

## Forest products and services in northern Laos -Case studies from two forest dwelling villages



Photo by Erik Kretz

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This report presents an MSc/BSc thesis at the Department of Forest Ecology and Management, Faculty of Forest Sciences, SLU. The work has been supervised and reviewed by the supervisor, and been approved by the examiner. However, the author is the sole responsible for the content.

## Preface

This master thesis was carried out within the programme Lao-Swedish Upland and Agricultural and Forestry Research Programme (LSUAFRP). The programme was a Sida financed programme with the overall aim of reducing poverty in the northern mountainous region of Laos through the development and improvement of agriculture and forestry techniques of small-scale farmers. The implementation and daily operational management of the programme was done by the Laotian National Agricultural and Forestry Research Institute (NAFRI) in cooperation with the consultancy firm Ramböll Natura.

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Interpreter Laykham Sihanat  
Photo: Markus Steen

## Abstract

All humans everywhere depend on ecosystem products and services for their well-being. But what if the ecosystems are not able to provide all these products and services because of overexploitation? In bad cases this can, for example, lead to starvation. Before such critically low levels of products or services are reached, it is important to establish which ones are most important so that they can be safeguarded.

This is an interview study where the importance of forest ecosystem products and services are studied and ranked. The field study was made during two months in the two poor mountain villages Namo Nua and Phou Xang in northern Laos in South East Asia. The forests around these villages still provide very many products and services but most of the important products and services are diminishing in abundance and quality. In these two villages, it is important today to identify which products are to be prioritized and safeguarded through wise forest management.

The objective of this study was to look into and identify which and how forest products and services are used and appreciated among the inhabitants in two forest dwelling villages in Northern Laos.

The results show that the forests and their products and services are essential to the villagers of Namo Nua and Phou Xang. Most important of all is the forests' water improving effect. The most important forest products are Bong and Bitter bamboo, fuel wood and construction wood. The villagers showed great interest towards learning wiser forest management techniques that could help safeguard these important forest products and services.

## Key words

NTFP, Non Timber Forest Products, NWFP, Ecosystem products, Ecosystem Services  
Timber, Fuel wood, Water quality, Oudomxai, Poverty reduction.

## Sammanfattning

Alla människor överallt är beroende av olika produkter och tjänster från ekosystem för sitt välbefinnande. Till exempel förser ekosystem oss med produkter som mat, medicin, byggnadsmaterial, bränslen, fibrer och inte minst syre. Ekosystem förser oss med tjänster; till exempel renar de vårt dricksvatten, de reglerar vattenflöden så vi undviker översvämningar, de skapar jordar och återanvänder näringsämnen. Andra ekosystemtjänster som anses viktiga för många är t ex rekreationsvärden – värdet av att få röra sig i vacker natur och även spirituella värden så som heliga skogslundar.

Ekosystemen ska uppenbarligen räcka till mycket. Men vad händer om produkterna och tjänsterna från ekosystemen inte räcker till? Räcker inte en essentiell produkt eller tjänst från ett ekosystem till en växande befolkning kan det t ex leda till svält. Innan sådana kritiska nivåer nås är det viktigt att inse vilka produkter och tjänster som är viktiga så att man kan handla för att säkerställa försörjningen av dessa. Detta innebär att prioriteringar måste göras.

Det här är en intervjustudie där produkter och tjänster från skogliga ekosystem studerats och rangordnats. Fältstudien utfördes under två månader i de två fattiga bergsbyarna Namo Nua och Phou Xang i Norra Laos i Sydostasien. Dessa byar har fortfarande relativt rika och intakta skogar som förser byarna med många produkter och tjänster. Men även i dessa byar minskar det skogliga kapitalet och prioriteringar mellan olika skogliga produkter och tjänster blir mer och mer aktuellt.

Syftet med den här studien är att identifiera vilka produkter och tjänster från de skogliga ekosystemen som är viktiga, och hur de är viktiga för människor som lever i och av skogen i norra Laos.

Resultatet från studien säger att skogarna i Namo Nua och Phou Xang och dess produkter och tjänster är livsnödvändiga för dessa bybor och att de flesta viktiga skogliga ekosystemprodukterna minskar i tillgång. Av alla skogliga ekosystemprodukter och tjänster är det skogens vattenrenande förmåga som värderas högst. De viktigaste produkterna från skogen är Bong bambu, Bitter bambu, brännved och konstruktionsvirke. Byborna visar en stor önskan att lära sig hur man på ett klokare och mer uthålligt sätt ska kunna sköta sin skog för att säkerställa tillgången på de viktiga produkterna och tjänsterna från de skogliga ekosystemen.

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# 1 Introduction

People everywhere around the world rely on ecosystems for their well-being (Capistrano, 2005). For example, ecosystems provide us with products such as food, water, medicine, timber, fuel and fibres. Ecosystems also provide us with services such as climate regulation, flood control, disease prevention, waste treatment and improve water quality. They help to create soils and oxygen and to cycle nutrients. Other services provided by ecosystems are recreational, aesthetic and spiritual values.

## 1.2 Definitions

An ecosystem is a dynamic complex of plant, animal and microorganism-communities and the non-living environment interacting as a functional unit (Millennium Ecosystem Assessment Board, 2005). The definition of ecosystem **services** used in this thesis is: *“the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfil human life”* (Daily, 1997). Ecosystem **products** are the produced biomass from any given ecosystem, for example timber, fodder, fish, game, berries or even honey.

## 1.3 Ecosystem services

The quality and the characteristics of an ecosystem affect the supply and quality of its services and products. This is, for example, obvious in the case of water. More than 3 billion people worldwide do not have access to clean water, and the problem is particularly acute in developing countries (FAO, 2003). Everybody needs water every day for drinking, cooking, washing, and sanitation. The minimum amount of fresh water per person is 20 litres per day (Myres, 1997a). The supply of fresh water is already insufficient to meet both human demand and ecosystem needs in large areas of the world, and the shortfall will continue to grow if current habits of water use continue (Millennium Ecosystem Assessment Board, 2005).

One main problem with poor water quality is wastewater discharge without treatment (FAO, 2003) something which in turn can be treated through ecosystem services (Etnier et al., 1996). Forest and vegetation often determines the quality and the time-distribution of water flow. Deforestation of upland catchments can change the character of the water from clear to muddy and from ever-flowing into streams susceptible to flood and draught (Myers, 1997a). This is especially the case in the humid tropics where the forests exert a “sponge effect” and soak up the moisture before releasing it at regular rates (Myers, 1997a; Hofer 2002). In monetary terms, the price for attaining drinking water quality increases twofold in catchments where the forest become subject to controlled logging compared to undisturbed forests. Because of increased erosion the price raises four fold when the forest becomes subject to uncontrolled logging (Myers, 1997a).

While roots provide clean water through fixation of soil and utilisation of nutrients, tree crowns maintain liveable climate for example by levelling out peak temperatures at ground level. Other examples of ecosystem services are crop pollination by insects and the decomposition of organic matter by micro organisms which in turn raises soil fertility.

Ecosystems and their biodiversity provide in their own sense an important service by functioning as “genetic libraries”. Forests harbour large number of species, interactions

between species and other rare and common forms of biodiversity. Just tropical forests are estimated to hold at least 50 percent of all species on earth (Myers, 1997b).

## **1.4 Ecosystem products**

### **1.4.1 Fuel wood**

One of the major ecosystem products appreciated by humans is fuel wood and similar products used for heating and lighting. More than three billion people still burn wood, dung, coal and other traditional fuels inside their homes (WHO, 2006). Fuel wood represents in global terms 7 percent of the world's total primary energy consumption (Trossero, 2002). Moreover, 76 percent of all fuel wood is used in developing countries where 77 percent of the world's population lives (Trossero, 2002).

Energy is essential to meet our most basic needs like cooking, boiling water, lighting and heating (WHO, 2006). As an example, 95 percent of all food needs to be cooked (Goldemberg, 2006). *“Energy is fundamental for good health – a reality that has been largely ignored by the world community”* (WHO, 2006).

Approximately 40 percent of the total wood harvested from the world's forests is used for energy purposes (FAO, 2006). The same figure is 80 percent for developing countries. Energy is in other words the main product from trees and forests in developing countries (Trossero, 2002).

The consumption of fuel wood is growing in many developing countries, especially in areas close to urban centres (Swanson, 1996). This overuse is caused by a number of factors although the main factor is over-population. As fuel wood is usually derived from common land, it is prone to be over-exploited (Brännlund, 1998). The willingness by users to invest in reforestation on communal land is minimal as the likelihood of the investment to paying off to the investor is a lot smaller with public products than with private. Also, poverty leads to short planning horizons (Swanson, 1996) and investments in reforestation of degraded forests is therefore not likely to occur as the time span for the investment to pay off is long.

