



UNIVERSITY OF HELSINKI
FACULTY OF AGRICULTURE AND FORESTRY
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**FOREST AND ENVIRONMENTAL INCOME
DEPENDENCY IN RURAL LIVELIHOODS:
A CASE STUDY OF THREE VILLAGES IN
MAHAXAY DISTRICT, LAO PDR**

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FOREST ECONOMICS AND MARKETING

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Tiivistelmä/Referat – Abstract <p>In recent years, the Laos economy – driven by the primary sector – has been growing fast, however poverty remains widespread. Economic growth is also influencing the livelihoods of rural people who account for 61% of Lao population and depend highly on forests and environmental resources. Many studies address the role of NTFPs in rural livelihoods globally but the total contribution of forests and environmental resources, and the associated changes in their access and availability, have generally been neglected, also in Laos.</p> <p>The overarching research question of this study aims to determine how dependent rural Lao livelihoods are on forest and environmental products by estimating their contribution in total household income and food security. The other objectives are <i>i)</i> to find out which forest and environmental products households are the most dependent on, <i>ii)</i> to compare NTFPs and timber in their contribution to livelihoods, and <i>iii)</i> to learn how the access to, and the number of, forest products has changed in the past and whether they are expected to change in the future. The primary data used in this study was collected in Mahaxay District, Central Lao PDR in March 2016. Altogether 90 randomly selected households were interviewed using semi-structured surveys in three sample villages purposefully selected along a remoteness gradient. In addition, two focus group discussions (one male and one female) and one key informant interview were conducted in each village to collect village-level background information.</p> <p>It was found that the sample households rely heavily on forests and the environment, especially for food products. In the most remote village 80% of the households would not have had enough to eat without the contribution of NTFPs in their nutrition. On average forest and environmental products contributed to 12% of the cash income of the households interviewed. The cash-equivalent value of subsistence income from forest and environmental products is higher than that of cash income from their sales all three sample villages. There were significant differences between the villages: the poorest village was also the most dependent on forest products for both cash and subsistence income. NTFPs were remarkably more important than timber for both subsistence and cash income. Bamboo shoots, firewood and mushrooms were the most collected forest products. Fallow was the most important land-use type for forest and environmental product collection. There was a strong decrease in both access to forest products and their availability in the past five years, and most sample households also expected the trend of decline to continue into the future.</p> <p>The kind of reliance on forests and wild lands described in this study is threatened by population growth, deforestation and forest degradation associated with Laos' rapid economic transition. The strong dependency of the rural Lao population on forest and environmental income should be considered also by the Lao government in the aim for green economic transition.</p>			
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Tiivistelmä/Referat – Abstract <p>Viime vuosina Laosin pääosin alkutuotantoon pohjautuva talous on kasvanut nopeasti, mutta köyhyys on edelleen maanlaajuinen ongelma. Talouskasvu näkyy myös Laosin maaseudulla elävän väestön (61% laosilaisista) toimeentulossa, jotka ovat vahvasti riippuvaisia metsistä ja ympäristöstä. Metsätuotteiden roolia toimeentulossa on tutkittu laajalti, mutta puutuotteiden merkitystä sekä metsätuotteiden määrän ja saatavuuden muutosta on tarkasteltu niukalti.</p> <p>Tutkimuskysymys on, kuinka riippuvaista Laosin maaseudun väestö on metsistä ja ympäristöstä. Tähän vastataan arvioimalla metsä- ja ympäristötuotteiden osuus kotitalouden kokonaistuloista, sekä niiden merkitys ravintona. Tutkimuksen muut tavoitteet ovat i) arvioida, mistä metsä- ja ympäristötuotteista kotitaloudet ovat kaikista riippuvaisimpia, ii) verrata puun ja muiden metsä- ja ympäristötuotteiden merkitystä toimeentulossa, sekä iii) selvittää, kuinka näiden hyödykkeiden määrä ja saatavuus ovat muuttuneet, sekä kuinka niiden odotetaan muuttuvan lähitulevaisuudessa. Tutkimuksen primääridata kerättiin kolmesta tarkoituksellisesti valitusta kylästä maaliskuussa 2016 Mahaxayn alueella Laosissa. Kaikkiaan 90 satunnaisesti valittua kotitaloutta haastateltiin puolistrukturoiduissa haastatteluisissa. Lisäksi jokaisessa kylässä toteutettiin kaksi fokusryhmähaastattelua ja yksi avainhenkilöhaastattelu taustatiedon keräämiseksi.</p> <p>Tutkimukseen haastatellut kotitaloudet ovat yhä vahvasti riippuvaisia metsistä. Syrjäisimmässä kylässä 80 % kotitalouksista olisi kokenut ravinnonpuutetta ilman metsätuotteita. Keskimäärin 12 % kotitalouksien rahallisesta tulosta ansaittiin metsä- ja ympäristötuotteilla. Omaan käyttöön kerätyillä metsä- ja ympäristötuotteilla oli rahassa mitattuna myyntituloa suurempi merkitys kaikissa kylissä. Kylien välillä oli myös merkittäviä eroja: köyhin kylä on myös kaikista riippuvaisin metsä- ja ympäristötuotteista. Eniten merkitystä toimeentulossa oli syötävillä metsä- ja ympäristötuotteilla. Bambunversoja, polttopuuta ja sieniä kerättiin eniten. Keräämisen näkökulmasta kesantoalueet olivat kaikista tärkein metsä- ja ympäristötyyppi. Metsätuotteiden määrässä ja saatavuudessa oli ollut laskeva trendi viimeisen viiden vuoden aikana ja useimmat kotitaloudet odottivat laskun jatkuvan myös lähitulevaisuudessa.</p> <p>Väestönkasvu, metsäkato ja metsien laadun heikkeneminen, jotka ovat tiiviissä yhteydessä Laosin talouden murrokseen, uhkaavat tutkimuksessa kuvatun kaltaista metsä- ja ympäristöriippuvuutta. Maaseudun väestön vahva metsäriippuvuus tulisi huomioida myös poliittisessa päätöksenteossa, kun maa tavoittelee ympäristöarvot huomioivaa taloudellista kehitystä.</p>			
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CONTENTS

LIST OF FIGURES	VI
LIST OF TABLES	VIII
ACKNOWLEDGEMENTS.....	X
LIST OF ABBREVIATIONS	XI
FOREWORD.....	XII
1 INTRODUCTION.....	2
1.1 Rationale.....	2
1.2 Research gap.....	3
1.3 Research questions and hypotheses.....	4
2 THEORETICAL FRAMEWORK	6
2.1 Framework of the study	6
2.2 Livelihoods	7
2.2.1 Defining forest dependency	8
2.2.2 Food security.....	10
2.3 Forest and environmental products	10
2.3.1 Defining forest	11
2.3.2 Forest product stakeholders.....	12
2.4 Defining access and availability.....	12
3 LITERATURE REVIEW.....	14
3.1 The role of forests in rural livelihoods and development	14
3.1.1 Forests in sustainable development	14
3.1.2 Forest and environmental products in rural livelihoods	15
3.2 Forest dependency	17
3.2.1 The role of forest and environmental products in poverty alleviation.....	18
3.2.2 Forest dependency in Laos.....	21
3.3 Access and availability of forest products	22
4 COUNTRY PROFILE OF LAOS	25
4.1 General information on Laos.....	25
4.1.1 History.....	26
4.1.2 Economy and development	27
4.1.3 Lao livelihoods.....	28
4.2 Laotian forests.....	29

4.2.1	Deforestation and forest degradation	31
4.2.2	Forest policies and governance in Laos	33
5	DATA AND METHODS	35
5.1	Overview.....	35
5.2	Study area.....	35
5.2.1	Selection of the villages	36
5.2.2	Village descriptions.....	38
5.2.2.1	Phowa	38
5.2.2.2	Phonnadee.....	40
5.2.2.3	Naphakeo.....	42
5.3	Data collection and methods.....	43
5.3.1	Key informant interviews.....	44
5.3.2	Household Surveys.....	45
5.3.2.1	Selection of the households	45
5.3.2.2	Designing the questionnaire	46
5.3.2.3	Testing the questionnaires	47
5.3.2.4	Executing household surveys	48
5.3.3	Focus group discussions.....	49
5.4	Data analysis	50
6	RESULTS	51
6.1	Demographic information.....	51
6.2	Dependency on forest and environmental products	52
6.2.1	Village livelihoods	52
6.2.2	Forest and environmental products in cash income	52
6.2.3	Subsistence income from forest and environmental products	54
6.2.4	Dependency according to income groups	55
6.2.5	Forest products in food security	57
6.2.6	The most collected forest and environmental products	58
6.2.7	Sources of forest and environmental products	59
6.3	Access and availability	60
6.3.1	Perceptions on past changes.....	60
6.3.2	Predicted changes.....	63
6.4	Summary of the main findings	65
7	DISCUSSION	66
7.1	The dependency of livelihoods on forest and environmental products	66

7.1.1	Food sufficiency in forest and environmental dependency	66
7.1.2	Cash income in forest and environmental dependency	67
7.1.3	Subsistence income in forest and environmental dependency	68
7.1.4	The dependency on forests across income groups	69
7.1.5	The importance of NTFPs compared to timber	70
7.1.6	Main forest and environmental products and land types	71
7.1.7	Concluding on forest dependency	72
7.2	Access and availability of forest products	73
7.3	Discussion on theoretical framework.....	76
7.4	Limitations of the study.....	76
7.4.1	Field work and interview based limitations	77
7.4.2	Limitations of the data	79
7.4.3	Representativeness of the sample.....	80
7.5	Future research.....	81
8	CONCLUSIONS	83
	REFERENCES	85
	APPENDICES	I
	Annex 1: Household questionnaire	i
	Annex 2: Questionnaire for focus group discussions	xi
	Annex 3: Key informant interview questionnaire	xvii
	Annex 4: Exchange rate and date of USD.....	xxiii
	Annex 5: The distribution of households' total income and forest product income data	xxiv
	Annex 6: The average prices of different product groups	xxv

LIST OF FIGURES

Figure 1. Framework of the study.	6
Figure 2. The sustainable livelihoods approach.	8
Figure 3. The dependency on forests in different living environments.	9
Figure 4. The contribution of different forest products to forest income (%).	18
Figure 5. Map of Laos showing the nation’s capital, Khammouan Province, and the neighbouring countries.	25
Figure 6. The Vegetation of Southeast Asia.	29
Figure 7. Forest cover in Laos during 1940-2010 in million hectares.	31
Figure 8. A map of the sample villages Phowa, Phonnadee and Naphakeo.	37
Figure 9. A view of the rice paddies and Karst mountains surrounding Phowa.	39
Figure 10. Phonnadee is situated next to the road from Panam to Boulapha.	41
Figure 11. Livestock is an important income source for the villagers of Naphakeo.	42
Figure 12. The shares of annual average income in the sample villages by income sources (bars, in percentage) and in USD (labels) per household.	53
Figure 13. The share and cash-value of forest and environmental products in the total household forest and environmental product cash income of the sample villages. ...	54
Figure 14. The division of total forest and environmental cash- and subsistence-income between the income groups in the sample villages in percentages.	56
Figure 15. The share of forest product income in the total annual income of different income groups in percentage.	57
Figure 16. Self-sufficiency of food production and food security without NTFPs. ..	58
Figure 17. The share of households collecting forest and environmental products in the sample villages.	59
Figure 18. The share of different wild land types from which the forest and environmental products* are collected.	60
Figure 19. Perceived changes in access and availability of forest products in all three study villages in the past 5 years.	61
Figure 20. The change in the number of forest products by different product groups in all the three villages in the past 5 years.	63
Figure 21. The change in forest product access and availability in the future.	64

Figure 22. The perceptions of reasons for future decrease in forest product access and availability in the sample villages. 65

Figure 23. Evaluation of forest dependency in the sample villages..... 66

Figure 24. Evaluation of negative past change in forest access and availability. 74

LIST OF TABLES

Table 1. The ways of gaining subsistence and cash income from forest and environmental products.....	16
Table 2. Highly forest dependent livelihoods and attributes of forest use.....	18
Table 3. Geographic and demographic information of the three sample villages in 2016.....	51
Table 4. Descriptive statistics of average annual cash income in the sample villages, in USD.....	52
Table 5. The estimated average annual household subsistence value and cash income of forest and environmental products in the three sample villages. In USD and percentage of total forest and environmental income.	55
Table 6. The subsistence use of the most important forest product groups in USD and percentage of total subsistence value, per household.....	55

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LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
CDM	Clean Development Mechanism of the United Nations Framework Convention on Climate Change
CIA	Central Intelligence Agency
CIFOR	Center for International Forestry Research
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FP	Forest Product
GDP	Gross Domestic Product
GET-LDC	Green Economy Transitions in the Least Developed Countries (project)
HA	Hectare (10,000 m ²)
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
IUFRO	International Union of Forest Research Organizations
NTFP	Non-Timber Forest Product
PDR	People's Democratic Republic
PFA	Production Forest Area
PROFOR	Program on Forests (World Bank)
REDD	Reduced emissions from deforestation and forest degradation
RRI	Rights and Resources Initiative
SPSS	Statistical Package for the Social Sciences (software)
SUFORD	Sustainable Forestry and Rural Development
UN	The United Nations
UNEP	United Nations Environment Programme
UNPD	United Nations Development Programme
USD	The United States Dollar (currency)

FOREWORD

This thesis is part of the Laos local-level study component of the VITRI of University of Helsinki's GET-LDC project (Green Economy Transitions in the Least Developed Countries); a multi-scale analysis of energy and forest use in Laos and Cambodia. The focus of this study is in the local scale of Lao PDR's forest and environmental product consumption, evaluating the importance of forest products in livelihoods and assessing how the availability and access to these products has changed and is changing in the near future.

The objective of this study - to determine the dependency of local livelihoods on forests - directly addresses part of the local-level goals of the GET-LDC project. The aim is that this local-level study can be used in further assessments on the importance of forest and environmental products in rural livelihoods in Laos. Also, the findings related to changes in access and availability of forest and environmental products provide useful information on the effects of policy changes in the rural areas.

The hypothesis and goals of this thesis are strongly linked to the fifth of seven hypotheses of the GET-LDC project plan: "*The livelihoods of most households highly depend on natural resources and fuelwood for cooking. Especially poor households are very vulnerable and the changes e.g. in access to resources will have significant impact on the households. An understanding of how access to natural resources and energy is gained, controlled and maintained contributes towards more holistic understanding of green economy.*" (Luukkanen and Kanninen 2014).

1 INTRODUCTION

1.1 Rationale

According to FAO (2014), more than billions of people depend on forests for energy, food and shelter worldwide. Approximately 350 million people depend on forests for subsistence use and income, 60 million of whom are completely dependent on forests (World Bank 2016). The role of forests is further emphasized when harvest failure, natural hazards and other livelihood risks are realized. Some forest products are also sold in towns, effecting the lives of urban people while bringing extra income for the rural population.

Forest dependency often goes hand in hand with poverty (e.g. Levang et al. 2005), although little is known of the relationship between poverty alleviation and forest resources (Sunderlin et al. 2003). The Lao People's Democratic Republic (PDR) is one of the poorest – and most forested - countries in South-East Asia¹ (World Bank, 2016a). Lao PDR has a high rate of rural population², low population density and high forest cover at 67% to 81%, depending on the definition (FAO 2014; World Bank 2016f; Ketphanh 2012). These factors enhance the dependency of the rural population on forests in Laos.

To be able to develop more people-focussed forest policies and forest management, it is important to acknowledge the role that forest and environmental products have in the everyday life of millions of people. Both timber and NTFPs need to be investigated to get a thorough view on the impact that forests have on livelihoods. With rapid population growth, it is vital to attain knowledge on how a sustainable level of forest product harvest can be regulated and maintained.

It is vital to recognize the effects of deforestation on rural people: in the most forest dependent areas of the world, deforestation and forest degradation can lead to further destitution and hunger. Deforestation and forest degradation are major problems also

¹ The GDP of Lao PDR was 12 369 million USD in 2015 (World Bank 2016a).

² Approximately 61% of Lao population live in the rural areas of the country (World Bank 2016d).

in Laos (Nhoybouakong et al. 2012). Timber and NTFPs can be utilized in a sustainable manner, but as Nhoybouakong et al. (2012) highlight, the sustainable level of harvest varies between species.

1.2 Research gap

The importance of NTFPs as an income source in rural livelihoods of developing countries has been widely recognized (e.g. Angelsen et al. 2014; FAO 2014). Even though many studies address the role of NTFPs in livelihoods, timber utilization and the combined benefits of different forest products are often neglected (e.g. Neumann and Hirsch 2000 p. 31): as UNEP (2009) and FAO (2014) state, there is little knowledge on the role of forest products in household income in general.

Lao PDR is one of the least developed countries (countries with the lowest level of socioeconomic development) in the world (World Bank, 2016a). The shortage in income puts additional pressure on the goods provided by forests as the people lack purchase power. In addition, poverty is one of the main drivers of illegal logging and fosters deforestation (Ravenel et al. 2005, p. 184), even though the magnitude that poverty drives illegal logging is difficult to quantify (Gaveau et al. 2009).

For Lao PDR, Foppes has carried out a comprehensive research program on the importance of NTFPs since the 1990's, especially focusing in food security. Foppes (2015) estimated, that the subsistence and cash value of NTFPs accounted for 32% of the GDP of Laos in 2006, but as Foppes and Dechaineux (2000) stated, the national economy of Laos have not acknowledged the importance of NTFPs. From a study conducted in Champasak and Savannakhet Provinces³ Foppes and Kethpanh (2004) found, that the contribution of NTFPs to food security is approximately half that of the contribution of rice, and indirectly even higher, since NTFPs are sold to buy rice and exchanged or gifted when shortages occur.

³There is no information on how many villages were included in the study.

The role of forest products in total income has been studied in Luang Prabang Province, most recently by Kimura et al. (2015)⁴, who found that NTFPs work as an important safety net to the communities and the cash-value of subsistence use is relatively high compared to the budget of the households. Before this, Foppes (2010) conducted research in three different Lao provinces in which the role of NTFPs in cash and non-cash income was investigated, the previous being 204 USD and the latter 489 USD per household. The research also included a short analysis on the change in the availability of several NTFPs. Hansen and Jeppesen (2004) conducted a master's thesis on the role of NTFPs in rural livelihoods in four villages in Savannakhet Province, finding that NTFPs contribute to only 2-6 USD (3-45% of total cash income) per household in a year, explaining the gap to studies done in southern and central Laos with regional difference. However, these studies excluded the contribution of timber.

To my knowledge, the contribution of NTFPs in income has not been studied in Khammouan Province after 1997. The total contribution of forest and environmental products in subsistence and cash income and the change in forest and environmental product access and availability has not previously been studied in Khammouan Province, Lao PDR, as far as the author knows. In addition, there are significant differences in the results between different studies on forest and environmental product income in Laos, leaving a gap for an up-to-date study.

1.3 Research questions and hypotheses

For the lack of recognizing the role of NTFPs in the national economy of Laos, the present study aims to provide information on NTFPs contribution in not only the economy, but in food security of rural Lao households. The core of the present study is to discuss the dependency of the rural population on forests and the environment, not only to define the status of livelihoods but also to provide information that can help in evaluating the livelihood changes of the future. In addition, access and availability of forest products is investigated, to gain information on trends that affect the livelihoods.

⁴ The research by Kimura et al. (2015) should be evaluated with criticism, as only one village was included. However, it is one of the newest research that were available and therefore cited here.

The overarching research question is **how dependent are rural livelihoods on forests and environmental resources?** The objectives of the research are as follows:

1. To determine the dependency of local livelihoods on forest and environmental products⁵ by estimating their contribution to household income and food security.
 - 1.1 To compare NTFPs and timber in their contribution to livelihoods.
 - 1.2 To learn which forest and environmental products are the most important in household economies and which land types are the most important sources of forest and environmental products.
2. To learn how the access to, and the availability of, forest products has changed in the past and whether they are expected to change in the near future⁶.

The hypotheses of this thesis are:

H1: The more remote⁷ villages are also more dependent on forests: there is a significant difference ($p < 0.05$) in forest and environmental cash income between villages closer to markets and villages further away.

H2: Households with lower income are more dependent on forest and environmental products than higher-income families.

H3: NTFPs are more important than timber for both cash and subsistence income.

H4: There is a general trend of reduced access to forest products and decreasing availability over time.

⁵ In Khammouan Province, Lao PDR.

⁶ For both, past and future, a five-year time frame is used.

⁷ Remoteness from the town of Thakhek and the District center, Mahaxay.

2 THEORETICAL FRAMEWORK

2.1 Framework of the study

Figure 1 presents a visual illustration of the livelihood strategies in rural Laos in the context of the present study. The aim is to estimate the contribution of different livelihood components to be able to evaluate the dependency on forests. The change in forest product access and availability is evaluated to deepen the knowledge on changing livelihoods and forest dependency. The focus of the study is on forest products, but also environmental products are included since these are often hard to separate in practice. For this reason, the theoretical background and literature review are both focused on forests – since forest based products form the core of the research.

