the villagers for house construction. There is no village regulation for preserving this tree species. Moreover, this tree species is contained in the logging list of SUFORD. At Kasae, around 10 m³ of Shorea trees will be harvested in each year of 2008 and 2009*. At Nakhamchouang, around 8 m³ of Shorea trees will be harvested in 2008*. Thus, this tree species will be reduced in the availability.

Cardamom was selected since it contributes the most proportion of cash income to household as compared to other processed products at Kasae (Appendix 5). It is also sold by the Nakhamchouang villagers. Factors that influence this product commercialization in the two study villages are similar as presented in Table 7.12.

* Source: SUFORD list of tree species for harvesting (2007)

Table 7.12: SWOT profile for cardamom commercialization in the study villages

Strengths	Weaknesses
-Available nearby the village	-Available only in the rainy season -Labour competition with paddy rice cultivation -Trend to reduce in the availability because of competition of other plants
Opportunities	Threats
-No restricted rule for harvesting and selling -District middlemen from Xaybouathong, Burapa and Mahaxay -Market demand in China	-Low market price

Source: Field survey 2006/2007

Cardamom is available nearby the village. It takes around 20 - 30 minutes to get to its habitat. Thus, villagers can collect and carry big quantity of fresh fruits of cardamom to the village for drying. The price of dried fruits of cardamom sold to middlemen at the study villages vary from US\$ 1.035 to US\$ 1.55 or 10,000-15,000 kip per kg. In Phongsaly province (the North), cardamom price was up to US\$ 4.65 or 45,000 kip per dried kg (Seng *et al.*, 2005:5). Therefore, the price is low in the study villages as compared to Phongsaly province. This is a weakness of cardamom in this village. Another weakness is collection season. Mature fruit of cardamom is available only in the rainy season when the villagers are busy with paddy rice production. Cardamom is traditionally dried using direct sunlight if there is a clear sky, or over fire in the house. Drying by the sunlight takes 10 days or more. Drying over fire takes around 4 or 5 days. Since drying is done in the rainy season, fire drying is more practical than sunlight drying. Kvitvik (2002:8) revealed that over fire drying reduces the oil content and quality of the seeds, and it is also impossible to avoid some smell and taste of smoke, especially if the wood is not dry. Therefore, low quality of dried cardamom results in low price. Seng *et al.* (2005:4) also revealed that the lower price of cardamom mainly caused by the poor quality of products that is resulted from improper processing (drying) after harvesting. Nevertheless, there is an alternative of traditional drying cardamom by over fire and sunlight. Phongsaly District Development Project (PDDP) in Phongsaly province (the North) has provided drying ovens to the villagers for cardamom processing for

improving the quality. This oven can also be used for drying of other agricultural products such as chili and maize, galangal seeds, etc. Cardamom is product for export using in pharmaceutical industry (Foppes *et al.*, 1997:2). It is exported mainly to China (EC and FAO, 2002: 103). In the study villages, villagers observed that cardamom has been dying because of competition from small bamboos. They explained that small bamboos were cut down as they entered the forest for harvesting cardamom over the years. However, in habitat where cardamom is not regularly harvested, these bamboos grow rapidly together with other trees and form a thick cover over the cardamom. Consequently, cardamom dies due to the crown covering of the forest that reduces the penetration of sun light. This is the negative trend to the availability of this NTFP.

7.5 Summary of Results and Discussion

This study is elaborated based upon formulated research questions. Various answers of these questions are summarised as follows:

- 1 Which NTFPs are available in the study villages?
 - Numbers of NTFPs, as mentioned in chapter 7.2.1, are as follows:
 - At Nakhamchouang, 69 NTFP species, which include 4 aquatic animals, 59 plants and 6 wildlife species, are identified.
 - At Kasae, 68 NTFP species, which include 4 aquatic animals, 58 plants and 6 wildlife species, are identified.
 - Results of the forest inventory, as mentioned in chapter 7.2.2 are as follows:
 - 20 NTFPs were recorded from the forest inventory in each study village.
 - The result of the forest inventory shows that NTFPs availability in the two study villages is similar. Among NTFP species, Laos lady palm (*Rhapis laoensis*) is the dominating species, regarding the abundance, in the mixed deciduous forest followed by *Calamus tetradactylus* and *Ancistrocladus tectorius*. These three NTFPs are widely distributed in this type of forest whereas other NTFPs are not so.