### **1.4.2 Timber products**

While fuel wood extraction accounts for 40 percent of global wood removal from forests, the other 60 percent are used in industries (FAO, 2006) mainly paper mills, saw mills and board factories. The figure above close to entirely refer to large-scale industries and the research material available follows the same proportion as there is hardly any published material on small-scale timber use. While there is a need to understand the whole range of forest products derived from forests by local residents, the importance of timber for local use and marketing has often been obscured by the interest for Non-Timber Forest Products (Wollenberg, 1998). Local use of timber is most often perceived as minor occurrence though houses and other constructions often are partly or entirely built out of timber (and / or bamboo) in many rural areas in developing countries.

### 1.4.3 NTFPs

As mentioned in the previous paragraph Non-Timber-Forest- Products (NTFPs) has received much attention. It has even been described that the interest in NTFPs “*has taken the world by storm*” (Wollenberg, 1998). Largely this interest lies in the potential of less-destructive uses of forests to provide substantial benefits to local people while still conserving forests.

There is a broad range of definitions of NTFPs with the most substantial difference being if services from forests are included or not. In this thesis the definition used is taken from Vantomme et al., 2002: “*NTFPs consists of products of biological origin other than wood, derived from forests, other wooded lands and trees outside forests*”. Consequently this definition does not include forest services.

Studies of NTFPs are most often related to tropical countries even though NTFPs are used world wide. Typical examples in the Nordic countries are berries, mushrooms, fish and game. In these countries, few people depend on NTFPs for the subsistence although great contributions to livelihoods can be associated with some of these products. For example, more than 90 000 moose were hunted and felled in Sweden in 2005 (SCB, 2007). In the Nordic countries, as well as in many other places, recreation and folklore are strongly connected with NTFPs and other forest values, for example hunting traditions.

Fish and crustaceans as ecosystem products closely relate to the quality of the ecosystem and the quality of the water that comes from it (Vantomme, et al., 2002). Indeed, the main part of nutrients to streams and its fauna and flora originate from debris from the surrounding vegetation (Örner, 1995). The species composition and quantities of, for example, fish is determined by the intensity of light reaching the surface, the flow of water, the character of the streambed, the amounts and kinds of nutrients and the quality of the water (Örner, 1995). All of these characters are to great extents determined by the surrounding vegetation.

The contribution of NTFPs to subsistence in developing countries is big. In particular, rural and poor people depend on NTFPs for their livelihoods (Foppes et al., 2004; Vantomme et al., 2002). NTFPs are both used for local consumption and as products for trade (Vantomme, et al. 2002).

Asia is by far the world’s largest producer and consumer of NTFPs (Vantomme, et al., 2002). NTFPs are utilized by all income classes (Vantomme, et al., 2002), and yet they often function more as safety nets (Arnold, et al., 1998) providing a mean of livelihood when agricultural production fails (Bounthong, et. al., 2003). In south east Asia the main NTFPs in order of importance are: Rattan and bamboo products, medicine, essential oils, resins, pine nuts, mushrooms, spices and herbs, fodder and animal products like bush meat, trophies and wild honey (Vantomme, et al., 2002).

## 1.5 Socioeconomics and ecosystem use

While all humans ultimately depend on nature and its services, it is important to realise that we humans are also an integral part of most ecosystems (Millennium Ecosystem Assessment Board, 2005). It is estimated that half of the world’s poor people live in ecologically fragile rural areas (Swanson, 1996). As ecosystem services and ecosystem products often are not appreciated for its true value to society, sufficient care is not taken to these ecosystems

carrying capacity and health. One reason for this is that these services and products are usually appreciated as resources but not as assets with potential for financial growth. Consequently, it is usually more economically optimal to harvest the entire stock of a given resource in order to invest the return in some more productive asset. This is called resource mining (Swanson, 1996). Also, all land has a conversion value, a value for its alternative use. Resources naturally found on a given area of land must be able to generate a higher or comparable economical yield in order to avoid conversion to other uses (Swanson, 1996). A natural asset which is undervalued or not at all valued by a market, will not contribute rightfully to establish the true value of a whole ecosystem, *“The disparity between actual value and perceived value is probably nowhere greater than in the case of ecosystem services”* (Daily, 1997). Typical examples of this disparity, leading to unrightfully transformation of land use are found everywhere around us. For example, transformation of wet lands, which effectively clean water, into spruce monocultures in Sweden in the 1970s and today’s transformation of old broadleaf forests, that hosts traditionally forest dwelling people to oil-palm monocultures in the tropics.

The current rate of land cover change is the greatest in tropical moist and temperate forests and in tropical and flooded grasslands, with more than 14 percent change between 1950 and 1990 (Millennium Ecosystem Assessment Board, 2005). Mediterranean forests and grasslands had already lost 70 percent of its original extent by 1950. This change have now slowed and has even been reversed in some places (Millennium Ecosystem Assessment Board, 2005).

Although deforestation and resource mining of ecosystems are common in the tropics there is evidence that what appears to be pristine forests worldwide may in many cases be forests that have been intensively used for quite a long time (Posey, 1993). This is encouraging because it means that intensive use of tropical forests does not entail catastrophic loss of biodiversity (McKey et al. 1993).

While demands for ecosystem services and products such as food and clean water are growing, human activities are diminishing the capabilities of many ecosystems to meet these demands (Millennium Ecosystem Assessment Board, 2005). One example of such a clash is the demand for hydro electricity versus fish for food. Hydro power plants complete with their dams, severely change the aquatic ecosystems and cut off the possibility for migrating fish to spawn.

Humans can certainly live side by side with nature without mining its values or upsetting its ecological functions. In order to safeguard the flow of ecosystems products and services, we need to better understand their functions and to realise their values even if they have a market price or not.

## **1.6 Ecosystem services and products in Laos**

In this thesis Ecosystem services and products in the uplands of Laos were studied. The dependence on forests and its ecosystem services and products is culturally, socially and economically strong here. In rural surveys villagers identified and utilized over 757 plant species and 150 animal species (Vantomme, et al., 2002). One main reason for the country’s high dependence on nature products is the relatively high proportion of forest cover combined with a small population (Foppes, et al., 2004). Laos is even the country in Southeast Asia with largest proportion pristine forests (WFP, 2005). The gathering of NTFPs is often of equal importance for peoples’s livelihoods in Laos as agriculture and livestock production (Foppes,

J. et al., 2004, Yokoyama, 2003). 50 to 55 percent of cash generation in rural areas, where 80 percent of the population lives, is related to NTFPs (Foppes, et al., 2000). There are examples where most of subsistence and all cash income are derived from forests (Yokoyama, 2003). NTFPs provide food security and are the main source of cash income to people who live in the uplands (Foppes, et al., 2004). Forest resources in Laos, just like in many other parts of the world, function as social safety net providing food and means of income especially for the poor. Close to all NTFPs are collected from the wild, where generally, the harvest levels are too high and therefore non sustainable (Vantomme, et al., 2002).

There is a never ending need of understanding how the forest and its related products and services are important for the people who direct depend on them. Poverty reduction and sustainability issues are dependant on more detailed and better knowledge concerning such items to be successful. These two case studies from the northern part of Laos hope to make the knowledge about forest services and products a little bit clearer in this region.

## **1.7 Objective**

The objective of this study was to identify and describe the current use of forest products and forest services by the inhabitants of two forest dwelling villages in northern Laos and to suggest potential management practices.

## 2 Material and method

### 2.1 Laos

The Lao People's Democratic Republic (figure 1), has a total area of 236 800 km<sup>2</sup>, approximately half the area of Sweden. All land is owned by the state but there are different kinds of user agreements (Vantomme et al, 2002, Foppes et. al., 2000). The population was in 2007 approximately 5.9 million inhabitants assembled in four main folk groups: Lao Loum (lowland) 68 percent, Lao Theung (Upland) 22 percent, Lao Soung (highland) including the Hmong and the Yao 9 percent and ethnic Vietnamese/Chinese 1 percent. The official language is Lao although French, English and various ethnic languages are common. 60 percent of the population are Buddhists while the other 40 percent follow animistic or other religions (UNODC, 2006).



Figure 1. Laos is situated inland between Vietnam and Thailand in south east Asia.

### 2.2 District of Namo

The area of study is located in the northern part of Laos within the district of Namo, Oudomxai province (figure 2). The terrain varies in elevation from 700 to 1050 m asl and is mountainous with low lying river valleys. As most land is found on mountain slopes, the area available for paddy rice is limited and the landscape is therefore dominated by rain-fed upland agricultural fields, fallows and forests. Farmers cultivate this hilly landscape via slash and burn (also called shifting cultivation), a practice that uses fire to clear temporary fields for cultivation. After some years of cultivating the fields are then abandoned (fallow period) for some years and left to recover before they can be burned and used again for cultivation (Yokoyama, 2003; Foppes, et al. 2004). Over the centuries, this has created a landscape that for a long time in the uplands of Laos that looks like a patch quilt pattern of ever alternating agricultural land, fallows and forests. (UNDP, 2002).