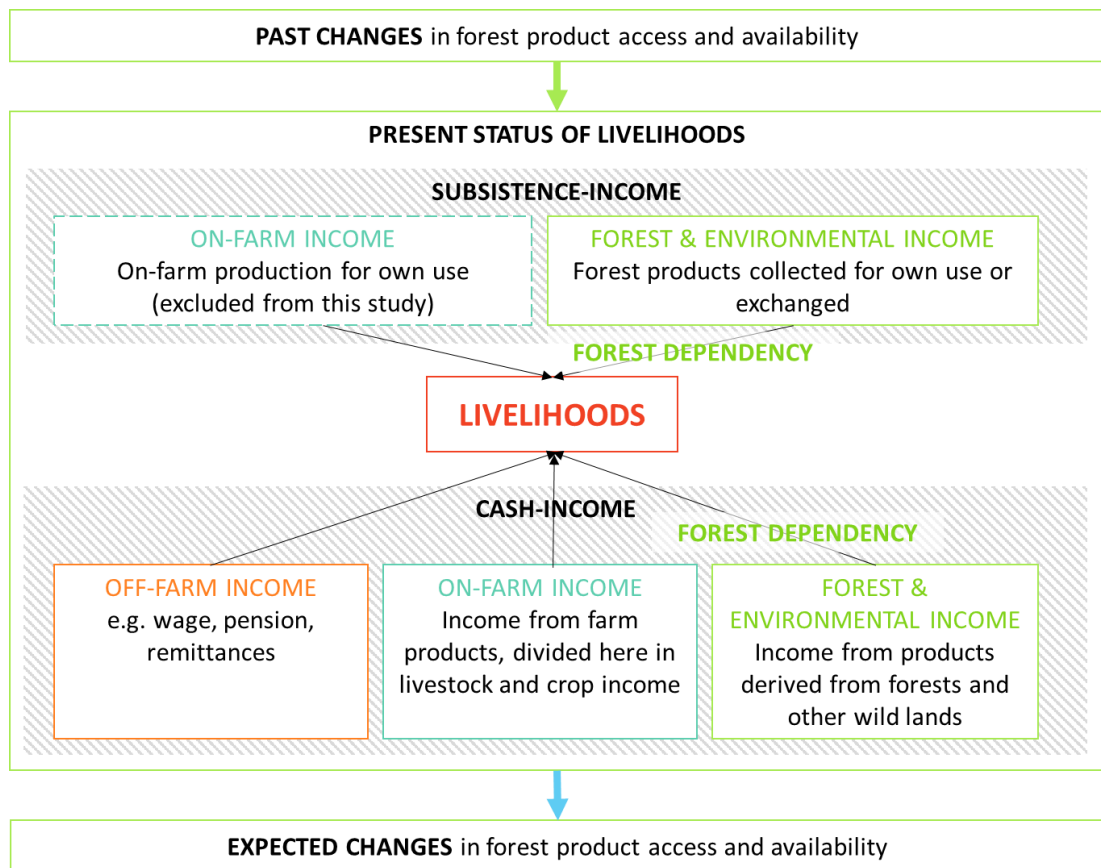


Figure 1. Framework of the study.

Livelihoods are formed by different combinations of income sources. The sources of income can be affected by different kind of shocks (e.g. unemployment, harvest failure, deforestation) changing the short-term dynamics of livelihoods. The concepts introduced in Figure 1 are further explained later in this chapter.

2.2 Livelihoods

Livelihood are the means of securing the necessities of life (Oxford University Press 2017). **Sustainable livelihood** refers to maintaining both, environmentally sustainable livelihood, which benefits from the environment while maintaining the same possibilities for the future generations, and socially sustainable livelihood, meaning that the livelihood is able to manage shocks, cope with stressful time periods and develop (Chambers and Conway 1991, p. 9-10).

Livelihood strategies are the choices and actions that are done to achieve the goals set for a livelihood, for example investment in housing, choosing a profession and family size. Livelihood strategies are influenced by structures, processes as well as the livelihood assets (Figure 2). For instance, starting a company demands financial assets and planting crops demands natural capital in the form of land. Livelihood assets are affected by their environment in the form of shocks, trends and seasonality. Shocks can be connected to, for example, nature, health issues or conflicts. Trends can influence the livelihoods in different forms, for instance population growth and change in political atmosphere. Seasonality includes seasonal changes in prices, health, employment and production (also food production) (Department for International Development 1999).

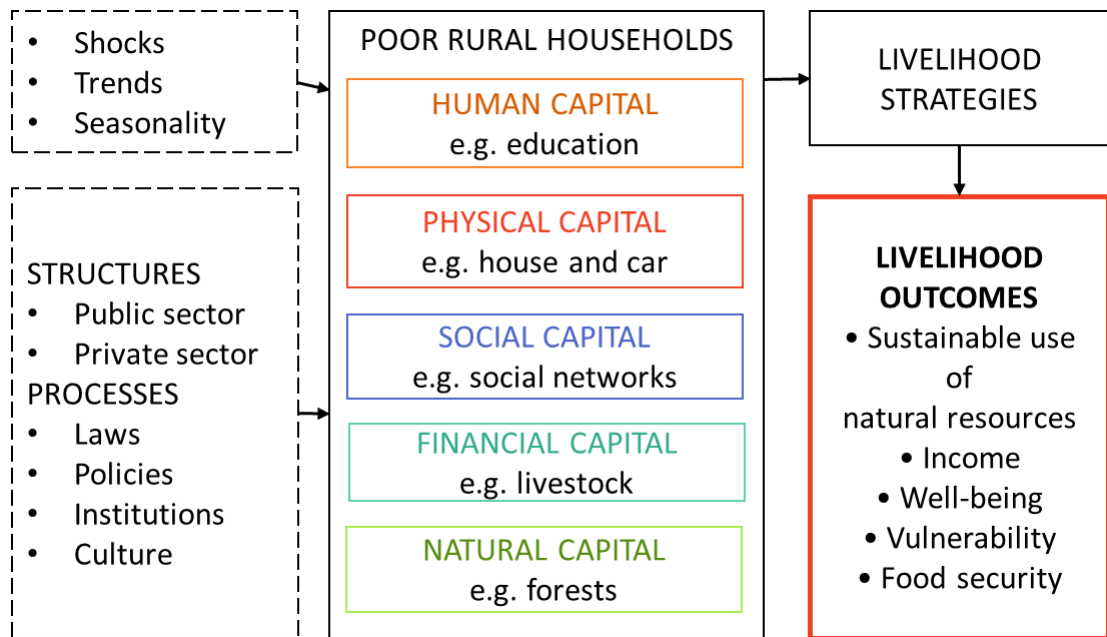


Figure 2. The sustainable livelihoods approach.

Source: modified from: Department for International Development 1999.

There are two key factors for which many rural poor tend to combine different livelihood strategies. Firstly, it is often difficult to earn adequately from one livelihood strategy. Secondly, combining strategies improves risk management, as for example NTFPs can be used for food when the yield of rice fails. (Sunderlin et al. 2005.) It is important to differentiate whether multiple livelihood strategies are combined by choice or because that is the only way to cope (Ellis 2000).

Livelihood outcomes are the core of this study: the level of income, food security, vulnerability, well-being and sustainable use of natural resources, especially focusing on the level of income and food security, both of which are also further described later in this chapter.

2.2.1 Defining forest dependency

Forest dependency is the level at which the quality of household's livelihood is dependent on forests, forest product use and forest-based income. Rural people lean on forests for income, food, fuels, construction material, fibres, oils, resins, medicine and to fulfil cultural needs in different forms, that for example sacred forests supply. Figure 3 presents the dependency on forests of different groups of people. Dependency is

strongest with isolated hunter-gatherer communities, whereas people living in urban areas in Northern countries are the least dependent on forests, but there is a significant difference between households within the groups.

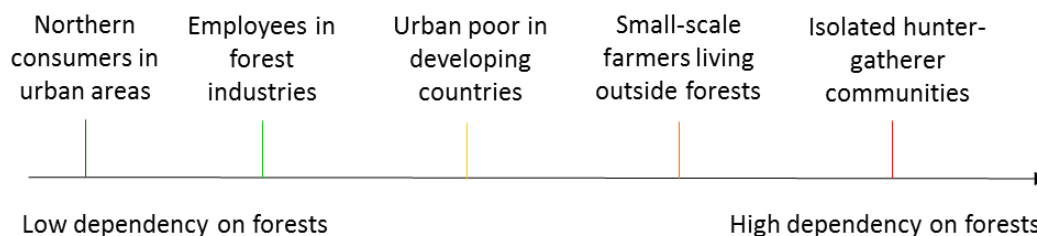


Figure 3. The dependency on forests in different living environments.

Source: UNEP 2009.

Forest dependency can be measured by the proportion of cash and subsistence forest and environmental income in total income. **Forest and environmental income** refers to cash and non-cash (subsistence) income earned from natural products that are collected from forests and other wild lands. In the study by Angelsen et al. (2014) forest income accounted for 20.1% in Asia (of which 1.8% was from plantation forests) and 22.2% globally of total cash-income. According to the same study, non-forest environmental income contributes 3.7% in Asia and 6.4% globally to total income, meaning that forests account for 86% of total forest and environmental income in Asia. The minor role of other environmental income is also the main reason why the present study is mostly focused on forests.

On-farm income refers to income connected to farm products, such as livestock, garden vegetables and crops. Subsistence on-farm income means the self-consumption of on-farm products⁸. Cash income from farm products refers to the earnings of for example sales of cattle or rice. According to Angelsen et al. (2014) on-farm income contributes 32.3% of cash-income in Asia and 41% globally. **Off-farm income** is cash income earned from sources as wage work, remittances, pensions and other governmental compensations – basically all forms of cash earned without selling self-collected or self-grown products. Angelsen et al. (2014) estimated that off-farm income account for 23.9% in Asia and 22.6% globally of total cash income.

⁸ Which is excluded from the present study.

Forest dependency is not easily measured. The most straightforward way is to estimate the relative contribution of forests to total subsistence and cash income, but this gives only a thin perception on the level of dependency: for instance, if 20% of two households' income is from forest products, these would be seen as equally forest dependent. However, if one household is much poorer, 20% of the income might have a lot more importance than in the other household – making this family a lot more forest dependent. Therefore, this study aims to give a broader perspective on forest dependency – also including the absolute monetary income as well as food security of the households.

2.2.2 Food security

Forest dependency is strongly linked to **food security**: the highest level of forest dependency is achieved when the household would face hunger without the contribution of forest products. As Pinstrup-Andersen (2009) stated: “*a household is considered food secure if it has the ability to acquire the food needed by its members to be food secure*”.

Forests are an important factor in food security and nourishment across the globe since they contribute through direct food provision as well as in income formation (through forest product sales and forest industry employment), both of which improve food security (Sunderland et al. 2013). However, deforestation and forest degradation threaten food security in the most forest dependent parts of the world (Porter et al. 2014).

2.3 Forest and environmental products

People often collect wild products from the environment wherever they find them. Therefore, mushrooms can, for instance, be both forest and environmental product: they can be collected from a forest (in which case it is defined as being a NTFP), from non-cultivated wild lands such as river edges or cultivated lands, such as rice paddies

(in which case it is defined as an environmental product)⁹. Also, researchers disagree to which extent products should be counted as being forest products, for instance, whether fish from rivers and lakes are included or not. Moreover, researchers disagree on to what extent a product can be processed and still fulfil the criteria of being a forest product (e.g. charcoal).

NTFPs (non-timber forest products) are defined by Belcher (2003, p. 161) as being “*all biological materials extracted from the forests other than timber for human use*”. For the present study, wild fish is included as an NTFP.

Forest products are defined as all products collected from forests, including wood-based products, such as timber, branches and leaves, but also NTFPs. Ecosystem services and abiotic goods are not included in this study. **Environmental products** are all products collected from the environment that are not cultivated, including for instance forest products but also environmental products (such as plants, fish) collected from residential land, roadsides, rivers etc.

2.3.1 Defining forest

There is no universally accepted definition of ‘forest’, which further challenges using the term ‘forest product’. There are various perceptions on what counts as a forest, resulting in imperfect data in an interview-based research.

In the present study, the FAO’s definition of **forests** is used (FAO 2000), which includes both, naturally renewed and planted forests. Trees should be able to reach the minimum height of five metres. However, for the definition on forests, an exception on tree cover is made: in the FAO definition, the tree cover is 10%, but in this study tree cover of 20% is used in order to be consistent with the Government of Laos definition.

⁹ Note that cultivated products, such as rice, are not environmental products.

2.3.2 Forest product stakeholders

It is also important to understand the diversity of stakeholders involved in forest product related activities. The diversity also explains the pressure on forest products and lawmakers, since a vast group of stakeholders has a large range of needs to fulfil with forest products. According to Foppes and Kethpanh (2001) the stakeholders of forest products include:

- Village communities (the focus of this study)
- Government authorities
- Traders
- Companies that use forest products
- Non-governmental organisations
- Donors
- Conservation agencies
- Conservation and development specialists.

Timber and NTFPs have a different set of stakeholders and networks of people who benefit or are disadvantaged from their utilization. In larger scale, timber is mostly utilized for the purposes of wood-processing industry. However, the local people may also benefit if, for example, the timber company pays the community part of the profits. Furthermore, the local landscape can potentially be changed significantly by timber extraction activities, which can affect NTFP collection possibilities. For example, clear-cut harvesting is often used for reasons such as cost efficiency, resulting in erosion and difficulties in forest recovery. The utilization of NTFPs has a different nature. NTFP exploitation benefits most often the local communities. However, NTFPs can also be over utilized, affecting for example the ecosystem dynamics and further utilization possibilities.

2.4 Defining access and availability

Access is defined as the “*ability to benefit from things - including material objects, persons, institutions, and symbols*” (Ribot and Beluso 2003). ‘Ability’ highlights the

chance of benefitting even if it's not accepted socially or by the rules. Separating 'access' from 'rights' is a key factor when speaking of forest and environmental products: for example, a remote forest might be owned by the government and have restriction on its use, but if villagers have easy access to it, and if there is poor monitoring, then they might utilize the forest products even though they do not have any rights to them.

Availability refers to the quantity and abundance of environmental and forest products. The present study investigates positive and negative changes in forest and environmental product availability.

3 LITERATURE REVIEW

3.1 The role of forests in rural livelihoods and development

Green economy is a concept promoted by UNEP (United Nations Environment Programme) referring to socially equal and well-being, environmentally safe and resource efficient society. Sustainable agriculture and forest management are solid parts of green economy, the latter of which is further addressed later in this chapter. The goal in green economy is to preserve the environment while enabling economic growth. (UNEP 2010.) For example, employment opportunities may be found from less polluting areas of work. Forests can contribute largely to meeting the goals of green economy, especially in regulating greenhouse gas emissions, through green infrastructure projects (e.g. wood buildings) and in the renewable energy sector (UNECE and FAO 2009, p. 3).

UNEP (2011) has brought out that green economy can be implemented also in the developing countries, on the contrary to the earlier idea, that these countries could not afford it. Laos is pursuing towards sustainable development and green economy through number of policy changes and economic projects that aim for example towards poverty alleviation, economic growth, improved infrastructure and forest conservation (Immonen 2015).

3.1.1 Forests in sustainable development

As defined by the UN General Assembly in 1987 “***Sustainable development*** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainable development is often described as balancing between economic, social and environmental sectors to enable development now and in the future (Giddings et al. 2002). Forests contribute to all three components: forests can enhance economic growth and increase social well-being. The role of forests in environmental sustainability is even more evident, contributing to biodiversity, water provisioning and air quality amongst multiple other aspects of environmental prosperity. As stated by the UN General Assembly (1987), “*Economic growth*

and development obviously involve changes in the physical ecosystem”. Forests are often utilized in an unsustainable manner, which has led to deforestation around the world. Especially many developing countries of the tropics suffer from deforestation. Deforestation is globally driven mainly by agricultural expansion, population growth and economic development (Leblois et al. 2017). In addition to these drivers, deforestation of the tropics is also enhanced by debt and poverty, as Culas (2007) notes.

To ensure the possibility to benefit from forests also in the future, forests should be utilized sustainably. **Multiple-use forest management** is a way to take into consideration all the possible ways to use forests, as an equivoise to the traditional forest management methods that aim only for maximised timber production levels. Multiple-use forestry combines the goals and interests of different users, which may be in contradiction. For example, one forest plot can be managed with the main goal to maximise the number of high-value logs as other areas for maintaining NTFP production. (Panayotou and Ashton 1992, 7-8.)

The success of multiple-use management is also strongly connected to access to forest products. If there is unlimited access to NTFPs or timber, their sustainability might be threatened (Guariguata et al. 2010). Forest-related managerial institutions are in general developed more for timber than NTFPs, which enhances the use of management models that maximise timber production with little focus for NTFP utilization (Shanley et al. 2008, p. 33).

Laos has a long way to go in achieving sustainable development, as outlined by the UN (2015). To achieve sustainable forest management, optimal management of both NTFPs and timber must be developed.

3.1.2 Forest and environmental products in rural livelihoods

Forest and environmental product utilization benefits households financially, contributing to the quality of livelihoods. Firstly, people who collect, for example, wild fruits or vegetables from forests or hunt bushmeat, benefit directly from using the products

but also need to buy less, saving money for other goods and services (Table 1). Secondly, people exchange these products for other products or services. Thirdly, forest and environmental products can be a source of income directly, as families collect forest and environmental products to sell them to other villagers, middlemen or take the products to a near market. This way forest and environmental products can also be a source of cash income.

Table 1. The ways of gaining subsistence and cash income from forest and environmental products.

Subsistence (non-cash) income	Collection for own use Exchanged products
Cash income	Selling collected products Selling exchanged products

Subsistence income is defined here according to the definition used in the PEN Technical Guidelines (2007, p.17) as being “*the value of products consumed directly by the household or given away to friends and relatives*”. Subsistence income (also non-cash income) refers to the value of consumption in a cash-equivalent unit¹⁰.

Angelsen et al. (2014) carried out the PEN (Poverty Environment Network) survey on the role of environmental income in rural livelihoods in Latin America, Asia and Africa. According to the research, income from forests accounted for an average of 22.2% of total household income in the three continents, and a bit less in Asia with an average of 20.1%. This is in line with the earlier estimation of Scherr et al. (2003) who found that for low-income farmers NTFPs contribute between 10-25% of their total cash income.

The 20.1% share of forests in the total cash income of the households in the Asian case studies of Angelsen et al. (2014) was larger than business (6.3%), wage (17.6%) and livestock (13.2%), but smaller than the share of crops (29.1%). The share of forest income includes also forest services, which accounted for 0.4% of forest and environ-

¹⁰ There are different ways to estimate monetary units. The monetary value is often presented to make the subsistence use comparable with e.g. the sales of forest products.

mental cash income. The study also suggested that forest and environmental cash income has the most important role in the livelihoods of the poorest households. (Angelsen et al. 2014.)

In Laos, Mouaxengcha et al. (2010) estimated, that NTFPs bring approximately half of household cash income in rural Laos. When the share of timber is included, the income from forests is even higher. These estimates are remarkably higher than the research by Rosales et al. (2003) indicate: the data was collected from three villages in Sekong area, finding that NTFPs bring only 8% (12 USD) of cash income of rural households, but 50% (408 USD) of subsistence income. Firewood accounted for 6% of subsistence use (included in NTFPs). According to the same study, timber was the most valuable single forest product, followed by fish, mushrooms and fuelwood in the order of importance.

3.2 Forest dependency

For a vast number of the world's rural poor, NTFPs act as a safety net (Burgener 2007, p. 11; Shackleton et al. 2011). However, forests are also widely utilized by wealthier people, especially in the most remote areas (IUCN 2012). Foppes (2015) estimate, that 80% of Lao people consume wild foods every day. The division of forest-based livelihoods by Sunderlin et al. (2005) is presented in Table 2. Hunters and gatherers strongly depend on forests for food while the other two groups depend more on the extra income brought by forest product sales. Sunderlin et al. (2005) noted that the types of livelihoods are often combined.

Table 2. Highly forest dependent livelihoods and attributes of forest use.

Type of livelihood	Main type of forest use	Forest density	Use value	Ex-change value	Forest product income ¹¹
Hunting and gathering	Food: capture and collection of forest fauna and flora	High	High	Low	High
Swidden cultivation	Source of agricultural land restored by forest fallows, use and marketing of forest products	Medium	Medium	Medium	Medium
Sedentary agriculture at forest frontier	Source of new agricultural land, marketing of forest products	Low	Low	High	Low

Source: modified from: Sunderlin et al. 2005.

According to Angelsen et al. (2014) rural Asian people are the most dependent on forests for fuel and food (Figure 4). In the same study the shares of these product groups in non-forest environmental income of Asian households was investigated, for which food products contributed the most (60%).

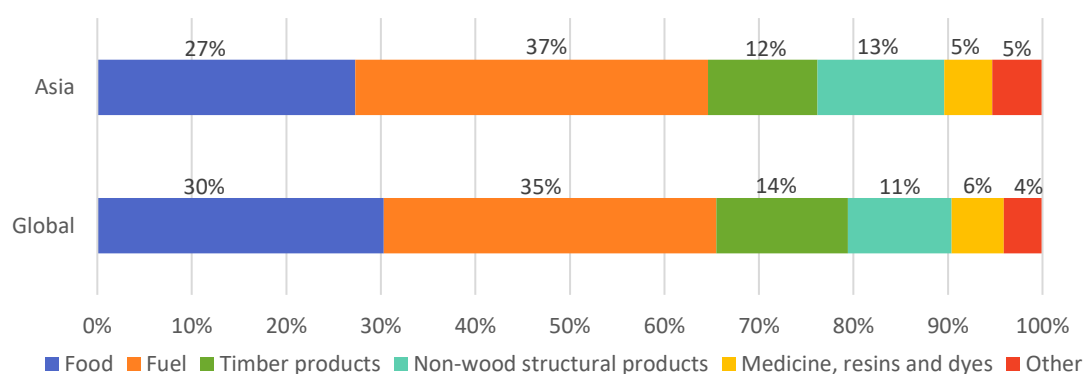


Figure 4. The contribution of different forest products to forest income (%).

Source: Modified from Angelsen et al. 2014.

3.2.1 The role of forest and environmental products in poverty alleviation

According to Belcher (2005) forests play an important role in poverty mitigation, especially when the forest resources can be accessed with low cost inputs. However,

¹¹ Forest product income is the share of forest income in the total income.

there is a debate about whether forests are more of a poverty trap or a pathway out of poverty for the rural poor (e.g. Neumann and Hirsch 2000 p. 33).

Many of the rural poor strongly depend on forests (Neumann and Hirsch 2000 p. 33). The level of forest dependency varies between rural people with different kinds of livelihoods but also between income groups. The role of forests as safety nets is most evident for the poorest people and further emphasised as livelihood shocks occur: according to Wunder et al. (2014) people who are poor in many aspects (e.g. land ownership and education) are also the most dependent on forests for coping with shocks. Furthermore, forests are often utilized as a source of additional income or to improve food sufficiency. However, Wunder et al. (2014) found that forests have only limited significance in seasonal gap-filling and coping with shocks: for instance, selling assets was reported more important in coping with shocks than forest products.

Neumann and Hirsch (2000 p. 36)¹² derive three main reasons for why rural poor depend so highly on forests. Firstly, collecting NTFPs needs no investment, for which it is a way to improve livelihoods also for the poorest of the poor (as long as there is access to the resource) but might also be the only option to make a living for some poor households. Secondly, the poor often have less alternative income sources, which affects the status of forests as a source of additional income or food. Thirdly, people living close to forests often lack economic or political power, which also enhances the role of forests in their lives. (Neumann and Hirsch 2000 p. 36.)