2 To what extent do NTFPs contribute to households?

- Sources of cash income in the study villages are rice, cash crops, NTFPs, livestock, wage and small business. Share of NTFPs in household income, as mentioned in chapter 7.3.1, are as follows:
 - At Nakhamchouang, total annual household cash income is US\$ 324.41. Livestock selling contributes US\$ 125.42 or 39 %, as the first, to annual household income. NTFP selling contributes US\$ 114.21 or 35 %, as the second, to annual household income.
 - At Kasae, total annual household cash income is US\$ 227.58. Wage contributes US\$ 143.94 or 64 %, as the first, to annual household income. NTFP selling contributes only US\$ 8.60 or 4 %, as the third, to annual household cash income.
- Percentage of values of harvested NTFPs in household consumption (non-cash income) and selling (cash income), as mentioned in chapter 7.3.2, are as follows:
 - At Nakhamchouang, 65 % or US\$ 121.09 of value of some important NTFPs accounts for annual household non-cash income whereas 35 % or US\$ 65.50 accounts for annual household cash income.
 - At Kasae, up to 95 % or US\$ 128.55 of value of some important NTFPs accounts for annual household non-cash income. Only 5 % or US\$ 6.70 of value of these NTFPs accounts for household cash income.

3 Which factors influence selected NTFPs utilization with regard to commercialization?

Laos lady palm (unprocessed product) and broom grass (processed product) are commercialized only at Nakhamchouang as mentioned in chapter 7.4:

+ **Strengths:**

- Laos lady palm is abundant and available nearby the village and all seasons while broom grass is available in the dry season and can be stored for long time.
- + **Weaknesses:**
 - Current harvesting practice of both Laos lady palm and broom grass is destructive to the plants.
- + **Opportunities:**
 - Villagers at Nakhamchouang are able to bring locally consumed products such as Laos lady palm and broom grass to sell in the Xaybouathong market on foot.
- + **Threats:**
 - Quantities of sold NTFPs such as Laos lady palm and broom grass are less than the quantities that the villagers would be able to harvest or produce. This is due to these products are sold only in Xaybouathong district which has low market demand. Moreover, no middlemen are seeking to purchase them to sell in other districts.

Although Laos lady palm and broom grass have strengths and opportunities that are positive trends for these two products commercialization as mentioned above, one worrying trend that has to be addressed is low market demand in Xaybouathong. This trend is not only indication for Nakhamchouang but also for Kasae where these two products are not currently commercialized. Thus, it requires finding out how to bring these products in the two study villages to sell new markets in other districts or regions.

Damar and cardamom are commercialized in both study villages as mentioned in chapter 7.4:

- + **Strengths:**
 - Damar is available in all seasons and cardamom is available nearby the village.
- + **Weaknesses:**
 - Shorea trees that are source of damar are not abundant in the forest and damar is slowly produced. Cardamom is available only in the rainy season and it has trend to reduce in the availability.
- + **Opportunities:**

- Damar has market demand in Thailand and Vietnam. Cardamom has market demand in China. These products are commercialized through the middlemen.
- + **Threats:**
- Shorea trees will be logged by SUFORD. Cardamom has low market price.

Damar and cardamom have strengths and opportunities that are positive trends of these products commercialization. However, worrying trends of these products are that cardamom has low market price and damar is slowly produced. Thus, the emphasis on developing damar and cardamom commercialization, it is essential to increase the market price of cardamom and to increase the production of damar.

Moreover, it can be stated that commercialization of NTFPs like Laos lady palm, broom grass and cardamom could be developed immediately or in a short period of time. This is due to these plants take few years to grow and produce NTFPs. In contrast to the NTFPs mentioned before, damar commercialization requires long-term for developing. This is due to the fact that Shorea tree takes some ten years to grow and start producing damar.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The number and NTFP species available are similar in the two study villages. From the forest inventory, it is found that Laos lady palm or *Rhapis laoensis* Becc., *Calamus tetradactylus* Hance. and *Ancistrocladus tectorius* Merr. are dominating NTFP species in the mixed deciduous forest of the two study villages.

NTFPs contribute to household consumption more than household cash income in both study villages. 65 % and 95 % of value of important NTFPs account for household consumption at Nakhamchouang and Kasae, respectively.