Figure 2. Oudomxai province is found in north western Laos.

However, due to the practice of shifting cultivation, the district of Namo has quite a substantial area of forests remaining (Anon., 2005). The main forest type is mixed deciduous forests, a blend between evergreen and deciduous trees (Anon., 2005). This forest is mainly located on higher elevation along the districts borders (Anon., 2005). These areas still have fairly dense forest

stands which support a range of protected wildlife species (Anon., 2005). These areas are also important producers of NTFPs and greatly help to contribute the livelihood of the local people (Anon., 2005). Approximately 60 percent of the lands area is classified as Provincial Conservation Forest and Provincial Protection Forest (Anon., 2005). Large areas of bamboo stands are also found throughout the landscape.

The annual rainfall ranges from 1380 to 1730 mm and the average maximum temperature is in the range of 25 to 30° C. The average minimum temperature ranges between 5 and 10° C. April is the warmest month while January is the coldest (Anon. 2005).

In 2004 the district's total population was 32 045, divided into 11 different ethnic groups. There are 78 villages where 41 are ethnic Khamu, 13 are Hmong, 7 are Akha, 4 are Thai Dam, 3 are Lu, one each is Phou Xang, Yang, Phou Yort and 7 are of mixed ethnicity (Anon., 2005). Namo is one of the poorest districts in the country.

The main paved road connecting Oudomxai and Luang Namtha runs through Namo district. There are also a handful of gravel roads of mixed quality found throughout the district and one of these roads links Namo directly with China at the international border post of Moutenu.

## **2.3 The studied villages**

For this case study the villages Namo Nua and Phou Xang found in the district Namo in the province of Oudomxai were selected. These are two neighbouring villages with different conditions for daily life. The villages are located in the centre of the district, circa 4 km between each other (see figure 3). Even though they are geographically close to one another, the natural as well as social and economic conditions vary between them. Both villages have a school and plenty of fresh water (Anon. 2005).

### **2.3.1 Namo Nua**

Namo Nua (Picture 1) is situated close to the main road with good trading possibilities. The village is one of the oldest in the area. It lies in the lowlands surrounded by a comparably large proportion of irrigated agricultural fields. The village was graded medium poor (Anon., 2005) and the ethnicity is Thaidam with a population of approximately 450 persons (Anon., 2005).

Compared to other villages in the region, this village is more agriculturally orientated than NTFP-orientated. As typical for Laotians living in the lowlands, the houses are built on high poles for protection against insects, animals and diseases.



Picture 1. Namo Nua is situated down in the valley with comparably large proportion irrigated agricultural fields. Photo by Markus Steen.



### 2.3.2 Phou Xang

On the other hand, Phou Xang (Picture 2) is situated more remote from any trading possibility and at a higher altitude. The village has no irrigated agricultural land and has therefore to rely more on upland agricultural fields and NTFPs. The village was graded very poor (Anon., 2005). Just like the village's name this ethnic group is also named Phou Xang. This is a very small ethnic group only found in a hand full of villages in the north of Laos and they speak their own language. The village population is approximately 190 persons and as typical for Laotians living on higher altitude, they build their houses on the ground.



Picture 2. Phou Xang is situated on high altitude on a mountain ridge. Photo by Markus Steen.

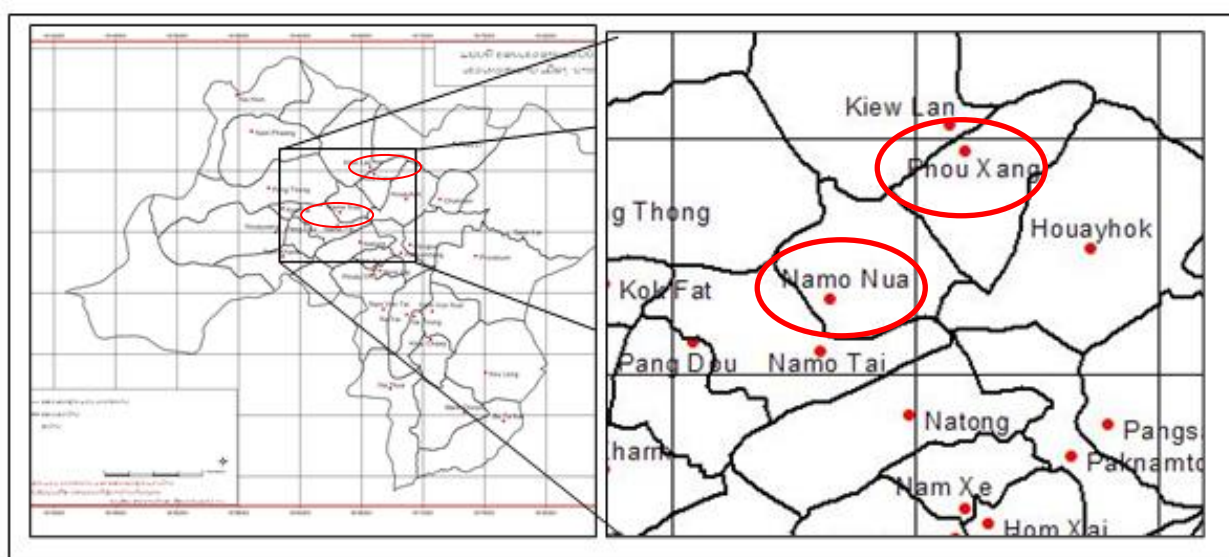


Figure 3. Phou Xang and Namdang Nua are found in central Namdang district. Namdang Nua is situated in the valley and has, for the region relatively high proportion of paddy rice. Phou Xang has a more mountainous location and has to rely on upland rice and forest products for its livelihood.



### 3 Method

In this case study, information about the forest ecosystem services and products used by the local people of Namo Nua and Phou Xang was collected using the following four kinds of interview techniques: Participatory Mapping, Household Interviews, Field studies and Elder Interview. The first technique, Participatory Mapping, provided a general overview of the natural resource situation while the last three techniques narrowed down and focused more on detailed levels.

#### 3.1 Participatory Mapping

In these initial interviews, the villages' council of leaders was gathered. These councils were composed of the village leader, the deputy village leader and the village treasurer. The objective was to obtain broad information about which the most important products and services in each village were, where the products were found and why they were important.



The mapping was carried out using a large blank sheet of paper (approximately one square meter) and a set of coloured pens. The interviewees themselves made the drawings (figure 4). First vast features like roads and rivers were drawn. After this followed the village centre, forested land, agricultural land and fallow. The land was then broken down in to different categories of forests, fallow and agricultural land. For each feature added to the map, associated information on how this resource is important was acquired.

Figure 4. Participatory Mapping provides an overview of the most important nature assets.

Participatory mapping provided the basic information for constructing the interview manuscript for the coming household interviews.

#### 3.2 Household Interviews

The objective of the Household Interviews was to detect and rank the different forest ecosystem products and services used by each household and to note how these products and services were used and their importance. For the highest ranked products, the respondents were also asked to recount the quantity harvested and how the product is managed locally. Those households which were interviewed were selected by the villages' leader.

The central question was as follows: which are the most important forest ecosystem products and services? To answer this question, it was necessary to divide it up into four categories each with a set of sub-questions as follows:

- NTFPs
  - Which are the five most important NTFPs for you? (*In order to have a somewhat fixed point of reference for the food gathered in the forest, NTFP-foods were compared to the importance of rice, the main staple food in this region.*)
  - In what way are they important?
  - How much of the most important NTFPs are used in this household?

- How much time is spent on collecting the most important NTFPs?
- How abundant are these products today compared to a few years ago?
- Are there any ways to increase the harvestable quantity of these NTFPs?
- Fuel wood
  - Which are your three favourite fuel wood species?
  - Why are these desirable?
  - How large quantities are collected for this household?
  - How much time is spent on collecting fuel wood in this household?
- Construction wood
  - Which are your five favourite construction wood species?
- Forest services
  - Does the forest provide any important services to you?

The household interviews were made in running dialogues. The questions were ticked off whenever mentioned. This technique created an open atmosphere that helped to bring both expected and not expected answers to the surface in a much easier way as compared to demanding answers to the above mentioned questions.

### **3.3 Field Studies**

The Field Studies were conducted at the end of the study. The objective was to gain a deeper understanding of the local forest ecosystem products and services and the villager's relation to them by studying them in field. The different products were pointed out and many aspects were discussed and explained together with the villagers. The Field studies were conducted during seven day-long field trips.

### **3.4 Elder Interview**

Here the elders of Namo Nua were gathered. The objective of this interview was to compare today's abundance of the important forest ecosystem products and services with the perceived abundance when the elders were young. With these results the historical abundance and the change in abundance as compared to today was estimated for various products.