But do forests work as a poverty trap or a pathway out of poverty? Firstly, as Angelsen and Wunder (2003) pointed out, the utilization of NTFPs can be especially time-consuming with minimal benefits. The time used for NTFP utilization may be used at the expense of activities that might enable improving livelihoods in the future (e.g. education). Secondly, it has been noted that even though the market prices or demand of a product increase, the collectors do not necessarily get wealthier (Neumann and Hirsch 2000 p. 38). This is due to multiple reasons, including that the poor often lack secure tenure rights and it is often the middlemen or other people mingling in the trade who

¹² The points made by Neumann and Hirsch are based on multiple studies from different regions of the world.

gain better profits out of the sales; and the collectors might not have the knowledge nor the power to ask for higher returns (Neumann and Hirsch 2000 p. 38, 41). It seems that when it comes to land use, agriculture is more beneficial in poverty alleviation than forest utilization as Wunder (2001) highlighted: forest goods demand little capital and the range of forest products is wide, but the collection is also labour-intensive.

However, forests can also contribute to poverty reduction. In the context of highly forest dependent people, forests work in poverty alleviation in the forms of diversifying livelihoods, fulfilling gaps caused by seasonal shocks (e.g. harvest failure) and fulfilling needs (e.g. medicine) that would be difficult to meet due to, for example, the lack of access or money to buy the goods (Arnold 2002). In these situations, forest and environmental products cushion the negative impacts of poverty, but they do not really help the households out of poverty. Also, these means of poverty alleviation are possible only with the poor who have access to the forest resource. The forest and environmental product based forms of income generation that open doors out of poverty are often available only for the less poor, as these actions require skills and investment (Arnold 2002; Belcher et al. 2003). This tends to lead to the phenomena that the poorest stay poor and the wealthier get richer. The forest product activities that could help the poorest out of poverty often require developing infrastructure, services and skills – and a forest product utilization option with development potential (Arnold 2002).

The overall image drawn from literature is that forests work as safety nets for many rural poor, but rarely lift people from poverty. Also, forest utilization in shock cushioning and in flattening seasonal changes is less important than often thought – as Wunder et al. (2014) stated “*forests and other wild lands work as the option of last resort*”, only chosen when they lack options or the shocks are especially harsh. The role of forests in the livelihoods of rural poor is also a matter of tenure rights: in the case of open access, if collecting certain forest product enables larger gains, more and more people start to exploit it, which might result in overexploitation and therefore reduced availability (Belcher et al. 2003). If, however, the land is owned by a specific group of people or an individual, they may have the capital to begin with and therefore also the profits are captured (elite capture) while the poor stay poor. Community forests play an important role in this setting – as in the best scenario, exploiting forest

products might increase the income level of the whole village. Also, it must be noted that even though collecting forest products is often labour intensive and the returns are relatively small, the profits may be adequate to collect savings that enable better living in the future.

3.2.2 Forest dependency in Laos

NTFPs have a significant role in rural Lao livelihoods. For example, Mouaxengcha et al. (2010) have estimated that NTFPs bring approximately half of cash income in rural Laos. The equivalent number combined by Foppes (2010) from twelve case studies was 40% or 208 USD per household. The gathering of NTFPs has changed rapidly since 1990's. Due to development of NTFP markets, population growth, forest conversion and policy changes (Mouaxengcha et al. 2010).

Kimura et al. (2015)¹³ have researched the importance of NTFPs in a village in central Laos. The researchers estimated the economic value of NTFPs used by the households through the number of products used as well as the market prices of the products. They found that the value of NTFPs was higher than rice cultivation in the household economies and brought 10% of the cash income of the households. Foppes (2015) claim that the poorest households of Laos are the most dependent on NTFPs: wild foods are the strategy to survive for the poor.

Kimura et al. (2015) broke the importance of NTFPs into product groups. Edible wild plants, buds and flowers form the group with biggest economic contribution when subsistence and cash income are combined, followed by fiber and fish and shellfish. Fibers and resins are the products with the biggest share of them sold (91% for both), followed by medicine (59%). The average household consumption of all NTFPs was 679 USD annually, 70% of which came from NTFPs of plant origin. (Kimura et al. 2015.)

In the research of Hansen and Jeppesen (2004) the interviewees found forest foods, fodder and firewood the most important NTFPs in the Lao villages of the study. In

¹³The study by Kimura et al. is limited since the data were collected from only one village in Laos, but it was chosen here because the data are up to date.

1997 Foppes and Kethpanh¹⁴ executed a wide research on NTFP use in three provinces¹⁵ in Laos. It was estimated that an average of 55% of cash income came from NTFPs in the villages near forests, while the second largest source of income was livestock. Foppes and Kethpanh (1997) also noticed that richer families often collected more NTFPs than poorer families, but were less dependent on NTFPs. NTFPs brought most (90%) of the cash income of poor Lao families as for richer families NTFPs counted only for 23% of their cash income. The wealthier families could maintain other sources of income, for instance livestock, as the poorer families had to spend money to buy rice. (Foppes and Kethpanh 1997.)

Dependency on timber has often quite different qualities than NTFP dependency. As Newby et al. (2014) noted, timber utilization often benefits only a small bunch of people, due to for example accumulation of capital, increasing the inequality in the community. However, combining agriculture, timber and NTFP utilization can increase the income level gained from the environment (Newby et al. 2014). FAO (2015) estimates, that in 2015 the gross value added from forestry in Laos was 160 million USD. The importance of forests cannot be ignored, but the contribution of timber in the livelihoods of ordinary Lao households is difficult to estimate.

3.3 Access and availability of forest products

Sustainable forest use is strongly linked to the access and availability of forest products¹⁶. The access to forests is a key question when assessing the contribution of forests in livelihoods. Limiting the access to forests can, however, enhance sustainability as overutilization is prevented.

¹⁴There are several problems connected to the study by Foppes and Kethpanh (1997). Firstly, the study is outdated: livelihoods, forest areas and the availability of NTFPs have gone through major changes in twenty years. Also, the study does not take into account firewood or charcoal use, even though the goal of the research was to rank the importance of different NTFPs for food, income and other inputs to the households. However, it is one of the most comprehensive NTFP studies made in Laos as far as the author knows, and therefore cited here.

¹⁵Oudomxai, Salavan and Champasak.

¹⁶ Access and availability section of the study is focused only on forest products, since investigating the change of all environmental products would not have given implications on the change in forest cover and quality.

Access to forest products is dependent on social, governance and market-based institutions, all of which can be local or given from outside the community (Wiersum et al. 2014). Ribot and Beluso (2003) divide access into right-based illegal (e.g. illegal logging), legal access (e.g. collecting permitted NTFPs) and access that is shaped by structural and relational mechanisms. For example, a local custom might prevent actions that are completely allowed by laws.

In tropical countries, the share of government owned forest has been decreasing and the share owned by indigenous people increasing. In Asia, 68% of forests are government owned, 25% owned by indigenous people and 4% owned privately (RRI and ITTO 2010). Smallholders gain higher forest income from government owned forests than privately and community owned forests (Jagger et al. 2014). Access relies strongly also on policy enforcement, especially in government owned forests. Jagger et al. (2014) found, that there is an inverse relationship between policy enforcement and forest income of smallholders - with strong policy enforcement, the income from forests decrease due to decreased forest product accessibility.

Globally, it is common that the rural poor have open-access to many NTFPs, partly because the environmental and economic impacts of NTFP collection have been considered minor and often no-one but the rural poor has pursued the utilization of some NTFPs for their low market value (Belcher 2005). However, the access to timber has been historically more regulated, preventing the access from the locals for multiple reasons. Firstly, tenure rights and the costs of processing the wood are usually expensive. Also, the political atmosphere often favours politically driven large players. Thirdly, the poor consider planting forests too expensive as the rotation time is long, the lack of which makes the rotation time even longer and advances erosion. Corruption and illegal logging are both ways to avoid these structures that constrain the local utilization of timber. (Belcher 2005.)

The availability of NTFPs in rural Laos has been declining due to deforestation, especially driven by agriculture, and severe harvesting. The biggest exception in this are forest vegetables that can still be found relatively easily. Forest vegetables, amongst some other widely used NTFPs, occur in fallows and degraded forest, for which reason

deforestation and forest degradation do not put such a pressure on these products. (Foppes 2010.)

Access and availability are researched in this present study to collect information on the changing role of forest and environmental products in the rural Lao livelihoods. However, access and availability are only a part of the factors influencing the role of forests in the lives of Lao people, also for example alternative income sources and personal limitations (e.g. disabilities) affect.

4 COUNTRY PROFILE OF LAOS

4.1 General information on Laos

Lao PDR (Laos) is a country in Southeast Asia, neighbouring Myanmar, China, Vietnam, Cambodia and Thailand (Figure 5). Laos is landlocked, with the Mekong River forming most of its border with Thailand. There are 16 provinces in Laos. The capital of the country is Vientiane, situated near the Thai border on the bank of the Mekong River. There were 6.8 million people living in Laos in 2015 (World Bank 2015). The total area of Laos is 236,800 square kilometres, of which only 6,000 square kilometres is water (World Bank 2007).



Figure 5. Map of Laos showing the nation's capital, Khammouan Province, and the neighbouring countries.

Source: modified from: History and maps 2015.

Of the land area of Laos 68% is covered with forest, 11 % is agricultural land and the rest, 22%, is occupied by other land uses, such as urban land. The climate of Laos is tropical monsoonal, with a rainy season continuing from May to November. Floods and draughts are usual in Laos. (CIA 2016.) Laos is a mountainous country, with the highest point being Mount Phou Bia, which rises up to 2,817 meters above sea-level. The lowest point is 70 meters above the sea level that is reached in the Mekong River (CIA 2010, p.356-358.)

Lao is the official language of the country. Other spoken languages are French, English and various ethnic languages. Most Laotian people (67%) are Buddhists. The main ethnic groups are Lao (55%), Khmou (11%) and Hmong (8%) and the rest belong to more than 100 minor ethnic groups (CIA 2010, p.356-358.)

4.1.1 History

The Lao nation emerged from the kingdom of Lan Xang from the 14th century (CIA 2010, p.356-358). After years of domination by Siam (nowadays Thailand), Laos became part of the French Indochina colonies in 1893. Laos gained full independency from France after World War II in 1954. (BBC 2016.)

During the Vietnam war, 1961-1973, Laos was bombed heavily by the US as part of the ‘Secret War’ to support the Royal Lao Government and in an attempt to disrupt the Ho Chi Minh trail¹⁷ that was used to supply the Vietcong. This bombing occurred despite a Geneva conference agreement of fourteen countries, including the US, establishing the neutrality of Laos in 1962 (Whitcomb 1997). The bombings, justified by the US by the illegal presence of North Vietnam troops, continued in Laos until 1973, making Laos the most heavily bombed country per capita in history with a total of 2.1 million tons of bombs dropped in the country (Khamvongsa and Russell 2009).

In 1973, the Vientiane ceasefire agreement divided Laos between communists and monarchists. The Lao king - Savang Vatthana - surrendered his crown in 1975. The

¹⁷The trail went from Northern Vietnam, through Laos and Cambodia.

monarchy was abolished and Marxist Laos was established by the only legal party, Lao People's Revolutionary Party. The party also started the socialistic conversion of the economy. In 1979 hundreds of thousands of refugees left Laos as the result of food shortages, which drove the party in power to slowly start operations to open and privatize the national economy. (BBC 2016.)

In 1986, the country took its first steps to open to international markets, liberating private companies step by step. Laos joined ASEAN (Association of Southeast Asian Nations) in 1997 (CIA 2010, p.356-358), and in 2008 Laos became a full member of WTO (the World Trade Organization) (BBC 2016).

4.1.2 Economy and development

The most important natural resources of Laos are gold, copper, timber, hydropower, gypsum, tin, and gemstones (CIA 2010, p.356-358; Nhoybouakong et al. 2012). The most important products exported are wood products, coffee, electricity, tin, copper and gold (CIA 2010, p.356-358).

Laos was one of the 50 poorest countries in the world when measured by GDP: the GDP per capita was 1,812 USD in 2015 (World Bank 2015). In neighbouring Thailand, the equivalent number was more than 5,800 USD, and to put it into perspective, over 41,920 USD in Finland (World Bank 2015).

Even though Laos is listed as one of the least developed countries (LDC) by UNPD (2015), with the rank 139 out of 187 countries in 2014, the poverty rate of Laos has decreased from 46% in 1992 to 27.6% in 2012. The change has been driven by improvements in the public sector and economic growth, which was 8% in 2012 (UNDP 2015; OECD 2013, p. 147).

Approximately 61% of Laos' 6.8 million people live in rural areas of the country. (World Bank 2016d). In 2005, the average population growth rate was 2% and the urbanization rate was 3.8%. The urbanization rate of Laos is one of the highest in the

world. In the capital of Laos, Vientiane, the population growth rate is much higher than in other parts of the country. (Nhoybouakong et al. 2012).

The average literacy rate of Laos is 73% which varies between genders, ethnic groups and urban and rural population (Nhoybouakong et al. 2012). Despite the improvements in recent years, the country lacks proper telecommunication and infrastructure, especially in the rural areas. Foreign investment has boosted the development of infrastructure along with mining and hydropower industries, even though the investment level dropped due to the financial crisis that begun in 2008 and a decline in some raw-material prices. (CIA 2010, p.357-358.)

Contaminated drinking water and infectious diseases are still major health problems in Laos (Nhoybouakong et al. 2012). Vast quantities of unexploded bombs in Laotian forests from the Vietnam War continue to kill and maim hundreds of people each year and cause economic damage. For example, only in 2008, 99 people died from bombs in Laos (Durham et al. 2013). The official cleaning of the explosives begun in 1994, led by UNDP. Still, approximately 37% of the country is contaminated by the bombs. (Khamvongsa and Russell 2009.)

4.1.3 Lao livelihoods

Agriculture accounts for approximately 40% of the GDP, giving labour for more than 80% of the employed Laotians. (CIA 2010, p.357-358.) In Laos, it is common to combine many different livelihood strategies, for example selling NTFPs in the market and working on a friend's rice field for salary. Forest and environmental products are used for food, energy, shelter, medicine, to earn money, to feed livestock and as raw material. All of which can also be replaced by purchased goods and some also with livestock and crops. (Raintree 2004.)

Foppes and Ketphanh (2001) researched the income formation of rural Lao households, according to which rice accounts for 50% of the household total subsistence and

cash income, followed by forest foods (28%), cash income (10%), firewood (6%) and other NTFPs (6%). The share of timber was not separately mentioned in the study.

4.2 Laotian forests

Laos is one of the most biodiversity rich countries in Asia. (Nhoybouakong et al. 2012.) The government of Laos estimated that there was approximately 9.5 million hectares of forests in Laos in 2010 (Lesterlin et al. 2013; Nhoybouakong et al. 2012)¹⁸. The forests of Laos are mostly mixed deciduous (10 181 170 ha), dry evergreen (1 367 399 ha) and dry dipterocarp forests (1 205 022 ha) (FAO 2015). The vegetation of Laos is shown in Figure 6: Laos is covered by evergreen mountain and lowland forests, fragmented and degraded evergreen forest, mosaics of cropping and regrowth, deciduous wood- and shrubland and regrowth mosaics (Stibig et al. 2004).

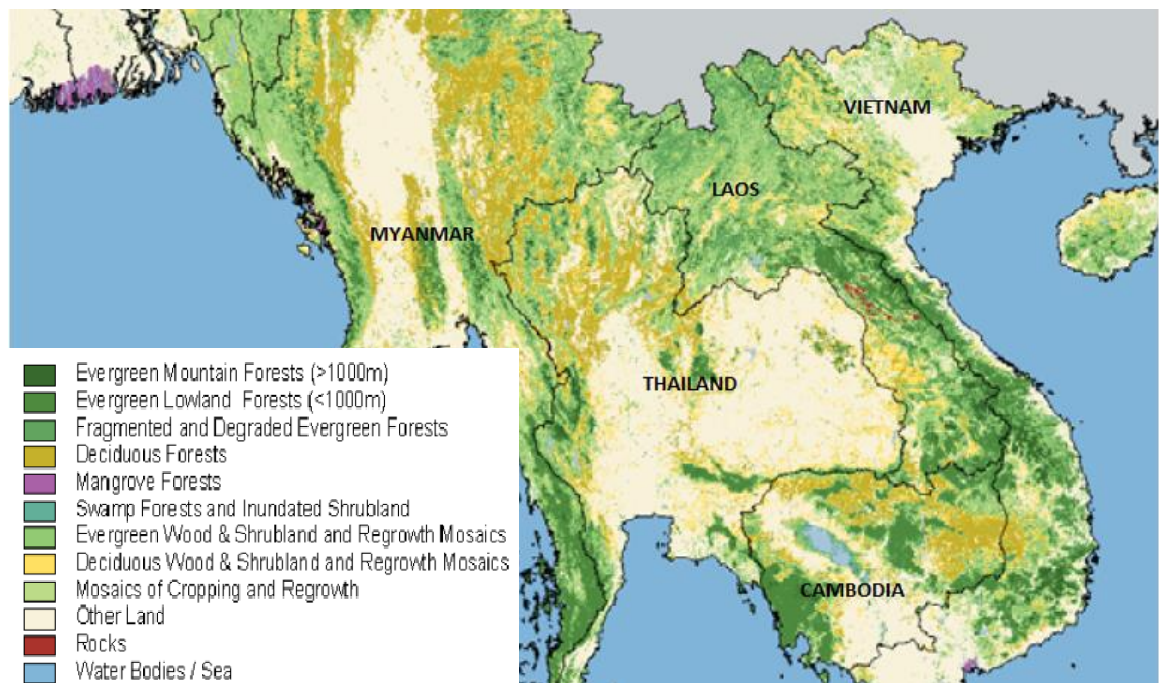


Figure 6. The Vegetation of Southeast Asia.

Source: modified from: Stibig et al. 2004.

¹⁸ By FAO estimation there was 17.8 million hectares of forest in 2010 (FAO 2015). The difference is explained by the various definitions on forest: by Lao government forest has 20% tree cover whereas by the FAO definition forest has a tree cover of only 10%.

Lao forests are divided into conservation, production and protection forest areas by the government (Forestry Law 2007 s 2). The purpose of **conservation forests** is to protect flora and fauna, culturally important, or other specifically valuable areas. The total land area of conservation forests is 3.4 million hectares (37% of total forest area). The goal of the Lao Government in the utilization of **production forests** is to fulfil social, economic and livelihood needs without causing significant negative changes for the environment. There are 3.2 million hectares of production forests in Laos (34% of the total forest area). The purpose of **protection forests** is to protect the environment by for example protecting water sheds and preventing erosion. The total area of protection forests in Laos is 2.8 million ha (28% of the forest area). In 2004 there was 146,000 hectares of plantation forests in Laos, mainly consisting of teak. (Grace et al. 2012.)

In Addition to the previously introduced forest types, rural areas have village (or community) forests, the wood from which are mainly used by the villagers for housebuilding and collecting NTFPs. Harvesting timber from village forests is allowed up to five cubic meters per household with the permission of District agriculture and forestry office. Part of the trees harvested are sent to local sawmills and sold. There is no data on the scale of the sales, nor the levels of local use or the area allocated to community forests altogether. (Grace et al. 2012.)

Timber is one of the most important and most exported natural resources of Laos (CIA 2010, p.356-358). According to Nhoybouakong et al. (2012), forestry accounts to over 5% of the GDP of Laos but the real contribution is estimated to be much larger with the informal sector included, with estimates varying from 15 to 20% of the GDP. Approximately 14% of total exports of Laos came from wood products in 2007 (Nhoybouakong et al. 2012). The demand for Laotian timber is mainly driven by Vietnamese, Chinese and Thai markets (Barney and Canby 2011, p. 6). The exports have been exponentially growing since late 2000s: the value of Lao wood products exported increased by more than eight times from 2009 to 2014 (Smirnov 2015).

4.2.1 Deforestation and forest degradation

Deforestation and forest degradation are major problems in Laos (Figure 7). Degraded forest is found in all of the state's forest categories (production, conservation and protection forest areas) (Lesterlin et al. 2013). The main reasons for deforestation (in order of significance) are logging and fuel-wood use, shifting cultivation¹⁹, expansion of agricultural land, plantations, hydropower projects, mining and other infrastructure projects, urban infrastructure and fires (Thomas 2015; Nhoibouakong et al. 2012). Smirnov (2015) highlights the connection between excessive undocumented timber exports and large-scale infrastructure projects – for the cases investigated, most of the wood was illegally extracted. Commercial logging officially decreased from 1992 to 2002, however illegal logging and fuelwood use have increased at the same time (Nhoibouakong et al. 2012). The agricultural expansion is driven by both, small-scale farmers and large-scale businesses (Lesterlin et al. 2013).

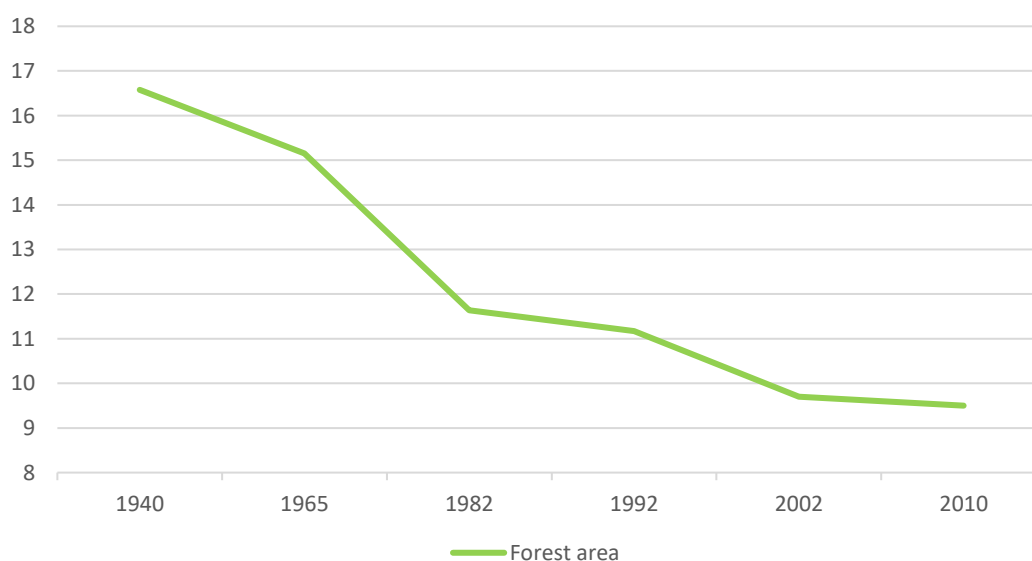


Figure 7. Forest cover in Laos during 1940-2010 in million hectares.