At Nakhamchouang, total annual household cash income is US\$ 324.41. NTFPs have proportion of US\$ 114.21 or 35 %. At Kasae, total annual household cash income is US\$ 227.58. NTFPs have proportion of US\$ 8.60 or 4 % only. Therefore, the contribution of NTFPs to annual household cash income at Nakhamchouang is more than at Kasae. This is due to the influence of the market accessibility. Villagers at Nakhamchouang, which is nearby the market, have more opportunities to sell NTFPs as compared to villagers at Kasae, which is far away from the market.

Four NTFPs: Laos lady palm, broom grass, damar and cardamom were selected for SWOT analysis in this study. Factors that influence these NTFPs commercialization are as following. These four NTFPs are currently harvested and sold freely by the villagers without any restricted rules. This currently indicates a positive factor that supports the villagers to maximise cash income from these NTFPs commercialization. Nevertheless, it may not be promising for long-term utilization. Laos lady palm is abundant in the forest and broom grass can be stored for many years. These are positive trends of these two products. However, quantities of sold NTFPs such as Laos lady palm and broom grass are less than the quantities that the villagers would be able to harvest. This is due to these products are sold only in Xaybouathong district which has low market demand. Moreover, no middlemen are seeking to purchase them to sell in other districts. Darma and cardamom are seeking to purchase by the middlemen for export to neighbouring countries such as Thailand, Vietnam and China. This is a positive trend of these two products commercialization. However, the products have negative trends. Cardamom is not attractive to the villagers to sell due to the low price as compared to the time invested in collection. Negative trend of damar is that Shorea trees (source of damar) are not abundant in the forest.

8.2 Recommendations

Derived from the results and discussion, the following recommendations are given for SUFORD:

- 1) Form NTFPs management plan with the involvement of villagers. The plan should include the assessment of NTFPs availability, the yield study and determination of

annual harvested quantities. This is to guarantee sustainability of NTFPs in the study villages.

- 2) Organize pilot villager groups of NTFPs harvesting, processing and selling. Such groups would be of value to negotiate better prices, bulk products up and transport them to other markets. In addition, relevant trainings regarding to proper harvesting and processing techniques and market information could be provided to the villagers through the groups.
- 3) Introduce drying technique such as drying by using oven for cardamom processing. This is to improve the quality of dried cardamom for export as well as increase the price for the villagers. In this issue, the amount of fuel wood required for the oven is to be found out compared to traditional drying.
- 4) Conserve Shorea trees that are the sources of damar. At the same time, encourage the villagers to form a regulation for preserving this tree species that is not abundant in the forest. And encourage enrichment planting Shorea trees to ensure damar production in the future.
- 5) Introduce tapping technique such as V-shaped cutting in the bark of Shorea trees for damar collection. This is to increase damar resin production.
- 6) Establish domestication trial of NTFPs, traded NTFPs such as broom grass and cardamom in particular, which have trend to reduce in the natural availability. This is to ensure the supply of these NTFPs. Broom grass is domesticated in Champasak province (the South) (SNV, 2007:126). Cardamom is cultivated in the North and the South (Kviktit, 2002: 5).

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APPENDICES

Appendix 1: Questionnaire for household survey

Appendix 2: NTFPs listed by the villagers in the two study villages

Appendix 3: NTFP use groups in the study villages

Appendix 4: Other NTFPs recorded from the forest inventory

Appendix 5: Annual household cash income from NTFPs selling

Appendix 6: Field research illustrations

Appendix 1: Questionnaire for household survey

Date of Interview:...../...../..... Time of Interview.....

Village:.....Household No.....

Part 1: Household information

- 1 Name of the respondentAge:..... Male/ Female
- 2 Are you HH head? Yes/ No, please specify.....
- 3 How many people are there in your HH? Please specify

HH member	Age	Health	Labour force	Education	Remark

- 4 What is rice product harvested in 2006?
 - paddy field:.....ha.....kg
 - shifting cultivation.....ha.....kg
- 5 How much rice did you sell from 1/2006-1/2007?kg.....Kip
- 6 Did you have rice shortage last year?months
- 7 Did you buy/borrow rice last year?
 - Buy:kg.....kip
 - Borrow.....kg, from whom?.....
- 8 Do you grow other crops?

Crops	Area (ha)	Sale (Cash/year)
Banana		
Sugar cane		
Papaya		
Pineapple		
Others		

9 Do you have home garden?

- Area:.....

- Components:.....