### **3.5 Data treatment**

During all interviews local names of all products were noted. Later during data treatment were all scientific names for all the products sought for. Due to the fact that many local names were not known to our Lao interpreters it has not been possible to find all the scientific names.

### 3.5.1 Data treatment of the Participatory Mapping

The derived data from the Participatory Mapping technique (picture 3) gave quick insights into the local situations regarding forest ecosystem products and services and was used as the basis for constructing the household interview manuscript. This information acted as a guide to how the questions should be categorized and on what subjects emphasis should be placed.



Picture 3. Participatory Mapping in Phou Xang. Photo by Erik Kretz

### 3.5.2 Data treatment of the Household Interviews

In these interviews, data about specific forest ecosystem products was attained. All gathered information has been arranged per product and service where both villages have its own section. Each product and service has in turn been categorised under the following four categories:

1. Forest Services
2. NTFPs
3. Construction Wood and Timber
4. Fuel Wood

In the matrix found in appendix 1 each product has been ranked according to the following scale:

- Three stars “\*\*\*” indicates essential
- Two stars “\*\*” indicates highly appreciated and/or commonly used
- One star “\*” indicates other

A product can be ranked under several categories.

### 3.5.3 Data treatment of the Field Studies

The objective of the Field Studies was to gain a deeper understanding of the forest ecosystems products and services and the villagers’ relation to them. The information gathered from these field observations helped to give a deeper understanding of the information from the Household Interviews and was therefore added to the villager’s descriptions of each product and service that are found in the results section.

### 3.5.4 Data treatment from Elder Interview

The objective of this interview was to compare today’s abundance of important forest ecosystem products and services with their perceived abundance when the elders were young. A trend could be concluded for some of the products and this trend was then added to the product description found in the results section.

## 3.6 Work description, preparations

In preparation for the fieldwork, meetings with stakeholder-organizations were held in Vientiane and Luang Prabang. Preliminary information was received regarding forest ecosystem products and services in Laos, regarding the study area as well as general guidance in interview techniques (see figure 5). To gain formal approval for the field studies and the field interviews, meetings were held with the following national, provincial and district governmental institutions: 1) the National Agriculture and Forestry Research Institute (NAFRI) in the capitol Vientiane, 2) Northern Agriculture and Forestry Research Center (NAFREc) in Luang Prabang and 3) the District Agriculture Forestry extension Office

(DAFeO) in Namo. After these meetings, acceptance of the study was also given by each village's headman (see figure 5).

The decision of which villages to study was decided together with DAFEO in Namo District. The selection criteria were one lowland village with good road connections and one fairly remote village in a mountainous location. The reason behind these selection criteria was to get two different perspectives on the dependence of natural resources based on two villages with vastly different environmental conditions and opportunities for commercial trade.

Wealth was the main selection criterion for which households to be interviewed. An even distribution of wealth classes was interviewed at their homes. The villages' council of leaders arranged each Household Interview as well as gathered the elders for the Elder Interview in Namo Nua. The council of leaders also provided guides with good local knowledge during the Field Studies. These Field Studies included visits to see most of the forest products and services mentioned throughout this thesis. The Field Studies covered the main part of the forest and bamboo stands surrounding the villages.

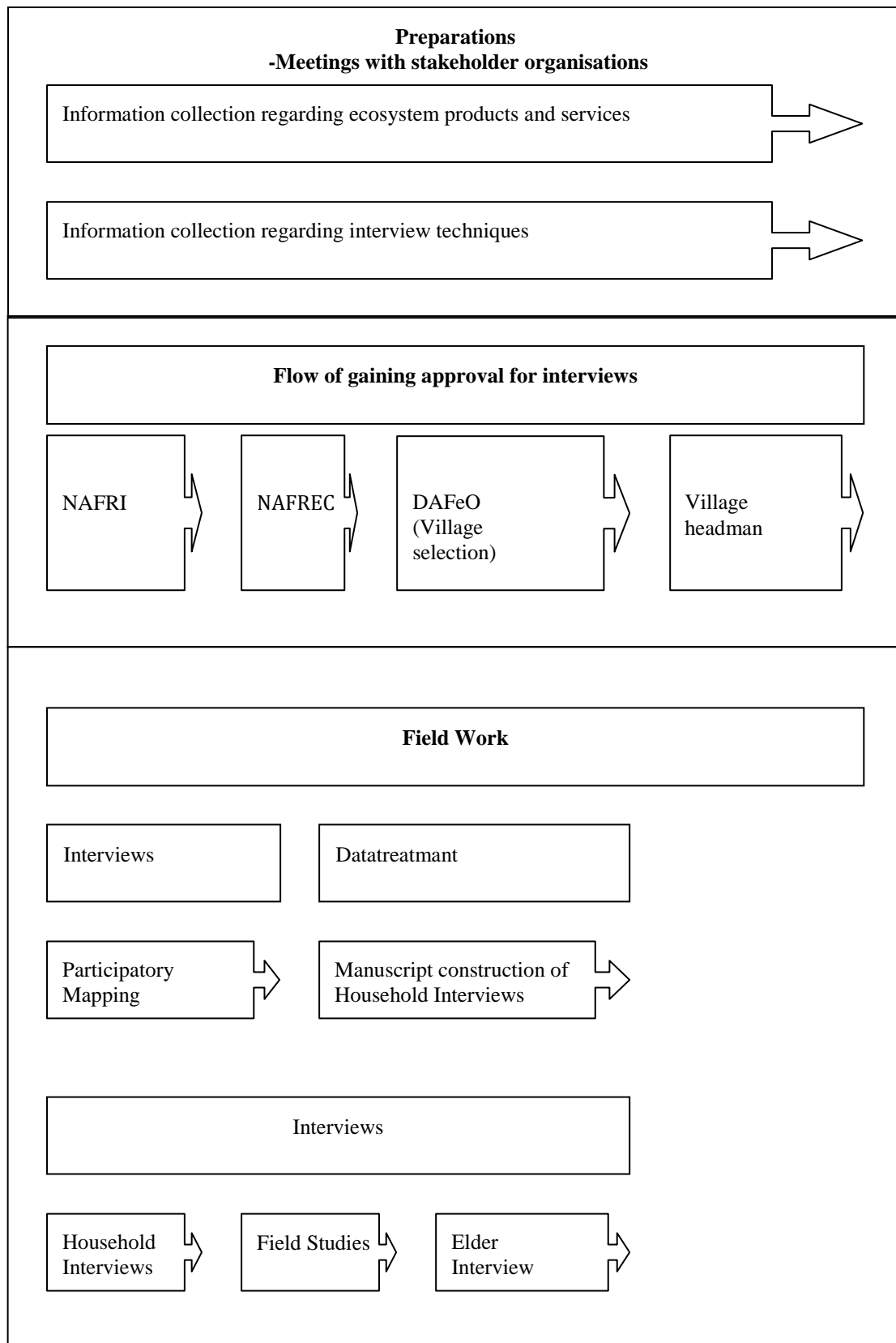


Figure 5.

## 4 Results

Both villages could show up a great number and knowledge about services and products from their surrounding forests. The villages also showed a great concern for the future of their forest and how to manage it properly for the best result of the products and services.

The villagers in Namonua for example showed a great concern for their rapidly diminishing forest resource. They were very eager to learn sound forest management and to find out new more wise farming techniques to replace the slash and burn agriculture. Several times they expressed a need for help with management methods which would make their forest utilization more sustainable. Another great wish in Namonua was that they would like more forest products and services in general.

In Phou Xang the villagers also showed a great concern that their forest resource was diminishing both in area and quality. A few interviewees would like to establish a working group for forest management to be able to use the forest in a wiser, more sustainable way than what have been done the past years. One interviewee even stated that he would like to be the chairman for such a group. A strong wish to learn wise forest management techniques was expressed several times. Some interviewees also stated that they would like to manage each part of the forest for the thing it was most suitable for. They also believed that the forest management would be more efficient if focus would be on one production type per area instead of several. Some interviewees stated that they wished to see that the village headman also set up rules for when to pick or “pick-able” minimum sizes for some important species.

The forest services and products in Namonua and Phou Xang are below described for their usage, management, preference etc. They are also arranged into four categories as follows: 1) Forest ecosystem Services, 2) Non-Timber Forest Products, 3) Fuel Wood and 4) Construction wood and Timber. The last category was very large and complex and has been lifted out from this study and analysed in a separate thesis by Kretz (2009).

For an overview of all found products and services they are summarized and listed in appendix 1.

### 4.1 Forest Ecosystem Services

#### 4.1.1 Forest Ecosystem Services in Namonua

##### **Water protection**

Water protection is in Namonua considered the most important service that the forest provides. The forest around the drinking water well is strictly protected by village rules. Villagers also show good insight into the fact that water quality greatly affects the quantity of fish and crustaceans in the streams.