Source: modified from: Nhoibouakong et al. 2012. Forest cover based on the Lao government definition of 20% forest cover.

¹⁹ **Shifting cultivation** is a method of forest management still widely used in Lao PDR. Shifting cultivation or shifting agriculture is defined as being a method in which land area is first cleared of vegetation, then cultivated for some time with agricultural crops, and after this abandoned so that normal vegetation starts to grow back (Glossary of Environment Statistics 1997).

Forest degradation is mainly enhanced by shifting cultivation and selective logging (Lesterlin et al. 2013). Approximately 4 million ha of Lao forest (approximately 42%) is estimated to be degraded (Grace et al. 2012). Forest degradation and deforestation are indirectly driven by the pursuit for economic growth, which has led to engaging foreign investments to the country, for instance in hydropower and mining projects. (Lesterlin et al. 2013). Population growth is also effecting the forests indirectly, for example in the form of expanding agricultural land. Rigg (2006) estimates that the integration of rural Lao people into bigger markets may lead to further degradation of forests.

Illegal logging is here defined after Hoare (2015, p. 2) as “*all illegal practices related to the harvesting, processing and trading of timber*”. Illegal logging is a widespread phenomenon across the world, causing deforestation and forest degradation. The effects are often positive for a small number of people in the form of earnings, but the negative impacts might reach the whole community or even larger groups of people, as people lose for example the spot for collecting NTFPs. In addition, illegal logging is a driver of corruption, as officials are bribed to log without permits. (Lawson and MacFaul 2010, p. xiiv.)

Illegal logging is a widespread problem in Laos: the level of illegal logging is estimated to exceed the reported harvest by ten times (Smirnov 2015). However, the estimates on the level of illegal logging vary: according to the report by Saunders (2014, p. 21), the levels of illegal logging are estimated to be 50-90% of total harvest in Laos²⁰. Laos plays an important role in the illegal sawnwood and log exports, being the third biggest exporter of illegal roundwood and sawnwood from Southeast Asia, after China and India (Jianbang et al. 2016).

The high illegal logging rates of Laos are driven largely by poor law enforcement, weakened by wide-spread corruption (Hoare 2015, p. x). According to Saunders (2014, p. 2, 6), bribes form a remarkable share of the costs of logging companies in Laos. The government of Laos has pursued to decrease illegal logging, for example negotiating

²⁰ Less than 20 respondents from NGOs and private companies in Lao PDR were interviewed for the study, for which reason the number have to be taken with criticism.

for the voluntary partnership agreement (VPA) with the EU, but the implementation of such actions is weak. (Saunders 2014, p.2, 6).

Logging changes the appearance of a forest but it can still be done sustainably if the level of logging is kept low enough for the forest to renew. For NTFPs the case is different: when for example nuts, latex and game are collected, the forests maintain the appearance of a forest, even though this might lead to forest degradation or the extinction of some species (Peters 1996, p.43). Also, as Peters (1996 p. 43) notes, in some cases, trees are cut to collect fruits or other NTFPs, in which case also forest cover is affected. For sustainable NTFP utilization, the importance of proper education in harvesting methods, sustainable harvest levels and the conservation of the most vulnerable NTFP species should be enhanced. Utilizing NTFPs does not only harm the forests, as Foppes and Dechaineux (2000) noted, NTFP utilization motivate people in biodiversity conservation to sustain NTFP levels.

4.2.2 Forest policies and governance in Laos

Most tropical forests are owned by national governments (Burgess et al. 2012). This applies also to Laos: according to FAO (2015), 100% of Laotian forests are owned and managed by the Lao government. This has its downsides: government ownership often results in inadequate monitoring of forest use (Burgess et al. 2012). However, the Lao Government has also taken actions to enhance sustainable forestry. To decrease the rate of deforestation, the Lao government set a ban on log exports from production forest areas to promote further wood processing in the country (Grace et al. 2012). However, unprocessed sawn wood and logs form still major share of monetary exports of the country (Smirnov 2015).

The renewed Forestry Law of 2007 (2007 s 4 (49)) limits the right for logging to “*production forests, where inventory, surveys and sustainable management plans have been completed and only in the areas that the government permits the construction of infrastructure*”. In the production forest areas, according to the Forestry Law (2007 s 4 (49)), a selective logging method must be used to enhance regeneration of the forest.

For the past decades, the Laotian government has pursued policy to conserve the remaining natural forests of Laos (Barney and Canby 2011, p. 6). Forestry is one of the cornerstones in the strategy of the Laotian government to reduce poverty, along with road infrastructure, agriculture, health and education. The government is, however, still lacking clear strategies on the management and use of NTFPs. NTFPs are under major pressure with population growth, increased commercial trade levels and environmental degradation. (Nhoybouakong et al. 2012.)

The enforcement of laws and practices is weak (Lesterlin et al. 2013). The Lao authorities are estimated to record only approximately 3-5% of illegal logging of Southern Laos (Smirnov 2015). In addition, the decision-making processes and the operations of government officials are to blame: corruption, inadequate involvement of local people and imbalanced sharing of benefits are still major problems in the country that negatively affecting Laotian forests. (Barney and Canby 2011, p. 6). Lao government is taking some steps to fight corruption, with the most recent effort being the ratification of UN Convention against Corruption in 2009 (Saunders 2014, p.6).

In addition to the forest policy efforts of Lao government, international forestry projects are taking place in the country. Of these projects, **SUFORD** (Sustainable Forestry and Rural Development) is introduced here since it has a role in the research area of this thesis²¹. SUFORD is a bilateral project of the Finnish Ministry of Foreign Affairs and the Ministry of Agriculture and Forestry of Laos, and has been the biggest development project in the forest sector in Laos. As a result of SUFORD project, approximately 80 000 ha of forest has been certified and sustainable forest management plans executed for 1.2 million ha in 16 Production Forest Areas (PFAs). In addition, benefit sharing has been enhanced, the rate of deforestation has declined, and poverty reduced (for instance by giving loans through village development grants). SUFORD will continue as the SUFORD Scaling-Up project until 2018, with the goal to execute REDD+ activities. The monitoring of the areas will continue and the certification of the PFAs will be supported. (Ministry of Agriculture and Forestry, Lao PDR 2015.)

²¹ The research area of the present study is introduced in section 5.2.

5 DATA AND METHODS

5.1 Overview

In each of the three sample villages one key informant interview (KII) with the village leader, two focus group discussions (FGDs) (one with male and the other with female participants) and 30 household surveys were conducted. The key informant interview was held first to enable arrangements of the other interviews and to obtain knowledge on the main qualities of the village to be able to modify the FGD and household interview questions if necessary. FGDs were held after the KII in each village, to learn more on the village and the livelihoods to ensure the comprehensiveness and quality of household surveys. After these, the household surveys were conducted with 30 randomly chosen households in each village. The selection of villages, data collection methods and data analysis are further explained later in this chapter.

5.2 Study area

Mahaxay District in Khammouan Province was selected as a field-site at a workshop held for the GET-LDC project in Laos in January 2015. Mahaxay was selected because of its underdeveloped energy provision, high rates of deforestation, intensive hydro-power development and the presence of REDD+ and CDM projects. (Chakma 2016.) The primary data for this thesis was collected in March 2016 (further explained in section 5.2.1). To be able to conduct interviews in the rural Laos as a foreigner, government permissions had to be asked from the Provincial Forest and Agriculture office in Thakhek, as well as from the District office in Mahaxay.

Khammouan Province also has a production forest area connected to the SUFORD project of 252,822 hectares (Grace et al. 2012), which made the area even more interesting for forestry based research. The SUFORD²² forests affect the livelihoods in two of the sample villages included in the research (see 5.2.2 for village descriptions).

²²The areas are part of the SUFORD Scaling-up project, meaning that the areas will be monitored until the end of 2018 and the certification of the PFAs will be supported (Ministry of Agriculture and Forestry, Lao PDR 2015). For more information on SUFORD see section 4.2.2.

5.2.1 Selection of the villages

To get best possible results in the timeframe given, it was decided beforehand that three villages would be chosen, since these should still give a broad view on the research topics. The villages were selected according to the following criteria:

1. Distance from the village to the main market in Mahaxay (remoteness gradient).
2. Villages with different kinds of forests (degraded forest, natural forest etc.).
3. A traditional site with normal agricultural activities and traditional fuel-wood use²³.
4. A village close-by a forest plantation and a village where there are no plantations.
5. A village influenced by a river and the upstream dam²⁴.
6. A village where charcoal is used and a village where it is not used¹².

The main idea was that all the criteria should have been filled with three sample villages, meaning that one village would fill for example the criteria 1-3, the second the criteria 3, 4 and 6 and so on. To fulfil the criteria with three villages, two master's thesis workers, two translators and two representatives of the GET-LDC project scouted eight villages along the road between Mahaxay and Boulapha, conducting rapid rural appraisals²⁵ with village leaders and key informants to determine which three would fulfil the criteria. The key issues (mirrored to the criteria) on each village were documented, after which Phowa, Phonnadee and Naphakeo were chosen (Figure 8).

²³ The data were also collected for a study handling wood-fuels in rural Laos.

²⁴ Dam Nam Theun.

²⁵ Rapid rural appraisal is a cost-efficient method to gain information. The core is to know what needs to be investigated and in what level of accuracy. (Chambers 1981.)



Figure 8. A map of the sample villages Phowa, Phonnadee and Naphakeo.
Source: The map is based on GPS coordinates collected while interviewing the villagers.

Phowa was selected because it was closest to the main market in Mahaxay, the forests around it were degraded and there was also mountain forest, a diverse set of fuels was used, there were no forest plantations, it was influenced by the upstream dam and charcoal was used. Phonnadee was chosen, because it was further from Mahaxay, surrounded by various kinds of forest (also SUFORD and plantation forests), the villagers were involved in traditional agriculture and fuel-wood use and charcoal was produced in the village. The reasons to choose Naphakeo were that it was the furthest village from Mahaxay where we conducted rapid rural appraisal, surrounded by various forest

types, the villagers leaned on traditional agriculture and firewood as an important energy source and used no charcoal.

Having a village with natural forest was also a criterion in selecting villages, but it was not met since there was no natural forest near any village, except in sacred forests, which are not utilized as a source of forest products. Sacred forests provide ecosystem services by fulfilling cultural needs, which is excluded from this study.

5.2.2 Village descriptions

The village descriptions are based on key informant interviews, focus group discussions, household surveys and observations made during field work in each village. All three villages are situated in Mahaxay District in the Province of Khammouan. In all of the villages Lao is the mother tongue for most of the people. As for most Laotians, Buddhism is the main religion in these villages. All the villages had electricity and working mobile phone networks. The villages were governed by village chief, vice chief and village committee. Only three out of 90 households interviewed were from a different ethnic group than Lao lum. Hence, the villages were too homogeneous to draw any conclusions about the impact of ethnicity on other factors.

Degradation was the main characteristic of the forests in the area, resulting from shifting cultivation, vast number of livestock, collection of NTFPs and logging. Rice was traditionally cultivated in all the villages.

5.2.2.1 Phowa

Village 1 is called Phowa, named after an old tree situated in the yard of the village temple. The village was founded in 1705. Historically, the people of the village had left for some periods in time because of wars. The last move was during the Vietnam War, when there was serious bombing in the area and people moved to Thakhek in the search of safer living environment. At the time of the field work there were 1,014

people in the village, forming 206 households. In Phowa 21% of the people were children (less than 15-years-old).

Phowa is only 5 kilometres from Mahaxay, which is also the capital of the District. There is a market in Mahaxay and a bigger market in Thakhek town 54 kilometres away. The village is by the river Xe Bangfai which has been controlled by the dam of Nam Theun from 2011. There are also other villages in the area, some of which just at the other side of the river. There are small, steep mountains surrounding the village, with forest covering the bottom half of the mountains (Figure 9). The land is mainly covered by rice paddies, residential area and what is left of the community forest.



Figure 9. A view of the rice paddies and Karst mountains surrounding Phowa.

The villagers were forced to give a vast area of the village land, mainly rice paddy and forest, to a Thai company that built a cement factory nearby. According to the vice chief of the village, the villagers were compensated with 3 000 million Lao kips (370 416 USD), of which 400 million kips (49 389 USD) was given to the community in cash and the rest will be used for example to build a new school. 1.5 million Lao kips (185 USD) were distributed to each household and people who lost their rice paddies were paid a separate compensation directly. When interviewed, it was clear that most

of the households were unhappy with the arrangement and not everyone had received the compensation. Also, the villagers seemed concerned that the work at the cement factory would end when all the construction work would be finished and the villagers would be replaced with people who have higher education. The cement company and how the living had changed was the issue most often brought up in KII and FGDs (methods explained in 5.3.1 and 5.3.2): before NTFPs were one of the most important sources of income, now there was rarely enough to be collected for sale, mostly because of the actions of the cement company. Most of the NTFPs had to be collected without permission from the company's fenced and guarded area.

According to the KII and FGDs, the main sources of living in Phowa were working in the cement factory, irrigated rice cultivation, fishing and collecting NTFPs such as bamboo shoots and mushrooms. For the households interviewed, the most common occupations were farming (25%), working at the cement factory (24%) and working as a government official (10%). Twelve percent of the adults²⁶ were students.

The village got electricity in the mid 1990's and it is now the main source of energy. Every household has access to electricity. Good quality road was built to the village in 2005, but there had been a road access from Mahaxay to the village for years before. The road from Mahaxay and Thakhek is in relatively good condition. The houses are mainly built of sawnwood and bamboo, except for a few houses in which also concrete is used. The houses with concrete seemed to belong to wealthier people, one of them to the village chief. The village has a worn-out primary school.

5.2.2.2 Phonnadee

Phonnadee village has 107 households and 523 inhabitants. Most (77%) of the adults²⁷ in Phonnadee earned their living with farming. Many of the farmers also produced charcoal for income. Phonnadee was founded in the 1950's when people moved to the village from neighbouring districts in the hope of good rice yields. When the road by the village was built in 1999 people moved from deeper in the forest closer to the road.

²⁶ Here defined as people who are 15-year-old or older.

²⁷ People who are 15 years old or above, of which form 66% of the population of Phonnadee.

Phonnadee is situated by the road from the market village of Panam (6 km from Phonnadee) to Boulapha (44 km from Phonnadee) and Vietnam. The road is in a relatively bad condition. The northern side of the village is covered with strongly degraded community forest, fallow and rice paddies. There are also two fish ponds, one natural and one man-made. Most of the houses are situated in the southern side of the road (Figure 10) as well as the former production forest area (SUFORD forest), which is now protected by the District. According to KIIs and FGDs the main sources of income are rice, livestock (mainly cows, ducks and chicken), charcoal and forest products, in order of importance. There is a primary school in the village. Most of the houses are made of sawn wood and bamboo, but there were also several concrete houses that clearly belong to wealthier inhabitants. Main source of energy is firewood. Approximately 75% of the households have electricity, which arrived together with the new road in 1999.



Figure 10. Phonnadee is situated next to the road from Panam to Boulapha.

The village was part of SUFORD project until 2006. After the project ended, the District “protected” the SUFORD forest area, allowing cutting trees only for house construction. Out of the three villages, the attitudes on logging appeared the most negligent in Phonnadee: people appeared to take trees from all forest types surrounding the

village and not only for house construction material. Unfortunately, this kind of illegal activities are difficult to identify in the interviews, since most people are not willing to share the information.

5.2.2.3 *Naphakeo*

Naphakeo, the most remote of the villages, is situated approximately 20 km of the nearest market in Boualapha village. The second nearest market is Panam, approximately 40 kilometres away. Naphakeo stands 2 kilometres apart from the road between Panam and Boualapha²⁸. The road is in bad condition. The government started to improve the road but the work has ceased for political reasons. There is a primary school in the village. The 471 inhabitants of Naphakeo form 96 households. 70% of people interviewed were 15 years or older. The main livelihood is farming. Rice is the main crop cultivated. Livestock is almost equally important source of living, especially cattle and poultry (Figure 11). Also, out of the interviewees, by far the most common occupation was farming (79%), leaving the second largest occupation, shop keeping, at 4%.



Figure 11. Livestock is an important income source for the villagers of Naphakeo.

²⁸ The same road that goes past Phonnadee.

The village was founded in 1944. Naphakeo and surrounding villages were bombed harshly during the Vietnam War. A large share of the villagers moved to Savannaketh during the war but returned after the war ended. There are still unexploded bombs in the area today. The village is surrounded by cliffs, mountains, rice paddies and fallows. A stream goes through the village. The total village area is 10,000 hectares. Naphakeo is part of SUFORD project, the SUFORD production forest being approximately five kilometres from the village. The SUFORD forest of Naphakeo is 10,741 hectares (Grace et al. 2012). Naphakeo has a community forest area nearby.

The villagers (100%) got electricity in 2003. Around that time, a logging company paid for a better road connection and monetary compensation for the villagers in return of cutting a part of the village forest. Most of the houses are made of wood and bamboo. In the whole village, only a few houses were made partly or wholly of concrete. As in the other villages, concrete house was an indication of better wealth.

5.3 Data collection and methods

The data were collected as primary data, meaning that the researcher collected the data herself. There are several benefits connected to using primary data. Firstly, I got a more comprehensive idea of the phenomena, the environment etc. than I would have by using a dataset collected by someone else. Secondly, the data were checked multiple times: first when talking with the households and the translator, then when entering the data, and the third time when doing statistical analyses. Also, there are benefits in collecting data in the field. As Reyes-García and Sunderlin (2011) highlighted, field work can bring out problems, viewpoints and other findings the researcher could not have predicted, give locals tools to comprehend with problems and involve them into policy making.

The format of the interview questions is vital: the answers should be consistent enough so that they can be compared and combined and some of the questions should be open, to enable finding unexpected results. In this study, semi-structured interview methods

were used to fulfil these goals in all the interviews²⁹; semi-structured interviewing is a qualitative³⁰ research method, in which the research questions are planned beforehand, but additional questions can be asked and questions can be rephrased and reorganized on-the-spot if the researcher sees it necessary (Galletta 2013, p.75). Argumentation in qualitative research is closer to explaining a problem and its various features than trying to find statistical significance from which the conclusions are drawn (Alasuutari 1994, p. 29). However, as a result, in the present study both qualitative and quantitative data are collected, both of which are analysed using partly different approaches.

The focus of the present study is on the role of forest resources (NTFPs and timber), but the role of other environmental products is also addressed. Firewood and wood collected for charcoal production are covered, but more lightly than other forest products. More comprehensive results on charcoal and firewood use will be published in the master's thesis of Jaakko Kaukomies (University of Helsinki) later in 2017.

5.3.1 Key informant interviews

The core of key informant interviews is to utilize the knowledge of people with the most insight on the matter researched. Key informants are not the people who represent the group the best, but people who are likely to have the most knowledge on the research topic. The aim of key informant interviews is to get an overview of issues addressed. (Lavrakas 2008, p. 407)

In this study, the key informant interviews were conducted with the village chiefs³¹ to collect overall information on the main characteristics of the villages. The main goal was to collect information on the village history, its inhabitants, land-use³² development projects and other main qualities of the village. The key informant questionnaire is presented in Annex 3.

²⁹ Household interviews, KIIs and FGDs.

³⁰ Semi-structured interviews often combine structured and open questions, for which it has the qualities of both, quantitative and qualitative research (Alasuutari 1994, p. 29).

³¹ In Phowa, the vice chief was interviewed because the chief was not available.

³² Unfortunately none of the village chiefs was well aware of how the land of the village is divided in different land-use types and therefore were unable to indicate the land-use types in hectares.

5.3.2 Household Surveys

Household surveys are the core of this research, providing comprehensive information of the relationship between forest and environmental products and the villagers. For the purpose of this study, a **household** is defined as the people living in the same house. For example, children that have moved away to work are excluded from being part of the household, but if they send remittances it is included as household income. Seasonal workers are included in the households if they live most of the year at the same house as rest of the family, otherwise only remittances they send are included as household income.

5.3.2.1 Selection of the households

The 90 sample households interviewed for this study were selected randomly. In each village, the village chief provided us with a list of all the households in the village. The households were numbered, after which we selected thirty primary households with picking random number cards. The only exception for this was Phonnadee, for which we used the random number generator provided in Excel. In addition to the 30 primary households, we selected 10 households that would be interviewed in the case one of the primary households would be hindered. In Naphakeo and Phowa one household was replaced with the first substitute household, since the families were on a longer trip.

At first, we planned to divide the households of each village into three income groups of which the sample households would have been selected randomly. However, we noticed that this could have led to mistakes since we could not be sure of the validity of the income data the village chiefs provided and whether or not it had been collected using the same principles in the different villages. Therefore, we decided to use random sampling³³ to ensure we would get a good sample of different kinds of families.

³³The principles of dividing the families in different income groups is explained in 5.4 *Data analysis*.

5.3.2.2 *Designing the questionnaire*

The key goals of the household surveys were to assess the input of forest and environmental products in the total income of the households and to assess availability and access of forest products in the context of natural resource-based contributions to livelihoods.

Studies on forest products often face the challenge of estimating the economic value of the products for multiple reasons. As Pearce and Mourato (2004) pointed out, there is an economic value attached to all ecological services. Therefore, also every forest product can be economically valued, even though the item would not have a market. For the present study, the investigation of direct use values of forest and environmental products were chosen as the scope of the research. There were a few reasons for this. Firstly, direct use values can be estimated in monetary terms in the easiest manner and hence also compared with other studies. Secondly, including willingness to pay and other more abstract concepts of ecosystem services could have been very difficult to understand for the interviewees, increasing the likeliness of mistakes in the data.

The sources of cash income were divided in three groups: forest and environmental products, farm products (that was divided further into crop and farm animal income) and off-farm income (including salary, pensions and other paid forms of income)³⁴. For subsistence (non-cash) income, only the contribution of forest and environmental products was estimated. In open questions, it was asked whether some of the products were vital in the case of harvest failure or other crises.

The household questionnaire (presented in Annex 1) was designed to cover a vast set of questions to provide information on the following themes:

- Size, ethnicity and age structure of the household
- Education, occupation and gender of the household members
- Land and other assets³⁵

³⁴The division is based on PROFOR's tool 4 introduced in Shepherd and Blockhus (2010, chap. 4).

³⁵Assets were included in the questionnaire to provide a double check on the income data supplied by the interviewees, e.g. if the head of a household suggested they make a little money but they had a car,

- Use and production of energy with the focus in wood fuels
- Collection and sales of forest and environmental products
- Other income sources
- Past and future trends in forest product access and availability.