10 How many animals do you have?

Animals	No.	Sale (1/2006-1/2007)			Remark
		No.	Price/head	Cash (Kip)	
Buffalo					
Cattle					
Pig					
Poultry					
Goat					
Others					

11 Do you have other sources of cash income besides above?

No	Income sources	Cash/year	Remark

12 What type of main expenditure do you have in HH?

No.	Expenditures	Kip/year	Remark

Part 2: NTFPs utilization

13 Which NTFPs do you collect for HH consumption?

NTFPs	Dry season		Rainy season		Remark
	Days/month	Qty/day	Days/month	Qty/day	

14 Do you sell NTFPs? (yes/no)

15 If No, why?.....

16 If yes, which NTFPs do you sell from 1/2006-1/2007?

NTFPs	Dry season		Rainy season		Price/unit	Remark
	Days/month	Cash/day	Days/month	Cash/day		

17 How do you sell NTFPs?

.....

18 Where do you sell NTFPs?.....

.....

Appendix 2: NTFPs listed by the villagers in the 2 study villages

No	Lao/English name	Scientific name	Availability		Classification		
			Nakhamchouang	Kasae	Aquatic animal	Plant	Wildlife
1	Gna kha/roof grass	<i>Imperata cylindrica</i> Beauv.	√	√		√	
2	Haem/ berberine	<i>Coscinium fenestratum</i> Gaertn.	√	√		√	
3	Het bod/mushroom	<i>Lentinus kurzianus</i> Gurr.	√	√		√	
4	Het hoo noo/mushroom	<i>Auricularia polytricha</i> Mont.	√	√		√	
5	Het khao/mushroom	<i>Lentinus squarrossulus</i>	√	√		√	
6	Het man/mushroom	-	√	√		√	
7	Het puak/mushroom	<i>Termitocytes</i> spp.	√	√		√	
8	Hoi/ snail	-	√	√	√		
9	Horn/Brush-tailed Porcupine	-	√	√			√
10	Ka hok/-	-	√	√			√
11	Ka tae/-	-	√	√			√
12	Ka poo/crab	-	√	√	√		
13	Khaem/broom grass	<i>Thysanolaena maxima</i> (Roxb.) O.Ktze.	√	√		√	
14	Khiat/frog	-	√	√	√		
15	Khon khaen/-	<i>Dracaena angustifolia</i> Roxb.	√	√		√	
16	Mai si/ damar	<i>Shorea</i> spp.	√	√		√	
17	Koi/-	<i>Dioscorea hispida</i> Venn.	√	√		√	
18	Lau/ hardy sugar cane	<i>Saccharum arundinaceum</i> Retz.	√	√		√	
19	Mai bong/ bamboo	<i>Bambusa tulda</i> Roxb.	√	√		√	
20	Mai hia/ bamboo	<i>Schizostachyum zollingeri</i> Steud.	√	√		√	
21	Mai ka sa/ bamboo	<i>Bambusa flexuosa</i> Munro.	√	√		√	
22	Mai ka saen/ bamboo	<i>Neohouzeana mekongensis</i> Buse	√	√		√	
23	Mai lai/ bamboo	<i>Gigantochloa pengaphylla</i> Munro.	√	√		√	
24	Mai phai paa/ bamboo	<i>Bambusa arudinaceae</i> Retz.	√	√		√	
25	Mai phoong/ bamboo	<i>Schizostachyum grande</i> Kurz	√			√	
26	Mai sord/ bamboo	<i>Oxythenanthera parvifolia</i>	√	√		√	
27	Mak fai/ Burma grape	<i>Baccaurea ramiflora</i> Lour.	√	√		√	
28	Mak houa lon/-	<i>Pakia streptocar pa</i> Hance.	√	√		√	
29	Mak bok/-	<i>Irvingia malayana</i> Oliv.	√	√		√	
30	Mak ken/-	<i>Flacourtia indica</i> Gagnep.	√	√		√	
31	Mak kham paep/velvet tamarind	<i>Dialium indum</i> L.		√		√	
32	Mak kheng/-	<i>Dialium cochichinensis</i> Pierre.	√	√		√	
33	Mak kho laen/-	<i>Nephelium hypoleucum</i>	√	√		√	
34	Mak khor som/-	<i>Schleichera trijuga</i> Willd	√	√		√	