## Shade

According to the elders, there used to be more large trees inside the village than what is found today. Due to this, the peak temperatures in the village are now more extreme since there are fewer trees giving shade during the warmest days and less foliage reflecting ground heat during cold nights. This forest service is today greatly missed by the elders of Namo Nua.

### 4.1.2 Forest Ecosystem Services in Phou Xang

## Water protection

Just like in Namo Nua, the protection of the water quality is of highest priority. The forest around the water well is strictly protected and no logging is allowed upslope from the well. Even the people in Phou Xang had insights into the effects that water quality has on the much appreciated fish and crustaceans found in the local streams.

## 4.2 Non Timber Forest Products

### 4.2.1 Non-Timber Forest Products in Namo Nua

Three products found in the surrounding forests are essential for the livelihoods of all families in Namo Nua and an additional hand full of products are collected by many families but are not essential to their direct survival. Instead, the village has a fairly large proportion of irrigated paddy fields and upland fields, which mainly contribute to the food and cash income of village residents. The surrounding forests are fairly degraded and some products are not found in needed quantities. To manage this situation, Namo Nua has collection agreements with the neighbouring village Phou Xang that gives the former village the right to collect Bitter bamboo and Mon leaf on the latter village's land.

### Bong bamboo *Bambusa tulda*

Bong bamboo shoots are locally called “nor bong” (see picture 4) and bong bamboo canes are called “mai bong”. Bong bamboo is the NTFP mentioned most often as the most important NTFP during all interviews. Bong bamboo shoots serves as the main staple food after rice. Mature canes are used for constructions and to start fires. The reason why this product is among the main staple foods is that it is commonly found on large areas close to the village and it has a long collecting period running from May to September. The ground shoots are most preferred and are collected throughout June until they reach a height of about 80 cm. After this, villagers collect branch shoots throughout August. In June, when Bong bamboo shoots are most plentiful, many families carry home quantities exceeding 100 kg, which are conserved for later use (see picture 5 and 6). Many respondents state they eat bong bamboo almost every day throughout the year. In the interview with the elders, it was stated that the bong bamboo used to be more



Picture 4. A bong bamboo shoot about 30 cm in height. Photo by Erik Kretz.



plentiful than it is today. As Bong bamboo shoots in Namo Nua is an essential food resource collected many days per year many villagers would like to grow it closer to the village, preferably within walking distance from the village. Bong bamboo is abundant in Namo Nua but most stands were in 2005 located far from the village.



Picture 5.



Picture 6.

In both villages Bong bamboo were conserved in bags either after they have been boiled as shown in picture 10 or after they have been dried as shown in picture 11. Photos by Erik Kretz.

### **Hok bamboo** *Dendrocalamus asper*

Hok bamboo shoots are locally called “nor hok” and hok bamboo canes are called “mai hok”. Hok bamboo is of lower importance than Bong bamboo but is of similar use. The shoots are collected for food and the canes are used for construction and as fire starters. Hok bamboo shoots are tastier than Bong bamboo shoots but are not found in such abundance as Bong bamboo and the collecting period runs only throughout June and July.

### **Hien bamboo**

Woven strips of Mai Hien bamboo (Hien canes) are used in poorer households as carpets and walls. Hien shoots (nor hien) can be eaten but this is rarely done. Hien canes are sometimes used for starting fires. Hien bamboo is of minor importance in Namo Nua as there are other preferred species which are more abundant.

### **Bitter bamboo** *Indosasa sinica*

“Nor kom” in Lao is considered to be an important food resource in this region. Bitter bamboo’s collecting period is from December to May when no other bamboo shoots can be collected. Bitter bamboo is therefore vital for levelling out the food resource over the year. Ground shoots can be sold at the local market and by the side of the road. However this is not practiced in Namo Nua as the resource is too limited and even decreasing in abundance here. Villagers in Namo Nua regularly walk to Phou Xang where they collect bitter bamboo for a collecting fee. For more information on this collecting fee system see, below, in the Phou Xang Bitter bamboo section. As Bitter bamboo is a very important food resource and a cash resource with high economical potential several villagers in Namo Nua would like to grow even Bitter bamboo within close walking distance from the village.

## Sweet bamboo

“Nor van” in Lao is of intermediate importance to Namo Nua. This NTFP is collected and eaten fresh but is only somewhat appreciated. Sweet bamboo functions as a cash crop in this region but this is not practiced much in Namo Nua as the resource is too limited. Some interviewees would like to grow Sweet bamboo within close walking distance from the village.

## Mushrooms

There are especially two species of mushrooms that are highly appreciated in Namo Nua, namely the Charcoal mushroom and the Red mushroom. These mushrooms are a very limited resource which has over the last years been rapidly decreasing in abundance. According to the elders, these two species used to be good cash crops. The mushrooms are collected and sold today but in smaller quantities than earlier. Mushroom is one of the things the villagers want to learn most how to manage effectively and properly to secure a good food and cash resource.

## Mon leaf

Mon leaf is a much utilised NTFP of intermediate importance. It is used as fodder for silk producing worms (see picture 7). In Namo Nua, silk production is practiced by most women but it is not considered a very important NTFP as the production is labour intense and does not yield large economic returns. Mon trees grow both in the forest and domesticated in gardens. Women from Namo Nua walk to Phou Xang to collect Mon leaves as according to the same fee system as for collecting Bitter bamboo.



Picture 7. A few hundred silk worms are here fed with Mon Leaf. The leafs are eaten within two minutes. Photo by Erik Kretz.

## Cardamom *Amomum spp.*

“Magneng” in Lao is an NTFP of minor importance in Namo Nua. Cardamom functions as a cash crop even thou it does not pay very well. The collection of cardamom used to be a large contributor to many household’s income but fewer rely on this today. Cardamom is fairly common in the mature forests surrounding Namo Nua. The mature forest area is shrinking each year and this undermines the production of wild cardamom.

### **Rattan shoots**

Today edible rattan is of minor importance to the people in Namo Nua. Eatable Rattan shoots used to be a reliable and appreciated food resource. Today, this is a scarce resource that is rarely used. There is a planting project for edible Rattan in one of the forests surrounding the village (see picture 8).



Picture 8. In Namo Nua there is a planting project for Rattan shoots. Photo by Markus Steen.

### **Root vegetable from old fallow**

This product is of least importance in Namo Nua and was only mentioned in one interview. This person said that this nutritious food could be a rich resource for the villagers but also that it is very rarely utilised because of its flavour.

### **Sang bamboo *Dendrocalamus brandisii***

This is a very large bamboo species; “Sang” means elephant. It is of intermediate importance and is mainly used for construction. The shoots can be eaten although this is not what the Sang bamboo is mainly appreciated for. Young Sang bamboo canes are used for making mats. Mature Sang bamboo canes are used as fence posts and as temporary houses poles. The canes are also used as containers where a node acts as the bottom. According to the elders, Sang Bamboo is one of the species which is not as abundant today as it used to be.

### **Mae larvae *Omphisa fuscidentalis***

Mae is a much appreciated cash crop collected mainly by poor people. The larvae are found inside Bong and Hok bamboo canes which makes Mae a heavy work to harvest (see picture 14). Mae is sold live in bamboo canes or fried as a delicacy by the side of the road or at the market in Namo. Mae is very unpredictable as a source of income. Some days the collector might not find any Mae and yet another day she or he might find Mae to the value of many weeks’ labour.

### **Puak Muak *Boehmeria malabarica***

This product varies widely in importance between households in Namo Nua as Puak Muak is strictly a cash crop. Puak Muak is a shrub which mainly is exported to China where the bark is used for incense and glue production. Some poor people who depend on NTFPs found in the forest consider this being an important product for earning cash income. Wealthier families with other sources of income often consider Puak Muak growing in the forest as a neglectable resource. When discussing forest ecosystem management in Namo Nua this product is often mentioned by all wealth classes as one of the products with best improvement possibilities. There is a planting project in Namo Nua for Puak Muak. Some few interviewees would like to plant more Puak Muak for generating a higher income.

## **Vegetables**

This category contains many different species collected at different times in the year. These species are more or less always grouped into one group. The category is always rated as important even though some species are not as appreciated as others. Some vegetables are domesticated while others are collected both in and outside the forest in Namonua.

## **Fern**

This category contains several different species of ferns that are often mentioned as one group. Some of these species are much appreciated as food. Fern is found both in and outside the forest in Namonua.

## **Fish**

Fish is a most appreciated product of fairly high importance to the people in Namonua. The fish resource is smaller today than it used to be. Some fifty years ago, the villagers ate fish several times per week but today many only eat fish about once a month. The fish population is dependent on the water quality, and water quality is dependent on the quality of the surrounding landscape and the forest. The quality of the water is worse today than what it used to be.

## **Birds**

Birds are a much appreciated food though they are a shrinking resource. In Namonua, most bird species seem to be eaten. It is mainly young boys who hunt birds with slingshots or crossbows.

## **Bats**

Bats are a food group of intermediate importance. Bats are caught with large nets.