The forest products were bundled into product groups for the study to make the data collection more efficient: bamboo poles, bamboo shoots, firewood, fish, fodder, fruits, insects, medicinal plants, mushrooms, oils and resins, timber, vegetables and rattan, wild animals (including also frogs and reptiles) and wood collected for charcoal production. For instance, altogether 507 different NTFP species were mentioned by the villagers in the study by Foppes and Kethpanh (1997), for which reason collecting thorough data on each product would have been too arduous.

5.3.2.3 Testing the questionnaires

To ensure the quality and usability of the household questionnaires and focus group discussions, we tested both methods in a randomly chosen village in the Mahaxay area. The goal was also to train the translators/research assistants for the interviews to ensure that the translators understood the questions correctly.

The test FGD was held with only male participants. A few shortcomings were found in the questionnaire and it was subsequently corrected for the final version. Also, it was noticed that the oldest participant was talking the most. The translator was then informed about the importance of involving all the participants in the discussion.

The practice household interview was also very helpful for the quality of the research. In the original questionnaire, the share of different products for the household's total income was investigated with a method designed by PROFOR (PROFOR's tool 4 introduced in Shepherd and Blockhus 2010, chap. 4), in which the interviewee divides a certain number of beans between different income sources to indicate the importance for the livelihood or the money earned, depending on whether it is a cash or non-cash

I was able to ask additional questions to get further information on the real level of income and other income sources, such as bribes and income from logging.

source. We drew tables on a large piece of paper with a section for each income group. Our test interviewee was not able to read, so it took a lot of time from the translator to explain this as the interviewee did not understand what was written on the papers. In addition, the interviewee lacked interest and did not seem to really understand the whole concept, which resulted in dividing the beans between some products carelessly. All of this confusion resulted in untrustworthy data that would not be adequate for an academic research. Therefore, I decided that the research method of income sources and forest product use would be changed. In addition, some questions were added and a few taken out of the household questionnaire because these were not providing answers to the original research questions. The revised questionnaire is presented in Annex 1.

5.3.2.4 Executing household surveys

Altogether 90 household interviews were conducted, 30 in each research village. The interviews were held between March 6th and 19th, 2016. A translator was used in the communication since I do not speak Lao. On average, one interview lasted for 46 minutes³⁶. The 90 sample households interviewed included a total of 427 people, which makes an average of 4.7 people per household. Of all the people, 54% were female. The average level of education was 4.8 years per person. In Laos, primary school takes 5 years.

The interviews were not recorded because transcription would have been complicated and costly for example due to large number of interviews and the mix of English and Lao languages. All the interviews were recorded with comprehensive notes made directly in the questionnaire and research notebook. Also photos were taken for example on charcoal production, some NTFPs etc. Photos of the interviewees are not published due to privacy issues.

³⁶This excludes the preparations, finding the interviewees etc. Only the pure interview time is included. The interviews done by Jaakko Kaukomies and his translator took less time since Jaakko speaks and understands Lao which decreased the time consumed on the interviews.

Even though the interviews were semi-structured, the order of the questionnaire was generally followed in most of the interviews. Additional questions were mostly asked in the first few households of each village, since we needed more support for the information given when we knew less on the specific qualities of a village. Due to conducting interviews on the spot, the circumstances might have affected the results. These issues are explained in 7.4.

5.3.3 *Focus group discussions*

Focus Group Discussion (FGD) were chosen as a research method to get an overview on the topics addressed in this study, an idea of the community's attitude towards forests and forest products as well as special qualities of the community and its history. FGD is a qualitative research method, in which a group of interviewees have a conversation on topics defined by a moderator. The moderator used is usually an expert of the matters discussed. In the typical FGD the interviewees have similar backgrounds and the interviews are conducted in a group of approximately seven people. (Morgan 1997, p. 1.)

Men and women were interviewed in separate groups for cultural reasons. Altogether six focus group discussions were held, two in each village. Similar topics were discussed in each group with adjustments made to fit special characteristics of each village. The guiding questions used in the FGDs are presented in Annex 2.

It is important to lead the FGDs but also to give space for free talk (Morgan 1997, p. 10). This way also issues that the moderator was unaware of might come up in the discussion. If brought up in the FGDs, unique qualities of a village could have been considered in the household surveys. This way, the focus group discussion is a learning process for the researcher and improves the quality of the research as questions raised in the FGDs can also be added to the household questionnaires.

5.4 Data analysis

According to Alasuutari (1994, p. 30-36) qualitative research is done in two parts: firstly, observations must be reduced for example by combining them and secondly the results are interpreted and the meaning of the findings is researched. These steps were taken with the open questions of the survey, most of which covered the topics of access and availability. Most of these questions were coded and inserted in excel. The answers to the closed questions were coded and analysed in Excel and SPSS. These included the topics of cash- and subsistence-income and forest and environmental product collection.

The research questions were mostly answered with quantitative methods, since most of the data were either quantitative or coded into quantitative form. Quantitative analysis methods enabled providing numeric results whereas qualitative data enabled for example providing thorough explanations for phenomenon. Because the income data are not normally distributed, Kruskal-Wallis test was used to define whether there was a significant difference between the cash income of the three villages.

To get an estimate of subsistence income, a monetary value was applied to all the forest products, except for fodder. Fodder was excluded because it was not sold and, therefore, there were no price data for the calculations. For the other products, the value was estimated through computing the average price per unit (for instance kg) of each product group. It is important to highlight that the monetary value for subsistence income is a rough estimate: all the forest product groups are formed of different products with different prices and the prices vary between villages and products due to multiple reasons (for instance the costs of selling). The average prices used as the base of the calculations are shown in Annex 6.

Because the households were not divided into income groups beforehand, this was done to the data afterwards: the thirty households of each village were divided into low-, middle- and high-income groups. The ten households that had the smallest total cash income in each village were selected to the low-income group and so forth.

6 RESULTS

6.1 Demographic information

Demographic and geographic information based on primary data is presented in Table 3. As the distance to Mahaxay grew, the household size increased. The inhabitants of Phowa were far better educated than the inhabitants of the other two sample villages. Of the adult³⁷ household members of all the sample villages, most (59%) were farmers. The other major occupation groups were labourers (10%), most of whom worked for the cement factory in Phowa, governmental officials (4%) and people working in the educational sector (3%). As seen in Table 3, the occupations were the most diverse in Phowa, whereas in the other two villages the domination of farming left a little space for other occupations.

Table 3. Geographic and demographic information of the three sample villages in 2016.

	1. Phowa	2. Phonnadee	3. Naphakeo
Distance to city (Thakhek) (km)	46	66	100
Dist. to main market (Mahaxay) (km)	5	25	59
Total population	1 014	523	471
No. of households	206	107	96
Average household size	4.5	4.8	4.9
Average years of education*	8.7	4.0	4.0
Average education of the hh head	8.1	4.0	3.5
Adults (%)	79	67	72
Farmers (%)	33	91	92
Labourers (%)	33	4	0
Teachers (%)	9	2	1
Governmental officials (%)	10	0	0
Shopkeepers (%)	3	1	5
Other (%)	12	1	2

*The occupation groups stand for the percentage of certain occupation of the employed villagers. *the average years of education for all adult household members. hh stands for household. Adults are people who are 15-years old or older.*

³⁷ Adult is here defined as a person who is 15-years old or older.

6.2 Dependency on forest and environmental products

6.2.1 Village livelihoods

The distribution of households' total cash income is presented in Table 4. Phonnadee had the lowest annual cash income on average whilst Phowa was the wealthiest village. The conversion rate from Lao kip to USD that is used across this study is presented in Annex 4. As the standard deviation shows, there is the most variance in the cash income in Phowa, and least in the poorest village Phonnadee.

Table 4. Descriptive statistics of average annual cash income in the sample villages, in USD.

Descriptive	1. Phowa	2. Phonnadee	3. Naphakeo
Median	4 443	680	990
Mean	4418	1294	1662
Minimum	889	148	185
Maximum	10 958	7 621	5 241
Standard deviation	2 555	1 221	1 760

n=90.

The income data for household's total income and forest product income are not normally distributed (see Annex 5). The difference between the villages total household income was tested by Kruskal-Wallis test and it showed that there is a significant difference ($p=0.05$) between the cash income of the villages $\chi^2(2) = 33.010$, $p = 0.000$, with the mean rank score of 67.77 for Phowa, 32.47 for Phonnadee and 36.27 for Naphakeo. There was a significant difference between the total household cash income of Phowa with the two other villages (in both of which $p=0.000$). There was no significant difference between the total income of Phonnadee and Naphakeo ($p=0.647$).

6.2.2 Forest and environmental products in cash income

At the significance level of 0.05, the Kruskal-Wallis test showed that there is a significant difference between the forest product cash income of the villages ($\chi^2(2) = 10.269$, $p=0.006$), with the mean rank score 43.77 for Phowa, 56.15 for Phonnadee and 36.58 for Naphakeo. For forest product cash income, the difference between Phowa and

Phonnadee is $p=0.061$, which means that there is no significant difference in the forest product income of the two villages. For Phowa and Naphakeo $p=0.238$, indicating that there is no significant difference. The only significant difference in forest product cash income is between Phonnadee and Naphakeo, where $p=0.001$.

With the data of all sample villages aggregated, off-farm income accounted for 60.6% of the total cash income of the families. The second largest group was farm animals (17.2%), followed by forest product income (11.4%) and income from crops (10.8%). Figure 12 shows the equivalent shares for each village. The share of off-farm income decreased as the distance from the sample villages to Mahaxay – the main town and market – increased (inverse relationship). However, on-farm income had the opposite relationship, whereby as the distance from Mahaxay increased, so too did on-farm cash income. The forest and environmental product income is the highest in Phonnadee, with 372 USD per household, more than half of which (213 USD) comes from charcoal sales.

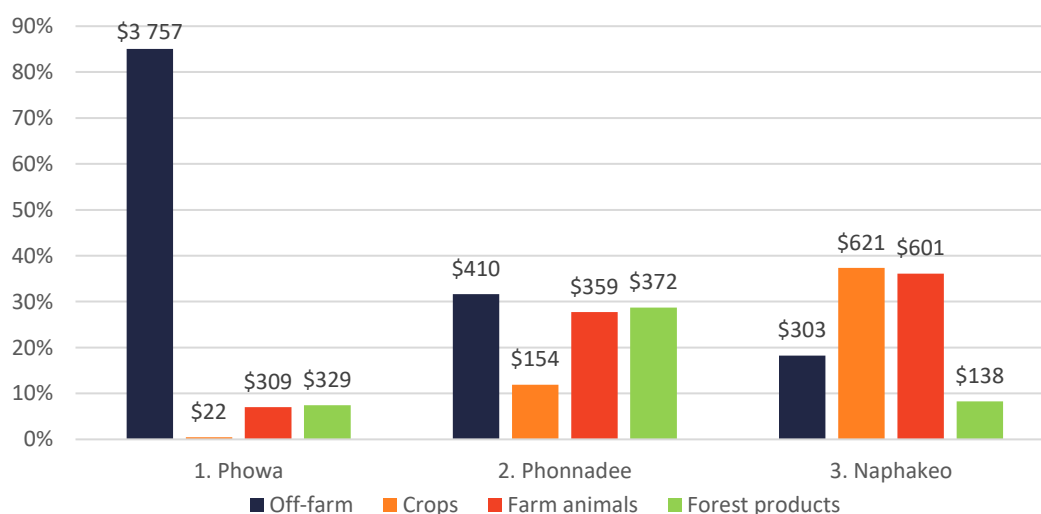


Figure 12. The shares of annual average income in the sample villages by income sources (bars, in percentage) and in USD (labels) per household. $n=90$.

Figure 13 presents the contribution of different forest and environmental product sales³⁸. The products that accounted for most of the earnings were fish, charcoal, mushrooms and bamboos. The most important forest and environmental products are,

³⁸ Out of the product groups of the study, fodder was the only one that was not sold in any of the villages.

however, different for each village: fish in Phowa, charcoal in Phonnadee and mushrooms in Naphakeo. Interestingly, timber sales bring the second largest share of forest cash income (28%) in Naphakeo but were not reported to bring any cash income in the other villages. Naphakeo differs from the other two villages also with more even and diverse spread of forest product sales. However, wild animals are important in the other two villages but not sold in Naphakeo at all.

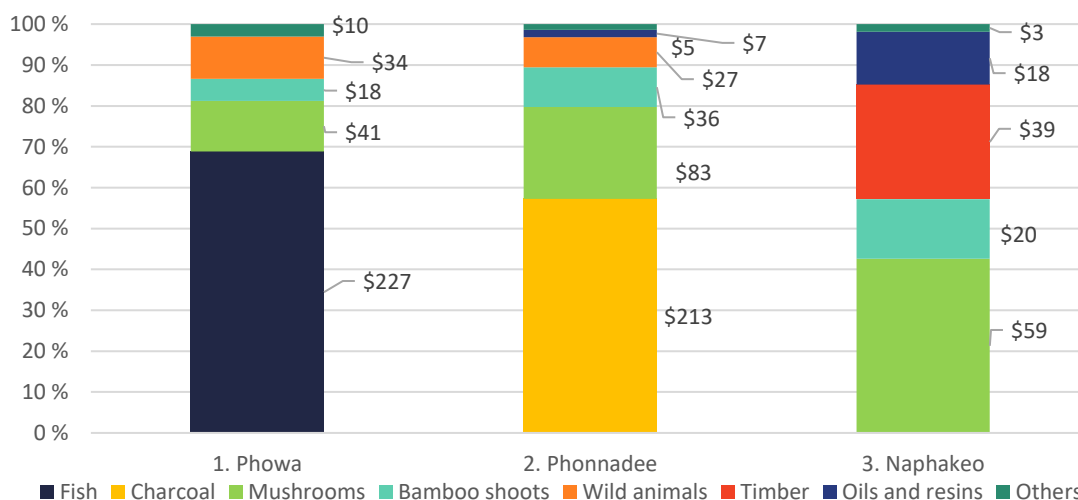


Figure 13. The share and cash-value of forest and environmental products in the total household forest and environmental product cash income of the sample villages. $n=90$.

6.2.3 Subsistence income from forest and environmental products

The cash-equivalent value of subsistence income³⁹ from forest and environmental products is higher than that of cash income in all three sample villages (Table 5). NTFPs are more important than timber for both subsistence and cash income. Timber sales were recorded only in Naphakeo, but there is uncertainty as to whether all timber sales were reported due to illegality issues (explained in section 7.4). The share of cash income from forest and environmental products was the highest in Phowa (35%) and the lowest in Naphakeo (16%). For subsistence income, the contribution of timber is the biggest in Phonnadee.

³⁹The calculation of subsistence income is explained in 5.4.

Table 5. The estimated average annual household subsistence value and cash income of forest and environmental products in the three sample villages. In USD and percentage of total forest and environmental income.

Village	Product	Subsistence income		Cash income		Total FEP income
		\$	%	\$	%	\$
1. Phowa	NTFPs	579	(64)	329	(36)	908
	Timber	26	(100)	0	(0)	26
	All FEPs	60	(65)	329	(35)	934
2. Phonnadee	NTFPs	1 146	(76)	371	(24)	1 517
	Timber	52	(100)	0	(0)	52
	All FEPs	1 198	(76)	371	(24)	1 569
3. Naphakeo	NTFPs	700	(88)	99	(12)	799
	Timber	11	(22)	39	(78)	50
	All FEPs	711	(84)	138	(16)	849

Firewood is included in NTFPs. FPs refers to forest products. FEP stands for forest and environmental products. NTFPs also include non-timber environmental products.

Table 6 summarizes the collection of different forest products for subsistence use per household in each sample village. Food products were the most important forest and environmental products for subsistence use, of which vegetables and rattan, mushrooms and bamboo shoots brought the most subsistence income⁴⁰.

Table 6. The subsistence use of the most important forest product groups in USD and percentage of total subsistence value, per household.

Forest product	1. Phowa		2. Phonnadee		3. Naphakeo	
	\$	%	\$	%	\$	%
Vegetables & rattan	65	(11)	277	(23)	166	(23)
Mushrooms	127	(21)	186	(16)	180	(25)
Bamboo shoots	51	(8)	331	(28)	107	(15)
Fish	199	(33)	33	(3)	158	(22)
Wild animals	42	(7)	167	(14)	28	(4)
Fruits	30	(5)	94	(8)	30	(4)
Timber	26	(4)	52	(4)	11	(2)
Firewood	24	(4)	24	(2)	24	(3)
Others	42	(7)	33	(3)	6	(1)
Total	605	100	1 198	100	712	100

6.2.4 Dependency according to income groups

The thirty sample households in each village were divided into three income groups. In absolute terms, most of the forest product cash income is made by the group with

⁴⁰This is calculated of the grand total of all villages combined.

highest income. The trend is the same across villages, but the difference is the most prominent in Phowa, where the low-income group makes only 3% of forest and environmental income whilst the equivalent number of the high-income group is 64% (Figure 14). However, the figures are different for subsistence income, from which the most is made by the low- and middle-income groups. In Naphakeo, subsistence income is divided almost equally between the three income groups. In Phowa and Phonnadee most subsistence income is made by the middle-income group.

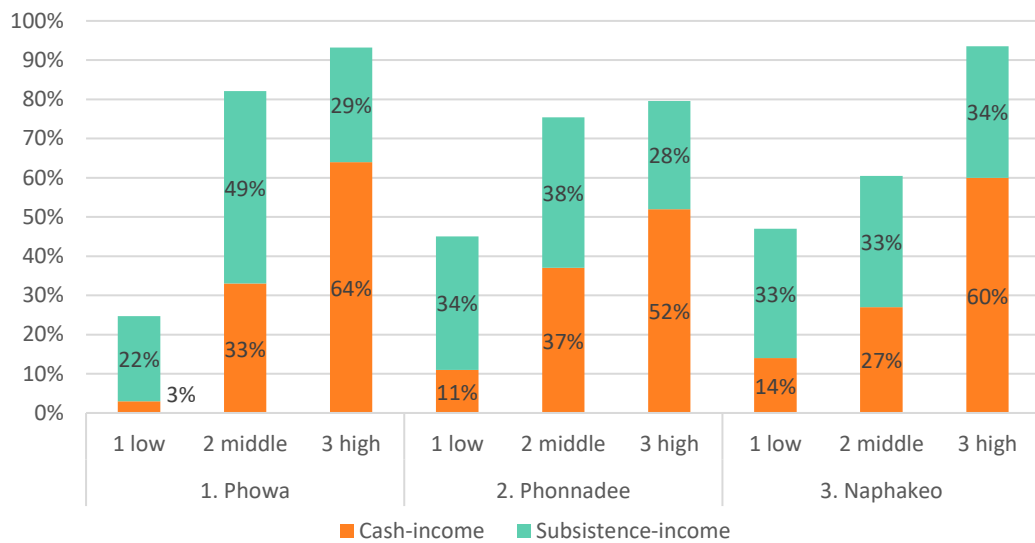


Figure 14. The division of total forest and environmental cash- and subsistence-income between the income groups in the sample villages in percentages.

Figure 15 shows the share of forest and environmental product income in the total annual income of the income group. For Phowa, the share of forest products increase from the low-income to high-income group. In Phonnadee, middle-income group earns the most (50%) from forest and environmental products, followed by low-income (34%) and high income groups. For Naphakeo, the phenomena is the opposite of Phowa: low-income group makes the biggest share with forest products, followed by middle-income and high-income groups.

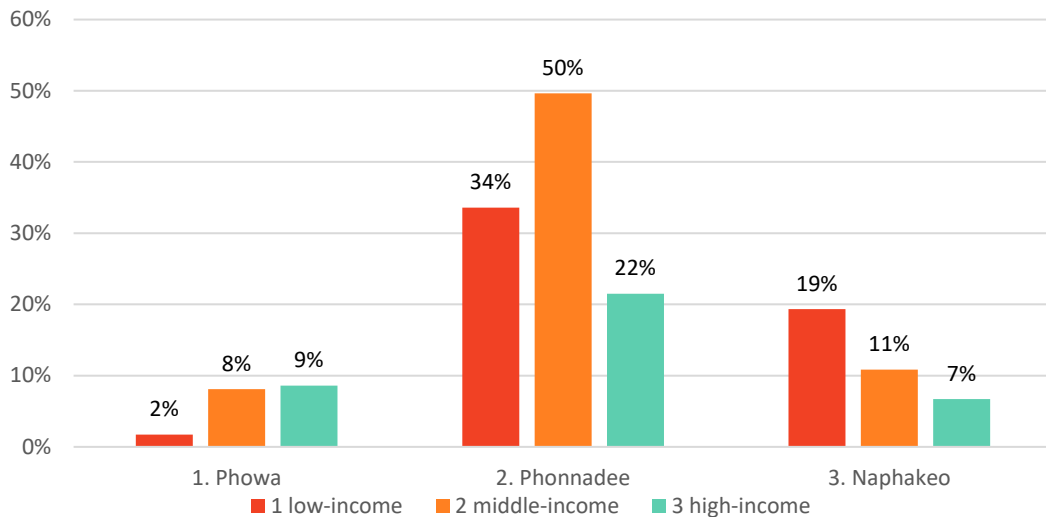


Figure 15. The share of forest product income in the total annual income of different income groups in percentage.

6.2.5 Forest products in food security

Most the households in all the sample villages were food secure. The situation was the best in Phowa, where all the households announced that they were self-sufficient⁴¹ with food (Figure 16). In Naphakeo the equivalent percentage was 87%, and in Phonnadee 83%. To get an indication about the role of forest products in food security, the households were also asked whether nourishment of the household would be sufficient without forest products (Figure 16). There was a vast difference between villages. In Phowa and Phonnadee the majority would have been sufficient in food production without forest products. For the people of Naphakeo, only 20% thought that they would have had enough to eat without forest products.

⁴¹ Here meaning, that all the members of household had enough to eat, whether the food was grown by themselves, collected, or bought.