35	Mak kor/-	<i>Castanopsis</i> spp.	√	√		√	
36	Mak kork/-	<i>Spondias mangifera</i> Willd.	√	√		√	
37	Mak muang paa/mango	<i>Mangifera</i> spp.	√	√		√	
38	Mak naeng/cardamom	<i>Amomum longigulare</i> T.L.Wu	√	√		√	
39	Mak ngeo/-	<i>Xerospermum laoticum</i> Gagnep.	√	√		√	
40	Mak pang/-	<i>Bouea gandaria</i> Blume	√	√		√	
41	Mak tong/-	<i>Sandoricum koetjape</i> Merr.	√	√		√	
42	Man leung/-	<i>Dioscorea</i> spp.	√	√		√	
43	Men/East Asian Porcupine	<i>Hytrix brachyura</i>	√	√		√	√
44	Mai gnan/-	<i>Dipterocarpus</i> spp.	√	√		√	
45	Nok/birds	-	√	√		√	√
46	Noo wai/ rat	-	√	√		√	√
47	Paa/fish	-	√	√	√	√	
48	Phak bi paa kang/-	-	√	√		√	
49	Phak ka doa/-	<i>Azadiracta indica</i> Juss.	√	√		√	
50	Phak ka don/-	<i>Careya sphaerica</i> Roxb.	√	√		√	
51	Phak kha/-	<i>Acacia pennata</i>	√	√		√	
52	Phak nam/-	<i>Lasia spinosa</i> Thw.	√	√		√	
53	Phak nork/-	<i>Centella asiatica</i> Urban.	√	√		√	
54	Phak sa mek/-	<i>Eugenia zeylanica</i> Wight.	√			√	
55	Phak tao/-	-	√	√		√	
56	Phak tiou/-	<i>Cratoxylum formosum</i> Benth.	√			√	
57	Phak wan/-	<i>Melientha suavis</i> Pirre.	√	√		√	
58	San/ Laos lady palm	<i>Rhapis laoensis</i> Becc.	√	√		√	
59	Si siet/ Burma mahogany	<i>Pentace burmanica</i> Kurz.	√	√		√	
60	Tao kai/ palm	<i>Didymosperma caudatum</i> W.	√	√		√	
61	Teuy/ pandanus	<i>Pandanus fibrosus</i> Gagnep.	√	√		√	
62	Thau/ algae	<i>Spirogyra</i> spp.	√	√		√	
63	Tong kuang/-	<i>Ancistrocladus tectorius</i> Merr.	√	√		√	
64	Wai boun/ Rattan	<i>Daemonorops jenkinsiana</i> Mart.	√	√		√	
65	Wai khaet/ Rattan	<i>Calamus palustris</i> Griff.	√	√		√	
66	Wai hang noo/ Rattan	<i>Calamus tetradactylus</i> Hance.	√	√		√	
67	Wai khom/ Rattan	<i>Calamus viminalis</i> Willd.	√	√		√	
68	Wai nok khor/ Rattan	<i>Calamus wailing</i>		√		√	
69	Wai sa noi/-	<i>Pothos scandens</i> L.	√	√		√	
70	Ya houa/-	<i>Smilax glabra</i> Roxb.	√	√		√	
71	Ya nang/-	<i>Limacia triandra</i> Miers.	√	√		√	
Total			69	68	4	61	6