## **Wild boar and deer**

These animals are a much appreciated food source but are very rarely caught. Both species used to be much more abundant than today.



#### 4.2.2 Non-Timber Forest Products in Phou Xang

The overall proportion of agricultural land in Phou Xang is small compared with many neighbouring villages. Phou Xang is therefore, strongly dependent on the forest and its products. A large proportion of the food, cash crops and construction material are NTFPs derived from the surrounding forests. Generally women spend a few hours per day collecting NTFPs. Families with smaller areas of agricultural land are more dependent on NTFPs and also tend to have a greater knowledge about different NTFPs. Most interviewees think they have a rich resource of NTFPs except concerning wildlife that they state is less plentiful today than what it used to be. Many villagers show concern for the future regarding the possibilities of finding some of the needed NTFPs.

##### **Bong Bamboo** *Bambusa tulda*

Bong bamboo shoots are just like in Namou Nua called “nor bong” and Bong bamboo canes are called “mai bong”. After rice, which is the main staple food, Bong bamboo competes with Bitter bamboo as the most important food in Phou Xang. Mature canes are used for construction and as a fire starter while the shoots are eaten. The reason why this product is among the main staple foods is that it is commonly found on large areas close to the village and that it has a long collecting period running from May until November with its peak in June. During the peak season most families store Bong bamboo shoots in jars for later use. From May to August, Bong bamboo shoots are collected about three times per week by many families. A family of 11 collects and eat about 500 kg of Bong bamboo shoots per year.

##### **Bitter bamboo** *Indosasa sinica*

This bamboo (see picture 9) is an important food staple in this region and especially in Phou Xang. Here, Bitter bamboo competes with Bong bamboo of being the second most important food staple after rice. Bitter bamboo can be collected from December to May when no other bamboo shoots can be collected. The product is therefore important for levelling out the food resource over the year. Bitter bamboo also functions as a major source of cash income. Ground shoots can be sold at the local market, by the side of the road or to traders who come to Phou Xang. In 2005 Bitter bamboo was usually sold in bundles of three for 1000 kip per bundle or about 1500 kip per kg (approximately US\$ 0,2). Bitter bamboo shoots are in this way a major source of cash income to the people of Phou Xang. Some interviewees state that there is enough Bitter bamboo growing for the local and the neighbouring villages’ needs. Other interviewees show concern for possible over harvesting of this important resource. In order to keep the control over the Bitter bamboo resource and hold the collecting levels down, the village have a collecting fee system for people from Namou Nua. Included in this system is also collecting of Mon leaf. Before anybody from



Picture 9. Bitter bamboo is considered one of the most important NTFPs in Phou Xang. Photo by Erik Kretz.

Namo Nua can come to collect Bitter bamboo they have to buy a collecting certificate in Namonua for 500 kip (approximately US\$ 0,06). Each day collecting in Phou Xang the person have to pay an additional 2000 kip (approximately US\$ 0,25). If the collector fails to show a valid certificate or do not pay the fee she or he has to pay 5000 kip (approximately US\$ 0,6) in penalty. The system is administrated by the village tax man in Phou Xang and most of the money is spent at an annual festival in the village. In Phou Xang they think it is easy to run this system. The villagers in Namonua accept this system and think it is fair. In Namonua they would like to use the same system for their little Bitter bamboo resource but do not think they can do this as this would mainly hit the villagers from Namotai which they state is a “friendship village”.

### **Hok bamboo** *Dendrocalamus asper*

Hok bamboo shoots are locally called “nor hok” and Hok bamboo canes are called “mai hok”. Hok bamboo is used as food, construction material and fire starter. Hok bamboo shoots are more appreciated than Bong bamboo but are not as abundant and has a shorter collecting period, June and July. Therefore is Hok bamboo not considered as important as Bong bamboo. Hok bamboo shoots can be stored for later use.

### **Hien bamboo**

Hien bamboo has the same utilisation and status in Phou Xang as in Namonua.

### **Mae larvae** *Omphisa fuscidentalis*

A few interviewees state that Mae larvae (see picture 10) is the most important NTFP as this is a profitable cash crop for them. Nevertheless, not many families collect Mae larvae at all. Mae larvae are sold fried by the side of the road in Namotai about six km away. The price in 2005 was 40 000 kip per kg (about 5 US\$). During an average collecting session villagers usually find about 100-200 gram of Mae larvae, and each session lasts for about six to seven hours. During the collecting season, July to November, gatherers usually make two sessions per week.



Picture 10. Mae larvae are found inside Bong and Hok bamboo canes. Photo by Markus Steen.

### **Mon leaf**

Mon leaf is of intermediate importance in Phou Xang. It is the fodder for silk larvae. Silk production is not the common practice in Phou Xang as it is in some of the neighbouring villages like Namonua. Women from these villages come to Phou Xang to collect Mon leaf through the same collecting fee system as for Bitter bamboo. Thus Mon leaf contributes to the village common economy even though villagers from Phou Xang rarely ever collect this NTFP themselves.

## **Fish and crustaceans**

Fish and crustaceans are much appreciated food products of intermediate importance in Phou Xang. Especially wealthier families who spend less time collecting different cash crops have time to catch fish and crustaceans.

## **Sweet bamboo**

This bamboo is of intermediate importance in Phou Xang. This NTFP is collected and eaten fresh but is only somewhat appreciated. Sweet bamboo functions as a cash crop in this region but this does not apply much for Phou Xang.

## **Mushrooms**

Mushrooms are appreciated but of minor importance in Phou Xang. Four species are mentioned in the interviews, namely: “Monkey Ear”, “Het Bee”, “Charcoal mushroom” and “Het Poo Naan”. Monkey Ear mushroom is paid 30 000 kip per kg (approximately US\$ 3,8) at the market in Namo. Monkey Ear is collected between May and September with the peak in July and August. Het Bee mushrooms can be collected all year round and they seem to grow in symbiosis with Mai Hien trees. Charcoal mushrooms were found for the first time in 2003 and was picked in considerably large quantities in 2005. Het Poo Naan mushroom is of least importance.

## **Cardamom *Amomum spp.***

This plant is a cash crop of intermediate importance to the villagers of Phou Xang. Cardamom is collected between June and August and is said to be found only in mature forests. In 2005 about three kg was found per family.

## **Puak Muak *Boehmeria malabarica***

Puak Muak is of intermediate importance in Phou Xang. This shrub is strictly a cash crop in Phou Xang.

## **Nja Bai Lay *Ludisia discolor***

Nja Bai Lay is a cash crop of minor importance collected by a few villagers in Phou Xang. It is a traditional medicine against malaria.

## **Broom grass *Thysanolaena maxima***

This NTFP is of minor importance in Phou Xang. Only brooms for local use are produced by the villagers from this product.

## **Vegetables**

Vegetables are most often mentioned as one group. In Phou Xang, vegetables hold a status of intermediate importance.

## Sea weed

This is a much appreciated food resource found in the streams and ponds in Phou Xang (see picture 11).



Picture 11. Recently collected sea weed before cooking. Photo by Markus Steen.

## 4.3 Fuel wood

### 4.3.1 Fuel wood in Namu Nua

In Namu Nua, only a few species are preferred as fuel wood. What signifies good fuel wood is that it does not smoke much, has good energy value and that the diameter of the log is between 5 and 15 cm. Logs with larger diameters are better as fuel but are heavier to transport and more difficult to cut. The wood of the “Ko” species (*Fagaceae fam.*) best meets these criteria and are therefore the most preferred species for fire wood. Ko wood is also appreciated when making the charcoal used during metal forging. Mai Tjao is the preferred species in some interviews and other appreciated species are Mai Gome, Mai Muat and Mai Pao (*Shorea siamensis*). Bong bamboo canes (*Bambusa tulda*) are mostly used to light fires. In the interview with elders in Namu Nua it was stated that the same species are used for fuel wood today as when they were young.

In Namu Nua most wood is collected in November after the rice harvest. The most common practice is to collect wood in the upland agricultural fields. However, some families who lack sufficient labour and have no tractor also collect fuel wood after the slash and burn. The slash and burn is mainly done during the dry season in May but also after harvest in October – November. These fields are always former forests that have been slashed and burned leaving plenty of swidden trunks and branches. Some families also collect fuel wood in mature forests without caring that this is not legal. Some families even only collect fuel wood from mature forests. Most people take care and try only to legally collect dead wood. Dead wood is easier to burn and there are village rules and penalties concerning the cutting of live trees. The first time somebody use live trees for fuel wood the person is fined 25 000 kip (approximately US\$ 3) per area of 2 by 2 metres. The second time this happens the fine is doubled. The same rule is used for neighbouring villagers who come to Namu Nua to cut live trees. Similarly, it is prohibited to carry out slash and burn in mature forests. The head man expressed frustration about the rule enforcement. There is very little respect shown to this rule and the village headman has low power to enforce it and demand the penalty fees. The reason why not many obey the rules is that they are new and the understanding of the rules is low. For example; in 2004, 14 ha were illegally logged within Namu Nua borders. Most of this was conducted by bordering villages.