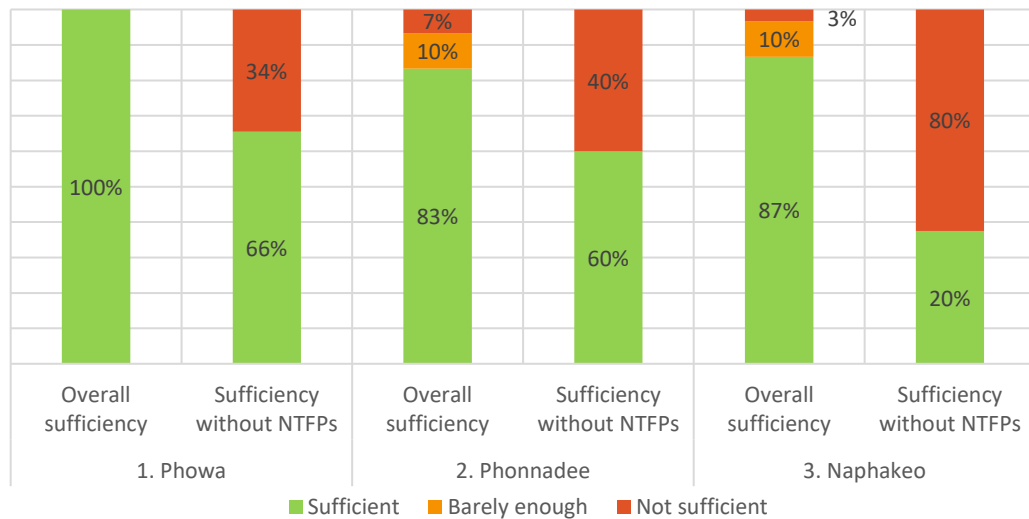


Figure 16. Self-sufficiency of food production and food security without NTFPs. For overall sufficiency n=90. For sufficiency without NTFPs: Phowa n=29, Phonnadee n=30, Naphakeo n=20.

6.2.6 The most collected forest and environmental products

Of all the forest environmental product groups, bamboo shoots were the most commonly used: 94% of all the households collected bamboo shoots. The other most commonly collected products were firewood with 90%, mushrooms with 86% and wild vegetables and rattan with 84% of all the households involved.

Figure 17 shows the percentages of households collecting the forest products in each sample village. In Phowa, the forest and environmental products that were collected by the most households were bamboo shoots (90%), Fish (83%) and firewood (80%). In Phonnadee, 100% of the households collected bamboo shoots, followed by firewood and wild animals, both of which were collected by 93% of the households. In Naphakeo, firewood was the most collected forest product with 100% of the households, followed by bamboo shoots and mushrooms, both with 97%.

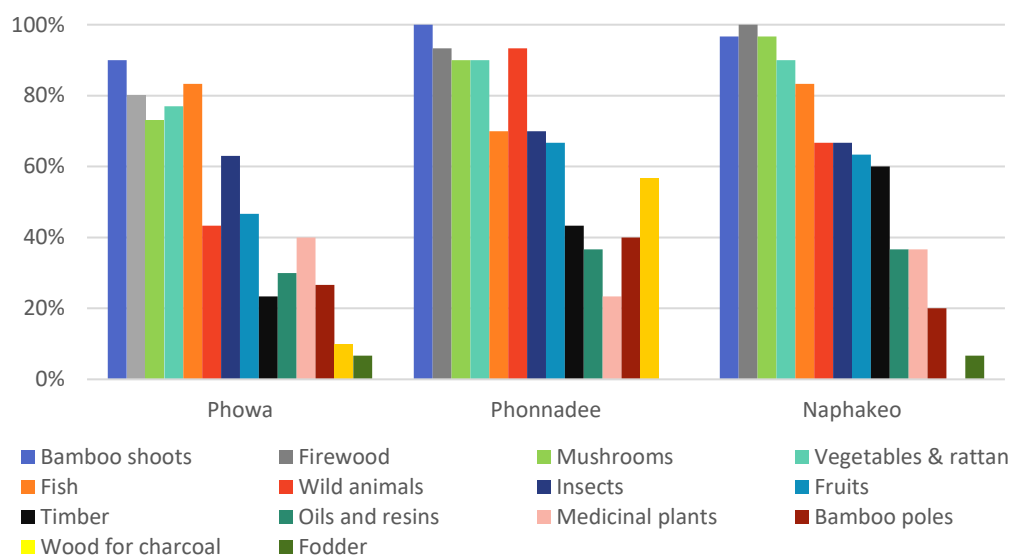


Figure 17. The share of households collecting forest and environmental products in the sample villages.

6.2.7 Sources of forest and environmental products

Bamboos were mostly collected from fallows and degraded forest (40%) and agricultural land or around it (16%). Agricultural land was also the main source of wild animals (60%). Fruits were mainly collected from fallows and degraded forest (37%) and SUFORD forest (30%). For fish, the main sources were rivers and streams (76%). For insects, agricultural land was the main source of collection with 54%. Medicinal plants were mainly collected from SUFORD forest (27%) and fallows (27%). Fallows were also the most common source of mushrooms (49%) and vegetables and rattan (45%). Most oils and resins (52%) were collected from SUFORD forest. Timber was taken mainly from fallow areas (39%) and community forests (34%).

Fields and degraded forests were the most important source of forest and environmental products (50%) (Figure 18). Natural-like forests were the second largest source (21%), followed by aquatic sources⁴² (17%).

⁴² Including also river banks, from which for instance crabs, frogs and bamboo shoots were sometimes collected from.

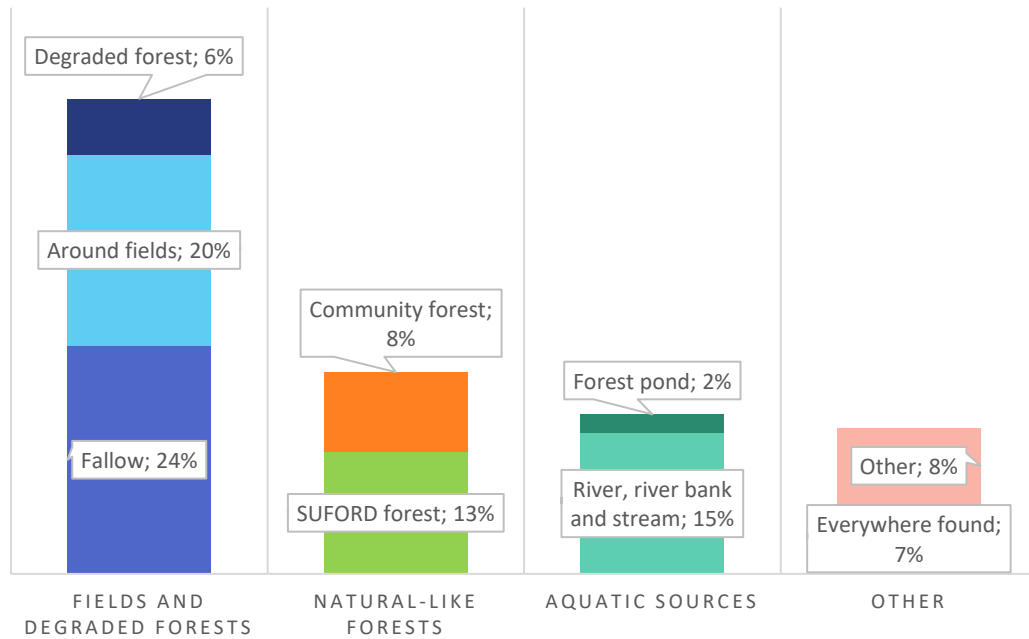


Figure 18. The share of different wild land types from which the forest and environmental products* are collected.

* does not include the collection of fuelwood.

6.3 Access and availability

6.3.1 Perceptions on past changes

As seen in Figure 19 the people of Phowa felt that the access to forests and forest products had changed the most: altogether 80% of the villagers said that there had been a negative change and most of whom thought that there had been a lot of negative changes. Most of the households in Phonnadee (57%) and Naphakeo (60%) thought that there had been no change in access. For Phowa the equivalent number was only 20% of the households.

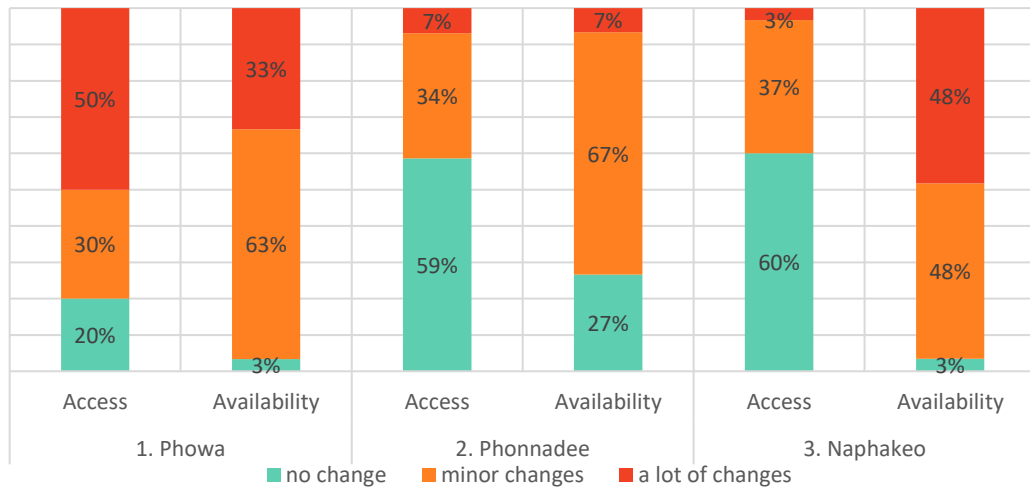


Figure 19. Perceived changes in access and availability of forest products in all three study villages in the past 5 years.

Access: Phowa n=30, Phonnadee n=29, Naphakeo n=30. Availability: Phowa n=30, Phonnadee n=30, Naphakeo n=29.

The biggest single reason for the change in access in Phowa was the effects of the cement factory: 73% of the households brought up directly the cement factory as the biggest single reason for the change. Also, the rest of the people who noted change in access indicated that the forest area had diminished, which was mostly due to the factory.

Timber was the only forest product for the collection of which the households interviewed needed permission. In Phowa, 80% of the households said that they have never needed a permit to access forest products, including timber. The rest, 20% of the households, answered that they had to get a permission to collect timber, of which 33% did not know the amount of the payment and another 33% said that people only need to pay if they do business with timber. The permission was asked either from the village committee or straight from the village chief.

In Phonnadee, 63% of the households had never asked permission for using any forest products. The rest, 37%, said that they needed to ask permission for the use timber from the village chief, one third of whom said they had to pay for timber with the average price being 12 USD per tree according to the interviewees. One family also brought out, that the poorest people do not necessarily have to pay.

In Naphakeo, 57% of the households answered that they never needed a permission to collect forest products. The rest, 43%, said that they needed a permission to collect timber, most of said, that they needed to ask permission for timber but they did not need to pay for it. The permissions were given by the village chief. One interviewee had also asked for the permission from the district officials. The rest, 20% of the households interviewed, said that they had to pay for the cuts. The prices ranged from 1 USD to 25 USD per tree.

The change in forest product availability is also presented in Figure 19. Most of the respondents felt that the number of forest products had hanged during the past five years. In the most remote village, Naphakeo, the interviewees reported the least change: 27% thought that there had been no change and 67% felt that the change had been minor. From both, Phonnadee and Phowa, 97% of the households indicated minor or major changes in the number of forest products. In Phowa, one respondent thought that the change was positive. Population growth was major reason for the decreased amount of forest products that was brought up in all the villages. Also, in all the villages a trend was that people had to use more time to collect the same number of forest products than before.

In Phowa, the effects of the cement company and the dam upstream the river were the biggest reasons behind the change; Nam Theun 2 dam affected the amount of Fish and harshness of floods and draughts and the cement factory decreasing and degrading forests and demolishing fish ponds. In addition to decreased amount of fish, the number of mushrooms, timber, mammals, ant eggs, bamboos, birds, snakes, turtles and lizards had diminished. In Phowa, even the number of rats had decreased, a hunt that was easily found in the other villages. According to a few households, some timber species had disappeared completely and one family said that they had lost timber as a source of income due to the change.

In Phonnadee, many families remarked that everything else had decreased in the forests and wild lands except bamboos. Households brought up that there were no big trees left, which influenced plant and animal species of the forests as well as income from timber. Also, many families told that the forest animals were gone. In Naphakeo,

the trend was that people used a bit less forest products for food than before because of the products were less available. One household also brought up that some tree species had disappeared (e.g. Mai Khaen).

Figure 20 shows the change in availability of different forest product groups in the three villages combined. The figure shows that the availability of timber has decreased the most drastically: 47% answered that there had been a big decrease and 26% that there had been a small decrease. Also for fish and wild animals, most of the interviewees had noticed a decrease, more than 25% of whom thought the change was big. The number of vegetables and rattan, bamboo poles, and medicinal plants had faced the smallest change.

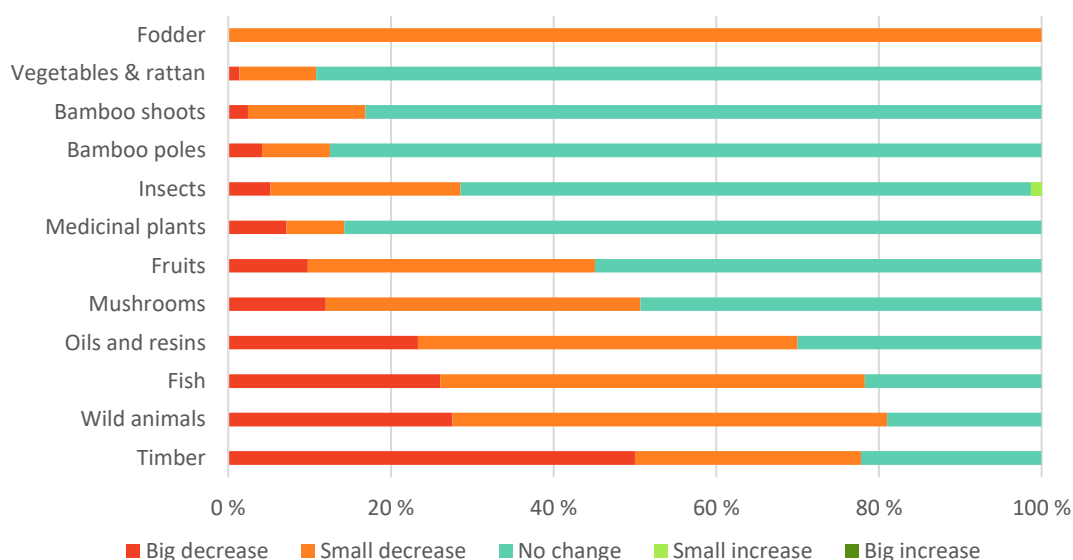


Figure 20. The change in the number of forest products by different product groups in all the three villages in the past 5 years.

n=607, values missing=29. Excluding firewood. Fodder was only collected by two households.

6.3.2 Predicted changes

As figure 21 demonstrates, most of the households expected a decrease in access and availability of forest products in the next five years. It follows the pattern of remoteness gradient: expectations were the most positive in Naphakeo, where 27% expected no change and 17% of interviewees expected a change for better, as the most negative

expectations were in Phowa, where 83% of the households expected negative changes and no one expected a change for better.

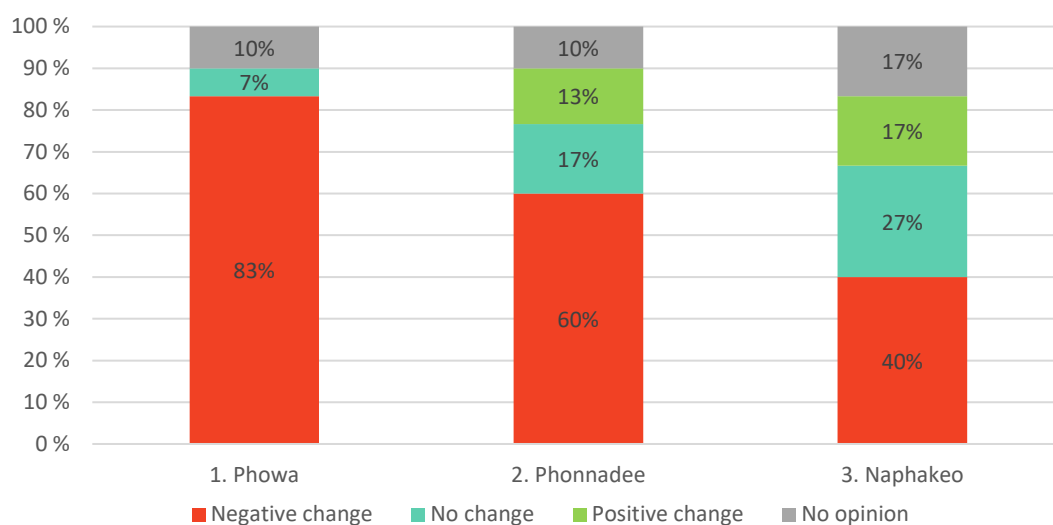


Figure 21. The change in forest product access and availability in the future. *n=90.*

The reasons for the perceived negative changes in access and availability are presented in Figure 22. In Phowa and Phonnadee the biggest explanatory reasons were diminishing amount of forest, population growth and extensive collection of forest products. In Naphakeo, the biggest single reason was population growth (42%), followed by extensive collection of forest products (25%) and regulations and environmental projects (17%), which mainly refers to SUFORD project. In Naphakeo, 80% of the households who said that the change would be positive (17% of the households), reasoned the change for good with regulations and environmental projects and the rest claimed that the change would be for better due to increased knowledge on forestry. In Phonnadee, the main reason for positive change (expected by 13% of the respondents) was increasing knowledge on environmental issues (50%), followed by an increase in access caused by better governance (25%). The rest did not know the reason for the increase.

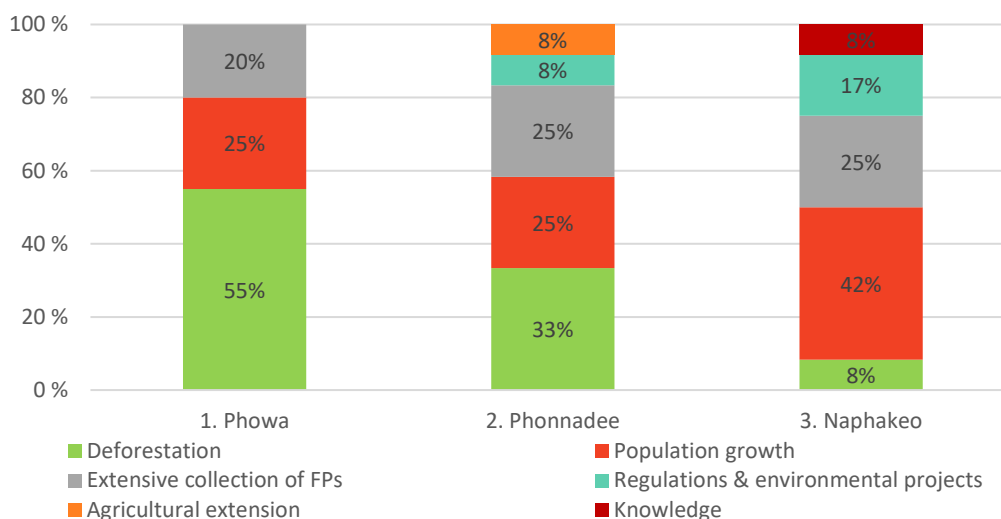


Figure 22. The perceptions of reasons for future decrease in forest product access and availability in the sample villages.

n=44. Only the perceptions on access were asked in the questionnaire but for the future people explained the change in both access and availability, since they often go hand in hand.

6.4 Summary of the main findings

The sample households still strongly rely on forest and environmental resources, even though less than most studies on Laos suggest. Forest and environmental income account for approximately 12% of the cash income of the sample households. The subsistence income of forest and environmental products is higher than the equivalent cash income of forest and environmental products, or for example crops in any of the villages. For subsistence income, food products have the largest contribution. NTFPs were more important to subsistence and cash income than timber, however, the value of timber was potentially not well captured. The poorest village was the most dependent on forests and the environmental resources, especially relying on charcoal production. Bamboo shoots, firewood and mushrooms were collected by the most households, and fallows were the most important land-type for collection.

There was a strong decrease in both access to forest products and their availability in the past five years. The decline in access and availability had been the strongest in the most developed village. For the future, most interviewees expected a negative change also, with the pessimistic expectations mainly blamed on population growth.

7 DISCUSSION

7.1 *The dependency of livelihoods on forest and environmental products*

In the present study, dependency is evaluated comprehensively: by cash income and subsistence income from forest and environmental products as well as the contribution of forest products in food security. The evaluation of forest dependency of the sample villages is expressed in Figure 23 which is further explained later in this section.

1. PHOWA	2. PHONNADEE	3. NAPHAKEO
High accessibility to market		Remote
Least natural-like forests		Most forested
Least traditional agriculture		Leans on agriculture
<ul style="list-style-type: none"> Highest income, industrial jobs 	<ul style="list-style-type: none"> Lowest income 	<ul style="list-style-type: none"> Least off-farm income
<p>Moderate forest dependency</p> <ul style="list-style-type: none"> High absolute forest income, relatively the smallest role FEPs important for additional subsistence and cash income (especially fish) 	<p>Strong forest dependency</p> <ul style="list-style-type: none"> Highest absolute forest income Highest share of forest and environmental income in total annual cash-income Especially dependent on charcoal 	<p>Strong forest dependency</p> <ul style="list-style-type: none"> 80% of households would face hunger without NTFPs Use and sales of diverse FEPs Problematic market access

Figure 23. Evaluation of forest dependency in the sample villages.
FEPs stands for forest and environmental products.

7.1.1 *Food sufficiency in forest and environmental dependency*

The most unambiguous way to determine forest dependency is through food security (self-sufficiency). The results clearly show that people in the study villages strongly depend on forests for nutrition. Also Foppes (2015) claim, that wild foods are the biggest safety net of rural poor and replacing their contribution in nutrition would be expensive. According the present study, the dependency on forests for food security in-

creases as the distance from Mahaxay increases (i.e. remoteness gradient). In Naphakeo 80% of the interviewees present the highest level of forest dependency: they would not have food security without the contribution of NTFPs.

The results show that forest plays an important role in food security in these villages: they have more importance in the more forested villages. Sunderland et al. (2013) also highlight the role of forests in food security, directly but also in income formation, which is further explained later in this chapter.