Appendix 3: NTFP use groups in the study villages

No	Lao/English name	Scientific name
A. Plant foods		
Algae		
1	Thau/ algae	<i>Spirogyra</i> spp.
Flowers		
1	Phak ka doa/-	<i>Azadiracta indica</i> Juss.
Fruits		
1	Mak fai/ Burma grape	<i>Baccaurea ramiflora</i> Lour.
2	Mak houa lon/-	<i>Pakia streptocar pa</i> Hance.
3	Mak ka bok/-	<i>Irvingai malayana</i> Oliv.
4	Mak ken/-	<i>Flacourtia indica</i> Gagnep.
5	Mak kham paep/velvet tamarind	<i>Dialium indum</i> L.
6	Mak kheng/-	<i>Dialium cochichinensis</i> Pierre.
7	Mak kho laen/-	<i>Nephelium hypoleucum</i>
8	Mak khor som/-	<i>Schleichera trijuga</i> Willd
9	Mak kor/-	<i>Castanopsis</i> spp.
10	Mak kork/-	<i>Spondias mangifera</i> Willd.
11	Mak muang paa/mango	<i>Mangifera</i> spp.
12	Mak ngeo/-	<i>Xerospermum laoticum</i> Gagnep.
13	Mak pang/-	<i>Bouea gandaria</i> Blume
14	Mak tong/-	<i>Sandoricum koetjape</i> Merr.
Leaves		
1	Phak bi paa kang/-	-
2	Phak ka doa/-	<i>Azadiracta indica</i> Juss.
3	Phak ka don/-	<i>Careya sphaerica</i> Roxb.
4	Phak kha/-	<i>Acacia pennata</i>
5	Phak nam/-	<i>Lasia spinosa</i> Thw.
6	Phak nork/-	<i>Centella asiatica</i> Urban.
7	Phak sa mek/-	<i>Eugenia zeylanica</i> Wight.
8	Phak tao/-	-
9	Phak tiou/-	<i>Cratoxylum formosum</i> Benth.
10	Phak wan/-	<i>Melientha suavis</i> Pirre.
11	Ya nang/-	<i>Limacia triandra</i> Miers.
Mushrooms		
1	Het bod/mushroom	<i>Lentinus kurzianus</i> Gurr.
2	Het hoo noo/mushroom	<i>Auricularia polytricha</i> Mont.
3	Het khao/mushroom	<i>Lentinus squarrossulus</i>
4	Het man/mushroom	-
5	Het puak/mushroom	<i>Termitocytes</i> spp.
Shoots		
1	Khon khaen/-	<i>Dracaena angustifolia</i> Roxb.
2	Lau/ hardy sugar cane	<i>Saccharum arundinaceum</i> Retz.
3	Mai bong/ bamboo	<i>Bambusa tulda</i> Roxb.
4	Mai hia/ bamboo	<i>Schizostachyum zollingeri</i> Steud.
5	Mai ka sa/ bamboo	<i>Bambusa flexuosa</i> Munro.
6	Mai ka saen/ bamboo	<i>Neohouzeana mekongensis</i> Buse
7	Mai lai/ bamboo	<i>Gigantochlao pengaphylla</i> Munro.
8	Mai phai paa/ bamboo	<i>Bambusa arudinaceae</i> Retz.
9	Mai phoong/ bamboo	<i>Schizostachyum grande</i> Kurz
10	Mai sord/ bamboo	<i>Oxythenanthera parvifolia</i>

11	San/ Laos lady palm	<i>Rhapis laoensis</i> Becc.
12	Wai boun/ rattan	<i>Daemonorops jenkinsiana</i> Mart.
13	Wai khaet/ rattan	<i>Calamus palustris</i> Griff.
14	Wai hang noo/ rattan	<i>Calamus tetradactylus</i> Hance.
15	Wai khom/ rattan	<i>Calamus viminalis</i> Willd.
16	Wai nok khor/ rattan	<i>Calamus wailing</i>
17	Tao kai/ palm	<i>Didymosperma caudatum</i> W.
Tubers/roots		
1	Koi/-	<i>Dioscorea hispida</i> Venn.
2	Man leung/-	<i>Dioscorea</i> spp.
B. Fibres		
Bamboos		
1	Mai bong/ bamboo	<i>Bambusa tulda</i> Roxb.
2	Mai hia/ bamboo	<i>Schizostachyum zollingeri</i> Steud.
3	Mai ka saen/ bamboo	<i>Neohouzeana mekongensis</i> Buse
4	Mai lai/ bamboo	<i>Gigantochlao pengaphylla</i> Munro.
5	Mai phai paa/ bamboo	<i>Bambusa arudinaceae</i> Retz.
6	Mai phoong/ bamboo	<i>Schizostachyum grande</i> Kurz
7	Mai sord/ bamboo	<i>Oxythenanthera parvifolia</i>
Leaf fibre		
1	Teuy/ pandanus	<i>Pandanus fibrosus</i> Gagnep.
2	Tong kuang/-	<i>Ancistrocladus tectorius</i> Merr.
Grass		
1	Gna kha/roof grass	<i>Imperata cylindrica</i> Beauv.
2	Khaem/broom grass	<i>Thysanolaena maxima</i> (Roxb.) O.Ktze.
Rattans		
1	Wai boun/ rattan	<i>Daemonorops jenkinsiana</i> Mart.
2	Wai khaet/ rattan	<i>Calamus palustris</i> Griff.
3	Wai hang noo/ rattan	<i>Calamus tetradactylus</i> Hance.
4	Wai khom/ rattan	<i>Calamus viminalis</i> Willd.
5	Wai nok khor/ rattan	<i>Calamus wailing</i>
C. Medicinal plants		
Fruits		
1	Mak naeng/cardamom	<i>Amomum longigulare</i> T.L.Wu.
Stems		
1	Wai sa noi/-	<i>Pothos scandens</i> L.
Stems/roots		
1	Haem/ berberine	<i>Cosciniun fenestratum</i> Gaertn.
Tubers/roots		
1	Ya houa/-	<i>Smilax glabra</i> Roxb.
D. Extractives		
1	Mai si/-	<i>Shorea</i> spp.
2	Mai gnang/-	<i>Dipterocarpus</i> spp.
E. Plant for other uses		
Bark		
1	Si siet/ Burma mahogany	<i>Pentace burmanica</i> Kurz.
F. Charcoal and fuel wood		
Bamboos		
1	Mai bong/ bamboo	<i>Bambusa tulda</i> Roxb.
2	Mai hia/ bamboo	<i>Schizostachyum zollingeri</i> Steud.
3	Mai ka sa/ bamboo	<i>Bambusa flexuosa</i> Munro.
4	Mai ka saen/ bamboo	<i>Neohouzeana mekongensis</i> Buse
5	Mai lai/ bamboo	<i>Gigantochlao pengaphylla</i> Munro.