Most interviewees did not show any concern for the fuel wood abundance today stating that there is plenty to find. However, many elders stated that fuel wood gathering is today much



more time consuming than it used to be. When there used to be more mature forest directly around the village (which is not the case today), the villagers used to spend around fifteen minutes per trip. Today it is common to spend about two hours to collect the same amount of fuel wood with usually one hour spent collecting and one hour for transport. The main difference from when the elders were young was the walking distance. Some families use tractor and wagon to transport the fuel wood from the side of the road back to the house, which saves a lot of time. Those who carry the fuel wood on their shoulders carry about 0,2 m<sup>3</sup> or 20-25 kg per trip per person. It takes a family about two days to gather all the fuel wood needed for a year if a tractor and wagon is used and most family members help out. But these cases are rare. It was stated several times in Namo Nua that it is mostly the women that do all fuel wood gathering. For example, in one family of seven, the mother and one of the daughters gathered about 12 m<sup>3</sup> per year. For these two to gather this amount, it took two hours per day or 30 days of labour per year. The amount of fuel wood gathered per family member ranges from 1 to 1.7 m<sup>3</sup> per year in Namo Nua.

In Namo Nua some interviewees express a strong will to manage the forest for more fuel wood. This concern comes from that it is more and more time consuming to collect fuel wood. One interviewee even state she can not afford to put more time into the fuel wood gathering. She believe fuel wood gathering will be even more time consuming in the future. It is mentioned that they would like to manage the Ko species in general (*Fagaceae fam.*). Mai Pao (*Shorea siamensis*) is mentioned as an alternative as it is stated that this species also provide good fodder for buffaloes. Mai Thalo (*Schima wallichii*) is also mentioned as this species is both fine construction wood and fine fuel wood.

#### 4.3.2 Fuel Wood in Phou Xang

Just like in Namo Nua, the preferred characteristics of fuel wood in Phou Xang are good energy value and that the wood produce little smoke. Even here in Phou Xang are the Mai Ko trees (*Fagaceae fam.*) the most preferred wood species group. Other appreciated species include: Mai Sako (*Anthocephalus chinensis*), Mai Tao (*Arenga westerhoutii*), Mai Thalo and Mai Pao (*Shorea siamensis*). To light fires, villagers in Phou Xang use Bong bamboo canes (*Bambusa tulda*).

Mai Ko is also appreciated because it is easy to find both in the mature forest and on recently swidden agricultural land. Mai Pao is appreciated because it splits easily and the foliage is good fodder for buffalos. Mai Thalo makes both fine fuel wood and fine construction timber. Dead wood is usually collected as this is already dry which is beneficial both for carrying and for burning. Log diameters which do not need to be split are preferred, but if the wood does need further splitting, then this is done out in field

and the wood is then carried home when dry. One interviewee stated that he does not harvest small diameter trees from agriculture



Picture 12. Fuel wood waiting for transport to the household by the side of the road in Phou Xang. Photo by Markus Steen.

land but instead leaves these for soil improvement.

Some families only collect fuel wood from swidden agriculture fields, some only from mature forest and some from both. The forest close to the road is the most popular forest for collecting fuel wood because it is easier to carry the load on the road or to transport the fuel wood with tractor and wagon (see picture 12). About half of the interviewees transport their fuel wood with tractor and wagon while the other half carries the fuel wood on their shoulders. The wealthier family, the more common tractor transport is. Families without their own tractor often rent this transport service from some neighbour for 30 000 kip (approximately US\$ 3,8) per turn.

The most common practice in Phou Xang is to collect all the fuel wood in November and December, after the rice harvest. Households with sufficient labour force and planning do all their collecting in this time, others do additional collecting after the slash and burn.

Furthermore, the gathering process used to be more time consuming than it is today due to the road through the village which was built a few years ago. Nevertheless, they do have to walk further and further each year as the good firewood along the road is getting scarcer. For example, a household of three can collect their year-long supply of firewood, ca 3 m<sup>3</sup>, in one day if all three household members participate and a tractor is used to transport the wood along the road. Another household of 12 uses 6 m<sup>3</sup> of fuel wood per year and two old women do all gathering in five days. They use tractor and wagon on the road. The amount fuel wood needed in Phou Xang ranges from 0.5 to 1 m<sup>3</sup> per person per year. Most of the village's fuel wood is collected by women even though men often help out.

#### 4.4 Construction Wood and Timber

Close to all constructions in Namou Nua and Pou Xang are built out of wood or bamboo from the surrounding forest. To express the importance of construction wood, a woman in Namou Nua stated: "rice for food, water to drink and wood for the house is all of equal importance. One can not live without any of them". As mentioned above, these founding's were very extensive and complex and have therefore been analysed in a separate study. For more information of these two villages use and consumption of construction wood and timber see Kretz (2009).

## 5 Discussion

Many interviewees are witnessing that the forest area around Namo Nua and Phou Xang is decreasing in extent. Several of the forest products and services are lost when the trees are cut for fuel wood, construction timber or when preparing an area for slash and burn agriculture. However, it is promising to understand that the consequences of all actions in the forests are thoroughly understood by the villagers. For example did villagers show great insight into the complex relationship between “undisturbed forest – water quality – human health – healthy fish and crustaceans populations”. There are many studies explaining these relationships (Etnier, et al., 1996; FAO, 2003; Hofer 2002; Myers, 1997a, Vantomme, 2002; Örner, 1995) but none are actually showing that this relationship also is understood by forest dwelling people. That this relationship is carefully understood explains why the forests upstream from the water well are strictly protected and in a relatively good condition.

The second preferred forest service was the benefits of shade given by trees within the village. Shade was however only mentioned in Namo Nua and only when interviewing the elders. Even though this was mentioned by rather few people and could be considered as a rather weak result it is still very interesting to see that this service is appreciated and noticed, especially as this was expressed by the elders. One reason why this was only mentioned by elders and not by any young could be that the younger never have experienced the benefits of trees within the village as the elder has. The reason why shade is important is the improved local micro climate it creates. It levels out peak temperatures, protects houses, animals and people from sun, rain and wind. At the same time those trees provide villagers with fruit and fodder close to where they live.

Both Namo Nua and Phou Xang depend to a large extent on NTFPs for food, which also is common in the whole region (Yokoyama, 2003). Phou Xang though, rely on NTFPs to a larger extent since they lack irrigated paddy fields for rice production and have to rely on poor upland rice production to get their main food resource. That probably increases the need of other complementary products. Actually NTFPs are extra important for households with insufficient available agricultural land. The food forest products act like a social safety net for these households, this has also been observed by Arnold et al. (1998) and Bounthong et al. (2003). Some households even rely entirely on NTFPs for survival. The forest resource is rich enough in both villages to support both rich and poor. But care should be taken to safeguard the forests' capacity to act as social safety nets as the abundance of several essential NTFPs are diminishing.

Most of the NTFPs in both villages are used for food and fodder for the village animals, which is similar to what has been found in other studies from the region (e.g. Foppes, 2004 and Vantomme, 2002). The food NTFPs are dominated by shoots of different bamboo species and wild animals like birds and larvae. It is especially Bong and Bitter bamboo that are really essential and appreciated for the people. Bong bamboo is the food favourite among the people, it has the longest collecting period of all important food NTFPs and it can be stored for long periods. Bitter bamboo is essential in this area since it is the only fresh forest grown food product found during winter time. Most likely these two vegetables play an extraordinary role in these people's diet and for their health. Bamboo is not only an appreciated food product it is also a very important and appreciated product for constructions and fuel wood.

Several products are sold at the road side or at different markets in the region. Here, Bitter bamboo also plays a central role as a very popular cash crop. Other crops, like Puak Muak, Cardamom and mushrooms are sold to the big markets in nearby larger towns and directly to China. These cash crop products are essential for many families to get some kind of capital, for some families it may be the only way to get money. The markets in China are today growing and the demand for several products increases month by month. How this will affect the collecting of such NTFPs is essential when planning for management routines in the near future.

Surprisingly no villagers mentioned any NTFP that was used for medicine. Medicine NTFPs are otherwise relatively common and appreciated in this area (Vantomme, 2002). Probably these two villages also uses NTFPs for medicine but of some unknown reason excluded them from the ranking lists in this study. However it may also be so that the people in these villages more and more rely on modern medical practices.