7.1.2 Cash income in forest and environmental dependency

Part of the first hypothesis was that *the more remote villages are also more dependent on forests: there is a significant difference ($p < 0.05$) in forest and environmental cash income between villages closer to markets and villages further away*, which was rejected. The only significant difference in forest cash income was between Phonnadee and Naphakeo, the two villages furthest away from Mahaxay. This can be mostly explained with two key factors. Firstly, by the charcoal sales of Phonnadee: charcoal production was one of the main income sources in the village, accounting for 16% of the total cash income of the households and 57% of forest cash income. Secondly, Naphakeo has poor market access, which affects the profitability of sales. As Sunderlin et al. (2005) highlight, remote location with the lack of easy market access puts the collectors of forest products in a poor bargaining position with middlemen.

However, the level of forest and environmental reliance also depends on the contribution of other sources of income and nutrition. The role of off-farm income decreases as the distance from Mahaxay increases, and the role of on-farm income increases simultaneously. In Phowa, where off-farm income accounts for 85% of the households' annual income on average, the role of the other income sources is relatively smaller, whereas the other two villages rely more equally on different forms of income.

In absolute terms, Phowa and Phonnadee have almost equal share of income from forest and environmental products⁴³, but for Phowa this accounts for 7% of the cash income of an average household, whereas in Phonnadee it accounts for 29% of the cash income of an average household. This means that the average Phonnadeen is far more forest dependent than an average villager from Phowa.

According to Angelsen et al. (2014), income from forests and the environment accounted for 22% of the total income of rural Asian households (20% of which was from forests), which is more than in the present study in which forest and environmental products form 12% of the cash income of an average household. The results of this study show also significantly lower percentages for forest and environmental cash income than those from Foppes and Dechaineux (2000) and Mouaxengcha et al. (2010), according to whom NTFPs contributed approximately half of the cash income of rural Lao people. However, in absolute terms, the difference is smaller when compared with the research by Foppes (2010), finding that NTFPs account for 204 USD in cash and 489 USD in non-cash income per household. The equivalent numbers of the present study are 266 USD and 808 USD, respectively.

7.1.3 Subsistence income in forest and environmental dependency

The value of subsistence use of forest and environmental products is higher than that of cash income in all three villages. The subsistence value is the highest for the poorest village⁴⁴, Phonnadee, followed by the second poorest village Naphakeo and Phowa. Angelsen et al. (2014) also found that the livelihoods of the poorest households are the most forest dependent. According to the present study, the subsistence value is higher than the cash income from farm animals or crops in all the villages. However, the subsistence value of crops and livestock was not estimated in this study, for which reason the overall importance cannot be compared.

⁴³ Phowa 329 USD and Phonnadee 372 USD per average household.

⁴⁴ In the assumptions made before the hypotheses I assumed, that the furthest village would also be the poorest, which was not the case eventually.

When looking at the assortment of forest products collected, there is a lot more variety in the products collected for subsistence use than the products sold, which is most probably due to specialization in the products collected for sale. Also, with subsistence use, people tend to collect whatever is found with little effort.

7.1.4 The dependency on forests across income groups

The second hypothesis, *households with lower income are more dependent on forest and environmental products than higher-income families*, holds for the two most remote villages. When looking at the contribution of forest products in the total income of a household, the poorest third of the households get the largest share (19%) of their cash income from forest products in the most remote village Naphakeo. In the second most remote village Phonnadee, the middle-income group gets the largest share of their income (50%) from forests, followed by low- and high-income groups. In Phowa, the poorest get only 2% of their cash income from forest products, whereas high-income households get the largest share of their income, 9%, from forest products.

The results show a certain pattern: in a more developed village where salary plays a bigger role, the poorest get the least of forest product cash income. In a more traditional agriculture-based village the poorest rely the most on forests for cash income. In Phonnadee, significant charcoal sales increased the level of income. According to Angelsen et al. (2014) forest and environmental income has the most important role in the livelihoods of the poorest households, which is in accordance with the most remote village of the present study, but not with the results on the most developed village.

It was also investigated how the total forest product cash income was divided between the income groups (in absolute terms). From the total forest product cash income, the high-income group gets more than 50% in all the villages, and the middle-income group gets the second largest share. The most evident explanation would be that the poorest would have to consume most of the forest products themselves. However, most of the subsistence income is received by the middle-income group in Phowa and Phonnadee, whereas in Naphakeo the subsistence income is distributed almost equally between all three income groups. It could also be that the higher income groups get

wealthier partly because extensive forest product utilization enables extensive sales of rice and other farm products. Foppes and Kethpanh (1997) also noticed that richer families often collected more NTFPs than poorer families, but were less depended on NTFPs because they had also other income sources of significance which is in line with my findings.

7.1.5 The importance of NTFPs compared to timber

The results support the third hypothesis that *NTFPs are more important than timber for both cash and subsistence income*. The results suggest that timber has only minor significance in subsistence income: timber had the most significance in Phonnadee with the share of 4% of total subsistence income. According to the data, timber was sold only in Naphakeo, in which the contribution of timber was 22% of total forest product cash income.

However, there are several issues connected to these results. First of all, the data collection method did not support the effective capturing of the contribution of timber very well. Timber was used in every village for housebuilding, but since the yearly contribution was almost impossible to estimate, we only included recent use of timber⁴⁵. Also, illegal logging was clearly happening at least in Naphakeo and Phonnadee⁴⁶: we observed for instance many operating sawmills, piles of logs under houses and on the roadsides, and freshly cut forest areas during our time on the field. Still, some people did not want to reveal the income from logging and for this reason the value of illegal logging is not well captured.

Enforcing the Lao logging ban is a key issue if the government of Laos wants to remain the country's forests. Corruption is still a major problem in Laos, weakening monitoring even though the local officials are present in the remote areas as well.

⁴⁵ The timber used for housebuilding should have been divided for the service-life of the house. We felt, that this would have given a lot of space for errors too, since everyone had a house and therefore decided to include the timber used for housebuilding during the past five years.

⁴⁶ A household representative in Phowa also said that they used to earn money with timber sales but could not anymore because there are no more trees to sell.

7.1.6 Main forest and environmental products and land types

Part of the first objective was *to learn which forest and environmental products are the most important in household economies and which land types are the most important sources of forest and environmental products*. Food and fuelwood were the most important forest products, of which bamboo shoots, firewood and mushrooms were collected by the most families. By cash-earnings, fish, charcoal and mushrooms were the most important forest and environmental products. This is not in line with Kimura et al. 2015, by whom fiber sources were the most important NTFP collected for sale in Laos. There was a big difference between the villages: in Phowa, almost 70% of the forest and environmental product cash income came from fish. In Phonadee, almost 60% of forest and environmental product cash income was earned with charcoal, and for Naphakeo more than 40% of the cash income came from mushrooms and an almost equal share from timber sales. For subsistence income, food products were the most important in all three villages. Foppes (2010) also reported that the most NTFPs are collected for food in rural Laos.

Fallows, fields and their surroundings and SUFORD forest were the most important land use types for the collection of forest products⁴⁷. However, too broad assumptions based on these findings should not be done due to multiple reasons. Firstly, people had different definitions of different land types. Secondly, it is likely that fallows, fields and degraded forests are important because that is the most common land type and provides commonly used forest products (e.g. bamboo shoots), not because these provide a lot of the most wanted forest products and are the most preferable land types.

The results are mainly in line with the study by Foppes and Kethpanh (1997), according to which a large share of NTFPs (43%) were collected from areas that are not forest, such as streams, different types of fields, ponds and fallows. Also, the amount of forest does not necessarily effect the collection of NTFPs as much as one could think: Foppes (2010) found that there is a little difference in the collection of NTFPs between the villages with a lot and with little forest. It seemed to be the case also in

⁴⁷ Except for fish which was mostly collected from forest ponds and rivers.

the sample villages of the present study, but it should be addressed with a more comprehensive data to draw solid conclusions.

7.1.7 Concluding on forest dependency

Rural Lao people of the study sample still rely on forests for both subsistence and cash income. The first hypothesis, *the more remote villages are also more dependent on forests*, holds when looked into forest dependency comprehensively: the two more remote villages were more dependent on forests for food security, for relative and absolute forest and environmental subsistence income and for relative forest and environmental cash income.

In the most developed village forest products are used mainly to get additional income or to save money. The same strategy is used also in the more remote villages, but even more products are collected and sold to earn income to buy other goods and to get enough food. The sales of forest and environmental products are also influenced by markets: most of the products are available for everyone in the more remote villages, but access to markets is trickier due to long distances, lack of transportation and run-down roads.

The results are similar to those from the study of Levang et al. (2005) made in Indonesia: people who are less forest dependent have the possibility for higher education⁴⁸ and higher income than forest dependent people. In the most remote village people depend on forests partly because they lack alternative options, not necessarily because that is the way of living they prefer. However, the difference in overall well-being is harder to estimate (Levang et al. 2005). It can be debated whether the forest dependent lifestyle also traps people in poverty. Still, poverty is preferable to hunger and as livelihood strategies develop more homogenous, the people also lose some of their safety nets as forests and agriculture have less role in the livelihoods. Wunder et al. (2014) pointed out that for safety nets the cash income from forests is more important than

⁴⁸The people in Phowa get on average 7.8 years of education whereas in Phonnadee only 3.5 years and in Naphakeo 3.4 years.

that of subsistence income. The present study shows partly the opposite, as subsistence income from forest and environmental products account for more than cash income in the livelihoods of the sample. However, the status of forest products as safety nets was only researched lightly, for which reason the question cannot be fully addressed with this data and would need further research.

Income is not a synonym to well-being: as observed in the villages, the people from the most remote village seemed to trust the future the most, probably because they had their future largely in their own hands. However, the people from the highest income village, Phowa, leaned strongly on their wage and therefore strongly depended on their employers. Also, the people of Phowa had seen the downsides and upsides of the cement factory project, which they could not influence, but strongly affected the lives of most of the villagers. Also, the livelihoods are more diverse in the more remote villages. Like Ellis (2000) highlighted, diverse livelihoods are less vulnerable when risks occur.

As Hogarth (2014) summarized, relative forest income is an important indicator of forest dependency in the context of a household, but for poverty mitigation, absolute forest income has a more important role – as it is the rise of absolute income that helps households out of poverty. An average household from Phonnadee lived with 1.8 dollars a day, which is under the poverty rate set by the World Bank (1.9 USD/day/person) (World Bank 2016c) – and this is for the whole household, not an individual. For a median household of Phowa the equivalent number is 12.2 USD per day⁴⁹. This indicates that it is the wage work that lifts households out of poverty, not the contribution of forest and environmental or farm income.

7.2 Access and availability of forest products

The results support the fourth hypothesis that *there is a general trend of reduced access to forest products and decreasing availability over time* (Figure 24), finding that

⁴⁹ The equivalent number for Naphakeo is 2.7 USD per day. The figures for an average household are higher.

is in line with the study of Hermans-Neumann et al. (2016), according to which decreased forest product availability was a general trend across continents in all forest product groups. By the present study, timber, wild animals and fish were decreasing in the most alarming rate⁵⁰. The price for timber, wild animals and fish was relatively high, which makes the products more appealing for sales. For wild animals, also the attitudes seemed to have an effect: for example, many rare species were highly sought after as rare food delicacies. In 1997 Foppes and Kethpanh estimated that wildlife is a more important source of protein for rural people in Laos than livestock. However, this seems to have changed, as wild animals are harder and harder to find, livelihoods develop rapidly, and especially Naphakeo leans strongly on livestock.

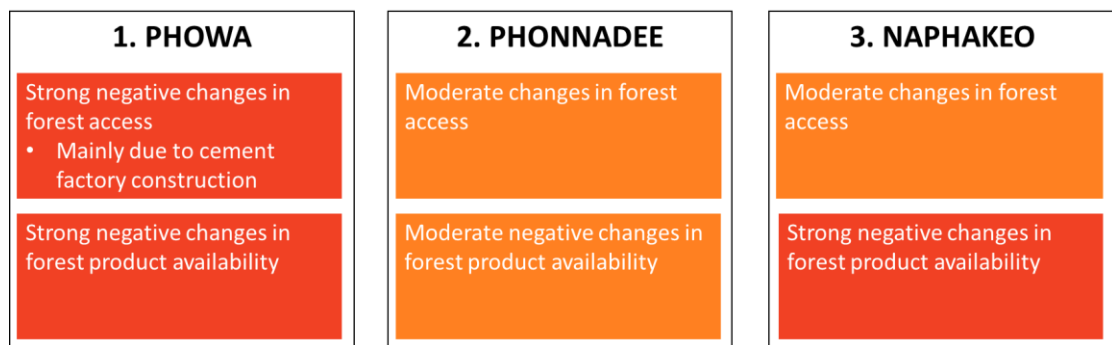


Figure 24. Evaluation of negative past change in forest access and availability. *With the timeframe of past five years.*

Most people thought that there had been no change in the availability of wild vegetables and rattan, bamboos, insects, medicinal plants and fruits, most of which survive also in degraded forests and fallows and are relatively easy to collect and find. Because these products are readily available for most households, they are largely used in subsistence income but seldom sold as the price stays low as the supply is high. Also Foppes (2010) noted, that forest vegetables remain easy to find, but found decline in the availability of bamboo shoots and rattan.

The majority of the interviewees saw no change in access during the past five years in Phonnadee and Naphakeo. However, in Phowa, 80% said that access had faced a negative change, for which the cement factory construction was brought up as the main reason. The biggest factor for the change in access in Phonnadee and Naphakeo was

⁵⁰ Firewood was excluded from the access and availability survey.

regulations: the logging ban but also the regulations connected to SUFORD forest and bans to collect living trees for charcoal production and firewood. However, the effects of SUFORD project were not only negative: many people said that they saw SUFORD as a good thing even though the project limited their forest access.

For forest product availability, the decline had been even stronger: in Phowa and Naphakeo only 3% of the interviewees announced that there had been no change, in Phonnadee the equivalent number was 27%. According to the interviews, population growth (especially because increased demand) was the main factor in declining number of forest products in all three sample villages. In Phowa, the cement factory construction project was also brought up as a key factor in the decline. In Phonnadee, other explanatory factors were extensive collection of NTFPs and logging. Foppes (2010) found agricultural expansion as the main reason for decreased availability of most products, but for products collected for sale extensive level of harvest was the main reason for decline. It must be noted that with forest product availability the reasons vary between villages and products.

For the future trend in access and availability, most interviewees expected a negative change. The situation was the most alarming in Phowa, where 83% expected a negative change. However, the perceptions were more positive when moved further from Mahaxay. The main reasons for future decrease in forest product access and availability were deforestation (36%) population growth (30%) and extensive use of forest products (23%). Hermans-Neumann et al. (2016) also found population growth as one of the key factors in declining forest cover and decrease in forest product availability.

As for Naphakeo, people worried a lot of population growth, since they could not remain the current lifestyle sustainably with rapidly increasing population. However, it can be argued whether the forest utilization was sustainable at the moment either. Also in Phonnadee, the sustainable harvest of many forest products had been exceeded, for example people complained that as more families had begun to produce charcoal, wood for it was harder to find and some people had already started to collect also living trees for charcoal production. Improved monitoring of forest resources would enhance

sustainability. However, there is more than one side to everything: well monitored laws that aim to control the use of forest resources also limit forest access.

7.3 Discussion on theoretical framework

The framework of the study (Figure 1) worked as a skeleton to the main parts of the study as well as an explanatory figure. Subsistence on-farm income was excluded from the research, but otherwise different forms of income were captured relatively well. Investigating the changes in access and availability enabled estimating the changing role of forest and environmental products in the livelihoods.

Seeing livelihoods through different income sources does not provide the complete picture, as they are affected by shocks, trends, seasonality, assets and policies (Figure 2). However, the approach of the study also addressed these topics (see Annex 1 for the household questionnaire) as main household assets, shocks effecting the household and forest access were evaluated. Still, for a more comprehensive perception on issues outside the livelihood outcomes, the other factors affecting the livelihoods should have been evaluated more carefully.

7.4 Limitations of the study

There are multiple limitations in this study. The circumstances are never perfect for scientific research in practice, especially when the study is strongly connected to people: the answers can be affected by the smallest of changes, such as a crying baby or the presence of a neighbour. The environment affecting the results of the present study are evaluated in this section.

Fish is here included as an NTFP, which is the approach usually used in researches on Laos. However, more often it would have been more grounded to include separately as an environmental product, as it was more often collected from a river than for example a forest pond. Furthermore, other products that were extracted from other than forest sources should have been separated in to a different product category: now only

timber is separated. However, it must also be noted, that separating the products as forest and environmental products in the interviews would have been complicated and could have resulted in further problems in the data.

7.4.1 Field work and interview based limitations

The study is based largely on the perceptions of people and therefore it must be evaluated separately from studies based on measurements. For instance, the biophysical changes in amount of forest products could have been measured, giving more exact quantitative data. However, interview-based studies may reveal problems that measurements would not consider, for example on reasons behind changes in forest product availability.

Firstly, there were a range of problems connected to cultural differences. For example, the perception of time differed, for which reason the question of forest accessibility in the future was difficult to understand for some interviewees. Another interesting cultural difference that caused long talks with the translators was the Laotian idea that food is a synonym to rice. When asking whether a family had enough to eat in the past twelve months, my translator often replied that yes, they had enough rice, without considering that it is difficult to cope with only rice. Luckily the biggest cultural differences were discovered at an early stage and discussed with the translators to avoid errors.

In addition, there were differences in the attitude of people towards the two translators. For instance, more families told the other translator that they had paid for the permission to collect timber whereas no one revealed this to the other translator in one village. We suspected that the difference was due to trust issues: one translator had more friendly and talkative approach in the interviews than the other. Also, how we presented ourselves and how the translators behaved played a role. One issue we noticed was the nervousness of one translator when asking more sensitive questions, i.e. about logging. Also, asking about income is somewhat sensitive, and the answers can be influenced by the trust the respondents have in the researchers, or with the presence of

other people. In addition, there were a handful of interviewees who clearly got an important portion of their income from bribes and bribe-like payments – based on our observations - but did not reveal the total amount of income to us.

Definitely one major issue connected to the quality of the study was the presence of government officials and village representatives in some of the interviews. The civil servants of the district demanded that an official should be with us in every village. At first, they demanded that he would attend the interviews every day, but we negotiated a deal that he would only be present for the first day⁵¹ of each village. Even though it was explained to the villagers that the research was done for a University in Finland and that the results would not be shared with any representatives of the government, having an official around most likely affected some people⁵². Furthermore, each village head demanded that a village representative would be with us in the interviews. In Phowa and Naphakeo only one village representative was sent with us, which meant that the other research group could go without disturbances. In Phonnadee, village representatives were ordered to go with both groups, other of whom was the village chief, which most likely affected some interviews.

A problem with many income studies in the developing countries is the impact of different seasons to the income level revealed. However, in this case, I think I was able to avoid the problem quite well, since we completed a seasonal calendar in every focus group discussion to account for this. In addition, the translators were well aware of the products collected in other seasons and therefore able to ask additional questions. Another issue connected to investigating forest products was that men and women often collect different products and hence men seemed to know little about the products collected by women and vice versa. In our case, to avoid this problem as well as we could, we interviewed both men and women and often both were present. This way we covered the viewpoints of both genders relatively well.

⁵¹ During the first day in every village KIIs and FGDs were held. On the first day in each village, we had time for only a couple of household interviews, for which reason we could minimize the damage the presence of the official made for household interviews.

⁵² Even though the official was not present in most of the interviews, people heard that he had visited or saw him the other day, raising suspicion of our connections to the officials.

Researching forest access is challenging for many reasons. Firstly, it is an abstract concept. Even when asking more specifically (e.g. do you think there will be law changes or physical barriers that will affect your access), the interviewees seemed to have very little idea of these things. The number of different products (i.e. availability) was a more tangible topic since changes in amount are easier to notice and understand. However, I suspect that many people estimated the change in the amount of forest products a little worse than it was because it was a topic they worried about. This is something that is difficult to avoid in interview-based studies. Also, regarding both access and availability, the five-year time-period seemed a difficult concept for some of the households. Most of the interviewees seemed to get the point after discussions, but also some errors might have been introduced to the data due to this.

There are also some limitations connected to focus group discussions. Firstly, the role of the researcher is visible and in the worst case, the researcher or the translator can lead the discussion in a desired direction. Secondly, analysing and making sense of the results are affected by the researcher's own interpretations. Thirdly, the role of different people might be problematic: comments from someone with a stronger opinion or more power in the community might get more value as others remain silent or conform. This is also one reason for conducting household surveys, where at least in principle, also the quietest members of the community can contribute without intimidation.

7.4.2 Limitations of the data

One key issue in this study is estimating monetary values. The cash-equivalent value of subsistence consumption is a rough estimate, since there were no data on every specific product in each product group, only the average price per unit. There was also a difference in the prices between the villages, which distorts the results since the same prices⁵³ were used in every village when estimating the subsistence value. With data on cash income and forest product sales the cash-value is closer to the truth, but as mentioned previously, there might also be some misleading figures due to for example

⁵³ Average price per unit, calculated as the average of all villages.

giving wrong information on purpose⁵⁴, by accident⁵⁵ or forgetting about income sources. Furthermore, monetary values used in the research were not purchase parity adjusted, which would have improved the comparison with earlier studies.

Even though the amount collected of each product was asked in the interviews, the data was not problem-free when making the calculations. To ensure that people answered as specifically as possible, different measures were used in the interviews. When I needed to estimate the value also for the subsistence use, all the amounts needed to be converted to a unit for which I had a price for. Luckily this was not needed for most of the data, but it still influenced the quality, since my perception of a bundle of firewood might differ from the villagers' estimates⁵⁶.

Also, as feared beforehand, describing different land types and especially forests appeared to be difficult. This was more of a problem for one of the translators, who was not a forest scientist. For this reason, the data on where the products are collected from is not completely adequate.

In summary, the data must be considered within the context of these limitations. Even though a lot of attention was paid to every stage of the research work, mistakes can happen in for instance inserting the data or making calculations, in addition to issues connected to people's perceptions. Also, the dataset is vast and has both qualitative and quantitative data, which made it more valuable but less straight-forward to analyse.

7.4.3 Representativeness of the sample

Determining the adequate sample size is always problematic, and depends on multiple factors, such as sampling method and research topic (Sandelowski 2007). Also, the present study combines qualitative and quantitative research methods, which brings its

⁵⁴ E.g. when people did not like to tell about bribe-like income sources or illegal logging.

⁵⁵ E.g. estimating the extent of the help by relatives seemed difficult to some household, for example when a relative was paying for the schooling of the children but the parents were unaware of the cost.