6	Mai phai paa/ bamboo	<i>Bambusa arudinaceae</i> Retz.
7	Mai phoong/ bamboo	<i>Schizostachyum grande</i> Kurz
8	Mai sord/ bamboo	<i>Oxythenanthera parvifolia</i>
Trees		
1	Mai gngang/-	<i>Dipterocarpus</i> spp.
2	Mai si/-	<i>Shorea</i> spp.
3	Mak fai/ Burma grape	<i>Baccaurea ramiflora</i> Lour.
4	Mak houa lon/-	<i>Pakia streptocar pa</i> Hance.
5	Mak ka bok/-	<i>Irvingai malayana</i> Oliv.
6	Mak ken/-	<i>Flacourtia indica</i> Gagnep.
7	Mak kham paep/velvet tamarind	<i>Dialium indum</i> L.
8	Mak kheng/-	<i>Dialium cochichinensis</i> Pierre.
9	Mak kho laen/-	<i>Nephelium hypoleucum</i>
10	Mak khor som/-	<i>Schleichera trijuga</i> Willd
11	Mak kor/-	<i>Castanopsis</i> spp.
12	Mak kork/-	<i>Spondias mangifera</i> Willd.
13	Mak muang paa/mango	<i>Mangifera</i> spp.
14	Mak ngeo/-	<i>Xerospermum laoticum</i> Gagnep.
15	Mak pang/-	<i>Bouea gandaria</i> Blume
16	Mak tong/-	<i>Sandoricum koetjape</i> Merr.
17	Phak ka doa/-	<i>Azadiracta indica</i> Juss.
18	Phak tiou/-	<i>Cratoxylum formosum</i> Benth.
19	Phak wan/-	<i>Melientha suavis</i> Pirre.
G. Animal products		
Aquatic animals		
1	Hoi/ snail	-
2	Ka poo/crab	-
3	Khiat/frog	-
4	Paa/fish	-
Wildlife (wild animals)		
1	Horn/Brush-tailed Porcupine	-
2	Ka hok/-	-
3	Ka tae/-	-
4	Men/East Asian Porcupine	<i>Hytrix brachyura</i>
5	Nok/birds	-
6	Noo wai/ rat	-

Appendix 4: Other NTFPs recorded from the forest inventory

Nakhamchouang

No	Lao/ English Name	Scientific Name	Abundance	Relative abundance	Frequency
			N/ha	%	%
1	Mai lai/bamboo	<i>Gigantochlao pengaphylla</i> Munro & Kurz.	3	0.10	6.25
2	Mak bok/-	<i>Irvingai malayana</i> Oliv.	3	0.08	18.75
3	Ya nang/-	<i>Titiacora triandra</i>	3	0.08	18.75
4	Si siet/ Burma mahogany	<i>Pentace burmanica</i> Kurz.	2	0.06	12.50
5	Mai ka sa/bamboo	<i>Bambusa flexuosa</i> Munro	2	0.06	6.25
6	Mai si/-	<i>Shorea</i> spp.	1	0.04	6.25
7	Mai gngang/-	<i>Dipterocarpus</i> spp.	1	0.02	6.25
8	Mak muang paa/mango	<i>Mangifera</i> spp.	1	0.02	6.25
9	Mak ngeo/-	<i>Xerospermum laoticum</i> Gagnep.	1	0.02	6.25
10	Teuy/pandanus	<i>Pandanus fibrosus</i> Gagnep.	1	0.02	6.25
Total			16	0.50	