People in these villages are very interested in management routines regarding forest products and services, and how to improve them to reach a sustainable forest use. It is very promising for example that people in both villages stated that they would like groups to be formed to work for wise forest management; groups that could learn together how to make management plans and establish sound harvesting levels together. Several interviewees also wanted to implement clear rules for when certain products may be collected or for minimum sizes that products must attain before harvest, for example mushrooms and Bitter bamboo shoots. These findings are good examples of that people in this part of Laos see there forests as an essential source for both food and other products, a source that you need to treat carefully. Better management routines and rules of harvestable sizes etc would probably help the villagers to get out of “The Tragedy of the Commons” (Brännlund, 1998; Daily, 1997; Swanson, 1996) which put its shadow over the whole management practices used today. Even if villagers today can see great potentials of leaving crops and products to reach an optimal size, they are afraid that someone else will come and collect it before them. The frustration about this tragedy of the commons was expressed by some villagers but the awareness among the villagers of this dilemma is probably widespread. The lack of common routines and rules is probably one of the main reasons that the forest today becomes degraded at a relatively fast speed.

Even though the resources are diminishing in abundance, the important bamboos Bong and Hok are abundant enough in both villages to support the populations. It is, however, different for Bitter bamboo, which is one of the most important products. Still Phou Xang has a supply that is enough to support both villages. At the same time Namou Nua lacks a good Bitter bamboo resource. The collecting fee system used in Phou Xang for Bitter bamboo is very interesting as this is Phou Xang’s way to protect their valuable resource from overexploitation. It is also worth mentioning that those interviewed in Namou Nua respect this collecting fee as a fair way for Phou Xang to protect their own valued resource and that villagers from Namou Nua even show interest in formulating similar arrangements for other resources they would like to protect.

As stated in several interviews, it is important that the most important and needed products are found close to the village to minimize transport time and effort. Examples of such products are stands of Bong, Hok and Bitter bamboo. Another benefit of management of preferred products is that it can relieve the harvesting pressure on pristine forests. Until

recently, forest resources have been abundant enough to support the villages. Therefore, only limited efforts have been made to domesticate desirable species. There could be great undeveloped potentials for the villagers if different NTFP could be domesticated and produced extensively.

Fuel wood was also found to be an essential forest product for the villagers in Namo Nua and Phou Xang. A general problem in both villages when gathering fuel wood is that the time needed to collect fuel wood has been ever increasing. This was mainly stated by elder people and the reason for that could be that the negative development of this resource happened over so long time spans that the villager's needs to gain a certain age to notice it. As fuel for cooking and for heating is essential to all people (Goldemberg, 2006; WHO, 2006), and the only fuel for cooking and heating in these two villages comes from wood, it is essential that the problem with the diminishing fuel wood resource is addressed. One interesting management idea that addresses this problem was presented by the villagers. The idea is to cultivate preferred fuel wood species on agricultural land left for fallow after the last harvest. Ideally, tree species suitable for fuel wood could be planted together with the crops, thereby giving the trees a faster start before the fallow period. The valuable fuel wood trees can then be harvested when the fallow period is over and it is time for a new round of slash and burn. Preferably, species that also can provide timber, fodder, food etc. are chosen. Seedlings of nearly all interesting fuel wood species are possible to find either in the fallow or in some nearby forest. Suitable seedlings could then be replanted on the fallow and competing vegetation cleared away. The supply of fuel wood can in this way be secured. Yet another wise way to economize the use of fuel wood is by using more efficient stoves which cook food with less fuel. Today the food is cooked over open fires in these villages.

This study ranked the importance of forest services and products. If a similar study is to be done it is recommended to focus more on which products and services are most important and how these are important. The ranking system "essential - Highly appreciated and/or commonly used – Other" is a ranking system which can be recommended. It is a ranking which is easy for the villager to understand. Management is a large subject which is recommended to be separately dealt with in a separate study.

Further studies are needed to quantify these detected needs and how to monitor the development of the preferred forest services and products. Also, it would be interesting with more research regarding the optimum potential of the most important forest products depending on time and intensity of harvest. It is likely that the potential optimum yield differs largely from today's harvest levels. To make it possible to approach this region's potential optimum harvest levels, it is important to gain further understanding about the tragedy of the commons and to introduce necessary rules and practices to counteract this.

Several difficulties which may have affected the results accompanied this study. One source of error could be mistranslations. The interviews were interpreted to English from Lao. In Phou Xang, there was yet one more step: English – Lao – Phou Xang. Another language problem throughout the field studies related to the identification of plant species. Local and not common Lao names were often used among villagers in both villages. This made it difficult or sometimes impossible to identify the scientific names. Further studies of some species have therefore been impossible.

## 6 Conclusion

To summarize, the most appreciated and essential forest ecosystem products and services in the villages of Namo Nua and Phou Xang were found to be clean water, Bong and Bitter bamboo and wood for fuel and construction. These forest ecosystem services and products must be safeguarded with sufficient quality and quantities if the quality of life is to be sustained in these two villages.



Erik Kretz and Markus Steen during field studies in Phou Xang 2005. Photo by Markus Steen.

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## Appendix

### Matrix over appreciated forest ecosystem services and products in Namu Nua and Phou Xang

\*\*\* indicates essential

\*\* indicates highly appreciated and/or commonly used

\* indicates non-specified status

- indicates not mentioned in any interview.

Brackets, “()”, indicates more complex status. See text for further description.

	In Namu Nua					In Phou Xang				
Service or product (Local and scientific name)	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood
<b>Water protection</b>	-	***	-	-	-	-	***	-	-	-
<b>Shade</b>	-	*	-	-	-	-	-	-	-	-
<b>Bong bamboo</b> <i>Bambusa tulda</i>	D, F	-	***	***	**	D, F	-	***	***	**
<b>Hok bamboo</b> <i>Dendrocalamus asper</i>	D, F	-	**	**	**	D, F	-	**(*)	**	**
<b>Bitter bamboo</b> <i>Indosasa sinica</i>	D, F	-	**	-	-	D, C, F	-	***	-	-
<b>Sweet bamboo</b>	D, F	-	*	-	-	D, (C), F	-	*	-	-
<b>Poa bamboo</b>	D	-	-	-	-	D	-	-	*	-
<b>Hien bamboo</b>	D, (F)	-	(*)	*	(*)	D, (F)	-	(*)	*	(*)
<b>Muchrooms</b>	D,C, F	-	**	-	-	D, C, F	-	*	-	-
<b>Mon leaf</b>	D,(C), Fo	-	*	-	-	(D), C	-	**	-	-

	In Namou Nua					In Phou Xang				
Service or product	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood
<b>Cardamom</b> <i>Amomum spp.</i>	C, F	-	*	-	-	C, F	-	*	-	-
<b>Rattan shoots</b>	D, F	-	*	-	-	-	-	-	-	-
<b>Root vegetable from old fallow</b>	D, F	-	*	-	-	-	-	-	-	-
<b>Sang bamboo</b> <i>Dendrocalamus brandisii</i>	D, (F)	-	*	**	-	-	-		-	-
<b>Mae larvae</b> <i>Omphisa fuscidentalis</i>	(D), C, F	-	**	-	-	C,F	-	*(**)	-	-
<b>Puak Muak</b> <i>Boehmeria malabarica</i>	C	-	*(*)	-	-	C	-	*	-	-
<b>Vegetables</b>	D, F	-	**	-	-	-	-	*	-	-
<b>Fern</b>	D, F	-	*(*)	-	-	-	-	-	-	-
<b>River weed</b> <i>Cladophora glomerata</i>						D, F	-	**	-	-
<b>Nja Bai Lay</b> <i>Ludisia discolor</i>						C	-	*	-	-
<b>Broom grass</b> <i>Thysanolaena maxima</i>						D	-	*	-	-
<b>Fish and Crustaceans</b>	D, (C), F	-	**	-	-	D, F	-	**	-	-

	In Namou Nua					In Phou Xang				
Service or product	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood	D for domestic use C for Cashcrop F for food Fo for fodder	Forest Service	NTFP	Wood and timber	Fuel Wood
<b>Birds</b>	D, F	-	**	-	-	-	-	-	-	-
<b>Bats</b>	D, F	-	*	-	-	-	-	-	-	-
<b>Wild Boar and deer</b>	D, F	-	**	-	-	-	-	-	-	-
<b>Koo (several species)</b> <i>Fagaceae fam.</i>	D	-	-	*	***	D	-	-	*	***
<b>Mai Tjao</b>	D	-	-	-	**(*)	-	-	-	-	-
<b>Mai Gome</b>	D	-	-	-	**	-	-	-	-	-
<b>Mai Muat</b>	D	-	-	-	**	D	-	-	-	*
<b>Mai Pao</b> <i>Shorea siamensis</i>	D, Fo	-	-	-	**	D, Fo	-	-	-	**
<b>Mai Sako</b> <i>Anthocephalus chinensis</i>	-	-	-	-	-	D	-	-	-	**
<b>Mai Thalo</b> <i>Schima wallichii</i>	D	-	-	**	**	D	-	-	**	**
<b>Mai Tao</b> <i>Arenga westerhoutii</i>	-	-	-	-	-	D	-	-	-	**

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