Kasae

No	Lao/ English Name	Scientific Name	Abundance	Relative abundance	Frequency
			N/ha	%	%
1	Mak pang/-	<i>Bouea gandaria</i> Blume.	4	0.11	25.00
2	Mak ngeo/-	<i>Xerospermum laoticum</i> Gagnep.	4	0.11	18.75
3	Mai si/-	<i>Shorea</i> spp.	4	0.09	25.00
4	Mak muang paa/mango	<i>Mangifera</i> spp.	3	0.08	25.00
5	Haem/berberine	<i>Cosciniium fenestratum</i> Gaertn.	3	0.08	18.75
6	Mai sord/bamboo	<i>Oxythenanthera parvifolia</i>	3	0.08	18.75
7	Mai gngang/-	<i>Dipterocarpus</i> spp.	3	0.08	18.75
8	Mak bok/-	<i>Irvingai malayana</i> Oliv.	2	0.05	18.75
9	Mak kham paetp/velvet tamarind	<i>Dialium indum</i> L.	2	0.05	12.50
10	Wai boun/rattan	<i>Daemonorops jenkinsiana</i> Mart.	1	0.03	6.25
Total			29	0.66	

Appendix 5: Annual household cash income from NTFPs selling

No	NTFPs	Product Type	US\$/year	Selling in
Nakhamchouang (26 sampled HH)				
1	Laos lady palm	Unprocessed	32.29	Xaybouathong market/town
2	Wildlife	Unprocessed	24.77	Xaybouathong market/town
3	<i>Calamus viminalis</i>	Unprocessed	12.57	Xaybouathong market/town
4	Aquatic animals	Unprocessed	8.56	Xaybouathong market/town
5	<i>Calamus palustris</i>	Unprocessed	7.62	Xaybouathong market/town
6	Bamboo shoots	Unprocessed	6.57	Xaybouathong market/town
7	Hardy sugar cane	Unprocessed	5.34	Xaybouathong market/town
8	Mushrooms	Unprocessed	4.98	Xaybouathong market/town
9	Wild vegetable	Unprocessed	3.84	Xaybouathong market/town
10	<i>Dracaena angustifolia</i>	Unprocessed	1.01	Xaybouathong market/town
11	Damar	Unprocessed	0.09	The village
12	Broom grass	Processed	2.39	Xaybouathong market/town
13	Dipterocarpus wood resin torch	Processed	2.29	The village
14	Roof grass	Processed	1.49	The village
15	Cardamom	Processed	0.42	The village
Total			114.21	
Kasae (14 sampled HH)				
1	Damar	Unprocessed	5.53	The village
2	Wildlife	Unprocessed	1.90	The village
3	Cardamom	Processed	0.62	The village
4	Berberine	Processed	0.44	The village
5	Burma mahogany	Processed	0.11	The village
Total			8.60	

Appendix 6: Field research illustrations



Left: Laos lady palm



Right: shoots of Laos lady palm for selling



Left: Broom grass clump



Right: Flower of broom grass harvested by Nakhamchouang villager



Left: Damar/ Shorea wood resin



Right: Damar contained in fertilizer bags purchased by the middlemen at Kasae



Left: Damar exuding from Shorea tree
Right: Cardamom cluster



Left: *Calamus tetradactylus* Hance.
Right: *Ancistrocladus tectorius* Merr.



Left: Weighing quantity of harvested NTFPs during household in-depth study
Right: Sample plot establishment (forest inventory)



Left: Home garden at Kasae
Right: Cattle rearing at Nakhamchouang



Left: Making the house post (off-farm)
Right: Household small business (off-farm)



Left & right: Forest extends into a range of villagers' habitats

DECLARATION

I, **Bouangeunh Khensabab**, hereby do declare that the master thesis entitled **“SWOT Analysis of utilization of Non-Timber Forest Products by Rural Farm Households - A Case Study of Xaybouathong District, Central Laos”**, submitted to the Institute of International Forestry and Forest Products at the Dresden University of Technology, is the result of my own efforts under my supervisors’ direction except for the references cited, and has not been submitted in any other institution.

Tharandt, Germany
17/September/ 2007

Bouangeunh Khensabab