⁵⁶ For all the units used, we asked for the villagers to show how much it was when we were interviewing, which improves the estimates but does not make them exact.

own challenges to determining sample size. As Sandelowski (2007) highlighted, quantitative research aims for a sample that allows generalizations as qualitative research often targets samples that enable informative cases.

The proportion of households interviewed in Phowa was 3%, and in both Phonnadee and Naphakeo 6% of the total population of the village. As the households were selected randomly, we can expect that it represents the population fairly well. However, it could also result in skewed results.

The results of the present study cannot be generalized for Laos or even for Mahaxay District, but can be considered to be indicative for the area, or for villages throughout Laos with similar conditions and qualities. The study should be considered as an informative overview of the three villages that introduces trends that are present across rural Laos, such as changing livelihoods and the impacts of development. Still, I suggest learning from the specific cases presented in this study rather than assuming that akin paths are faced across the country.

7.5 Future research

Even though the study only gives a view on the issues in a small area in Laos, the trends in income formation as well as changes in access and availability are not unique. For the GET-LDC project, a broader range of sample villages from other parts of Laos and Cambodia are included, which makes for a more comprehensive evaluation of rural livelihoods and other possible implications in the local scale of Laos and other countries.

The present study approaches forest dependency from different angles but livelihoods could have been captured in a more comprehensive manner: the contribution of subsistence agricultural income was not included, even though especially rice cultivation, livestock and home gardens had great emphasis in the livelihoods. A study considering the subsistence income from crop and livestock sources would offer a more thorough

comparison of the income sources, as total subsistence- and cash income could be compared.

The scale of illegal logging was not recorded adequately for the present study and should therefore be further researched. Timber is still an important forest product in the area but is partly missing from this study due to problems in data collection. A similar study considering the differences in product prices between villages⁵⁷ would be valuable in estimating the influences of market proximity and would give more specific price data for subsistence use. In addition, a study with more villages would have provided more representative data. In the case of the present study, specific qualities unique to the sample villages affect the results.

In my opinion, there is a strong need for a study looking into the change in livelihoods in rural Laos and the changing role of forests in them, as well as whether the role of forests has changed due to decreased access and availability and forest degradation or due to more societal-level livelihood changes. The role of forests should be researched continuously, since the livelihoods change rapidly.

⁵⁷ The data on product group prices for all the villages were collected also for this study, but it was not further analyzed since it is not in the scope of the present study.

8 CONCLUSIONS

The results of the study cannot be generalized for the whole of Laos, but they represent a common pattern. Even though the remoteness gradient did not explain all the differences in forest and environmental dependency between the villages, it is an indicative of development process throughout rural Laos, as it demonstrates the effects of improved access (i.e. infrastructure, better availability of wage work) related to development changes on forests and rural livelihoods.

Rural Laotian people in the sample strongly depend on forests, not only for improving the quality of life but also for food security. Whether forest dependency is trapping people in poverty or lifting them from it cannot be answered unequivocally. What is unambiguous, however, is that forests still provide vital safety net to part of the rural population, keeping these people from hunger and contributing in income.

One of the key factors enabling the Laotian lifestyle, which has strongly leaned on forests, has been the country's low population density⁵⁸. However, the situation is changing rapidly: in the last ten years⁵⁹ the population of Laos has increased by 18% (World Bank 2016b). As also reported in this study, population growth is one of the main drivers of deforestation, forest degradation and decreased availability of forest products (e.g. De Fries et al. 2010; Jha and Bawa 2006; Cropper and Griffiths 1994), threatening the future of forest dependent livelihoods.

Laos still has a long way to achieve the goals of green economy. Not only the rural people, but the whole national economy of Laos leans strongly on natural resources for example for mining, timber and electricity production. However, the sustainability of the current economic activities is questionable as, for example, deforestation is a major problem in the country. Also, employment activities are often in industries that damage the environment, for instance in a factory that extract local mountains for cement production, as was the case in one of the sample villages.

⁵⁸ From the ASEAN member countries, Lao PDR has the lowest population density (Jones 2013, ref. United Nations Population Division 2010).

⁵⁹ From 2005 to 2015.

As foreign investment is drawn to Laos, extensive infrastructure and other projects put additional pressure on forests. For the whole of Laos, Foppes (2010) estimated, that the contribution of NTFPs is 9.2% of GDP and as timber is one of the most important goods exported, the status of forests in Lao livelihoods should not be neglected in policy making and investment decisions. The long-term effects should be properly evaluated, not only for the environmental consequences but also to maintain social and economic sustainability: people often seek an easy way to improve livelihoods, giving more weight to the short-term benefits rather than considering the disadvantages that will - or might - appear in the future⁶⁰.

The Lao government has a major role in the future of Laotian forests: with sustainable collection and better monitoring of forest-use the rate of deforestation and forest degradation can be diminished. Still, governmental efforts to protect the forests remain extremely challenging with wide-spread corruption, overuse of forest products and illegal logging. As Sunderlin et al. (2005) stated, forest dependent people are often politically powerless. This study, together with the GET-LDC project, aim to give these people a stronger voice. Improved knowledge of the local use of forest products can contribute towards achieving the objectives of green economy, guiding Laos on a more sustainable path and securing sustainable rural livelihoods into the future.

⁶⁰This might also be the case for Phowa, as the construction of the cement factory can be easily reasoned for short term, as villagers and politicians get compensations and employment. However, the benefits offered when the factory starts to operate in full are questionable, as people might lose their jobs for people with higher education. Also, the factory is the main reason the villagers do not have as much forest anymore, which results in the lack of extra income (both, subsistence and cash) and safety net, all of which are vital if fourth of the villagers are left unemployed.

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APPENDICES

Annex 1: Household questionnaire

HOUSEHOLD QUESTIONNAIRE

Khammouan Province, Mahaxay District, Lao PDR, March 2016

Intro to households

We are from the University of Helsinki, Finland, the Viikki Tropical Resources Institute in the Department of Forest Sciences; and the National University of Laos, Faculty of Forestry. We are interested in the role of forest and wild products in livelihoods, to determine the contribution of forests to household welfare in this village. We are doing this research for our master's thesis. We are interested especially in woodfuels, non-timber forest products and how these things affect the lives of local people. In addition we are asking overall information to give background for the study.

We selected 3 different kinds of villages for this survey so that we would get a comprehensive image of the villages of the area. Your village is one of these.

You may stop the discussion at any point and ask questions or request an explanation.

All information is confidential. This discussion is voluntary and we thank you for participating in the survey.

Number of the household	
Name & number of the village	
Date	
Start time & end time	
GPS coordinates	

Section 1: Demographic information

1. List the household members in the table below: (Make sure that the definition of household is consistent)

1. Household member number	2. Relation to household head ¹⁾ (you can write this)	3. Over 15 years old (1=yes, 0=no)	4. Sex (M/F)	5. Education (number of years completed)	6. Occupation
1	Household head				
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

2. Which ethnic group do you belong to?

3. How much land does the household own/manage?

Category	1. Area (ha)	Specify landtype and use
Forest		
Agricultural land		
Fallow		
Homegarden		
Other land uses (specify)		

Section 2: Charcoal and Firewood

4. Which sources of energy do you use for cooking? What is the main source (highlight this)?

Firewood	
Charcoal	
Electricity	
Petroleum	
Gas	
Other?	

5. Do you use wood fuels for anything else than for cooking? For what?
6. Has your main source of energy changed in the 5 years? What was it before?
7. Are you planning to change it in the next 5 years? What would you like it to be?

	Firewood	Charcoal
8. How much (wood-fuels) do you collect or produce in one week? (Bags, truck loads, cart loads, shoulder loads, bunches).	(Season, amount, how often)	
9. How much (wood-fuels) do you normally buy in one month? (Bags, truck loads, cart loads, shoulder loads, bunches)	(Season, amount, how often)	
10. How much (wood-fuels) do you normally sell in one week? (Bags, truck loads, cart loads, shoulder loads, bunches)	(Season, amount, how often)	

11. From where do you collect the firewood or wood used for charcoal production?
(Mark all, highlight main site)

Governance:

Community Forest	
Plantations	
Agricultural/Pasture/Shifting	
Protected forest	
Conserved forest	
Production Forest	
Other	

Ecological:

Primary forest	
Secondary forest	
Fallow	
Fields	
Other	

12. Who collects the wood-fuels for your households needs? (Add shares/percentages)

Children	
Women	
Men	

13. For how many hours per one visit (including travels)?

14. Do you also cut living trees for firewood?

15. Does your household produce charcoal? Yes or No (If no, go to 21 questions)

16. In which kind of kiln do you produce charcoal?

Earth mounds	
Clay Kilns	
Brick Kilns	
Other	

17. Where are the kilns located?

18. Which wood species do you use for the charcoal production? (If almost everything, then we can ask is there some species that you cannot use)

19. Do you produce more charcoal for sale when the crops fail? (Drought, flooding etc.)

20. Which kind of stoves do you use for cooking (list all)?

Improved cooking stove	
Open fire	
Gas stove	
Electric stove	
Other?	

21. Aspects that affect your choice of energy. What are the pros and cons of different wood fuels?

(Go through all the options and add +/- in every field that they agree as a positive or negative aspect of certain wood fuel)

Firewood:	
Affordability	
Accessibility	
Usability	
Tradition/habit	
Other, what?	

Charcoal:	
Affordability	
Accessibility	
Usability	
Tradition/habit	
Other, what?	

Electricity:	
Affordability	
Accessibility	
Usability	
Tradition/habit	
Other, what?	

22. Approximately, how many kips do you have to pay for electricity in month?

23. How has the access to fuelwood changed during the past 5 years?

Section 3: Assessing income

24. What assets does the household have?

	1. No. of units owned	2. Notes
1. Car/truck		
2. Tractor or toktok		
3. Motorcycle		
4. Handphone/phone		
5. TV		
6. Refrigerator/freezer		
7. Fishing boat and boat engine		
8. Chainsaw		
9. Plough		
10. Shotgun/rifle		
11. Water pump		

Forest Product	Where collected	Who collects	When (months/year)	How many times/during season	Amount collected per visit	How much of it is sold (%)	Kips earned from sales	Buyer/selling place	Change in availability (sm inc/dec,
Mushrooms									
Fish									
Bushmeat									
Insects									
Timber									
Fruits									
Vegetables and rattan									
Bamboo shoots									
Bamboo poles									
Medicinal plants									
Oils and resins									
Fodder									
Other, specify									

25. Has the role of forest products in your livelihood changed during your lifetime? If yes, explain how

26. In addition to forest products, where does the household get cash:

	Income source (X)	Kips per year	Notes
Off-farm income (Salary, money sent by relatives & similar sources)			
Income from crops (rice, corn..)			
Income from farm animal (cows, buffalos, chicken..)			
Other income sources (specify below)			

27. Does the level of income fluctuate from year to year?

28. If yes, how much and in which ways?

29. Has the food production of the household been sufficient during the past 12 months?
1= no, 2=just enough 3=yes

30. Do you think your family's food production would have been sufficient without forest products?

31. Has the household faced any major income shortfalls or unexpectedly large expenditures during the past 12 months?

Event	How did your family cope with the loss?
1. Serious crop failure	
2. Serious illness in family	
3. Land loss (expropriation, etc.)	
4. Major livestock loss (theft, drought, etc.)	
5. Other major asset loss (fire, theft, flood, etc.)	
6. Lost wage employment	
7. Wedding or other costly social events	

Section 4: Forest product accessibility

32. How far is the house to the edge of the nearest forest that you have access to and can use?

Kilometres:	walking time (minutes):
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33. Did you ever need a license or permit to access forest products? For which products?

34. If yes, from which authority did you get the permit from? (village, district etc.)

35. Did you have to pay for the permit?

36. Has the amount of forest products changed in the past 5 years?

No change	Minor changes	A lot of changes

37. If yes, in which ways?

38. If yes, how has this affected your household?

39. In the past 5 years, has there been changes that have affected your access to forests or forest products? (Policies, infrastructure, etc.)

No change	Minor changes	A lot of changes

40. If yes, what were the changes?

41. Describe what impact these changes have had on your household?

42. Is the accessibility changing in the near future (next 5 years)? If so, how?

Annex 2: Questionnaire for focus group discussions

FOCUS GROUP DISCUSSIONS

(Modified from UN sourcebook draft (ask permission to use))

I. IDENTIFICATION			
NOTE TAKER		DATE OF FGD:	
CONVERSATION LEADER		HAS BEEN COPIED/SCANNED/PHOTO? CODES: 1 = yes, 2 = no	
TIME START		TOTAL DISCUSSION TIME	
TIME END		(HH/MM):	
CHECKED BY (NAME):		CHECKED BY (DATE):	

We are from the University of Helsinki, Finland, Tropical Resource Institute in the Department of Forestry; and the National University of Laos, Faculty of Forestry. We are interested in the role of forest and wild products in livelihoods, to determine the contribution of forests to household welfare in this village. We are doing this research for our master's thesis. We are interested especially in woodfuels, non-timber forest products and how these things affect the lives of local people. In addition we are asking overall information to give background for the study.

We selected 3 different kinds of villages for this survey so that we would get a comprehensive image of the villages of the area. Your village is one of these. We have visited the head of this village, and have his/her permission to carry out this group discussion.

You may stop the discussion at any point and ask questions or request an explanation.

All information is confidential. This discussion is voluntary and we thank you for participating in the survey.

Before we start, does anyone have questions?

Does everyone agree to participate in this discussion?

II. LIST OF PARTICIPANTS			
No.	OCCUPATION	GENDER (M/F)	AGE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

1. When was the village founded?

2. Where did the people come from?

3. How the size of the village has changed in the past years?

4. Anything else you want to tell about the history of the village?

5. What do you think of the income level of the village compared to other villages in the area?

6. What is the main source of income for the villagers?

7. What are the most important crops for the village?

8. What are the most important farm animals for the village?

9. What are the most important forest products for the village?

10. What are the most important NTFPs for the village?

11. Has forest land been converted into plantations (example: rubber, teak, eucalyptus)?

12. If yes, has this decreased the possibility for the villagers to benefit from the forest (collect NTFPs for instance)?

19. Have you noticed forest degradation in the village? If yes, how does this show?

20. Draw a map of the village. (Roads, Rivers, different types of forests etc.)

A. Seasonal calendar of main income sources and most important products

What are the main activities and products in this village? In which month these activities take place?

Codes: 1= main harvest/work 2= sale 3 = harvest/work and sale period are the same

	SEASON												
no.	PRODUCT/ ACTIVITY	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	Firewood												
2	Charcoal production												
3	Rice												
4													
5													
6													
7													
8													
9													
10													
11													
12													

TIME END	
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Annex 3: Key informant interview questionnaire

KEY INFORMANT INTERVIEWS

We are from the University of Helsinki, Finland, Tropical Resource Institute in the Department of Forestry; and the National University of Laos, Faculty of Forestry. We are interested in the role of forest and wild products in livelihoods, to determine the contribution of forests to household welfare in this village. We are doing this research for our master's thesis. We are interested especially in woodfuels, non-timber forest products and how these things affect the lives of local people. In addition we are asking overall information to give background for the study.

We selected 3 different kinds of villages for this survey so that we would get a comprehensive image of the villages of the area. Your village is one of these. We have visited the head of this village, and have his/her permission to carry out this group discussion.

Interviewer name	
Name of the interviewee	
Position in the village	
Name & number of the village	
Date	
Start time & end time (length of interview, mins)	
Number of households in the village	
Number of people living in the village	

1. Have there been people doing surveys before in this village?

2. Tell us about the history of the village

17. Are these rules and guidelines followed or no?

18. The land area of the village and its allocation

Total Land Area of the Village	_____	hec- tares
	—	
Total Land Area Allotted to:		
1. Fields and pas- tures	_____	hec- tares
	—	
2. Forest	_____	hec- tares
	—	
3. Residential	_____	hec- tares
	—	
4. Other (Specify)	_____	hec- tares
	—	

19. How does the access to other villages change from season to season?

20. When were the roads to the village built? How does this effect the liveli-
hoods?

21. Who owns the forests outside the village? If different owners, how is the for-
est divided? Sketch a map if possible

Community owned forest	_____	hectares
Government owned forest	_____	hectares
Company owned forest	_____	hectares
Other, specify	_____	hectares

22. What kind of forest types are there?

Primary forest (Conservation, sacred)	_____	hectares
Secondary/production forest	_____	hectares
Plantation forest	_____	hectares
Other, specify	_____	hectares

23. Estimate, how much forest area has been cleared in the past 5 years? (ha, &/or %)

24. How was the forest cleared (cutting, burning etc)?

25. What was the forest cleared for (the new land use)

1. Plantation forest	_____	hectares
2. Other forest type	_____	hectares
3. Cropland	_____	hectares
4. Land for livestock	_____	hectares
5. Residential	_____	hectares
6. Other, specify	_____	hectares

26. What kind of problems have deforestation and forest degradation caused in the area?

27. Do you have any suggestions how to reduce deforestation and forest degradation?

28. What are the decisions or actions taken by villagers and/or leaders to avoid deforestation and forest degradation in the last 5 years?

TIME END	
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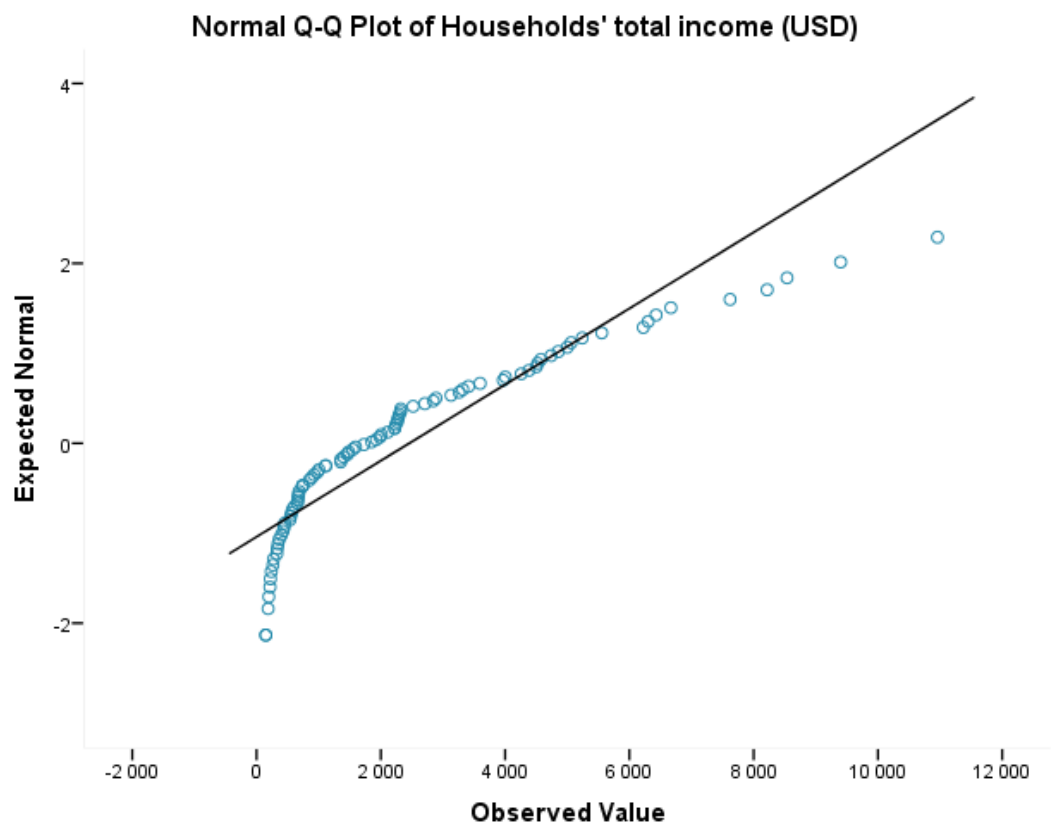
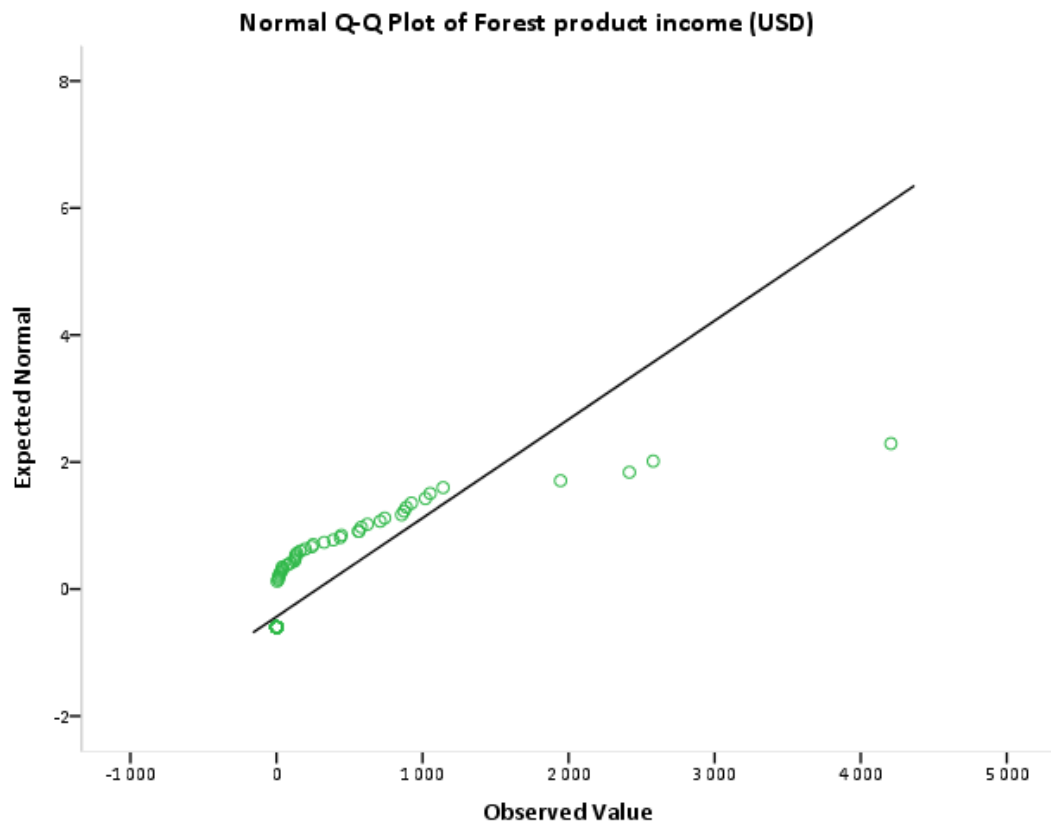
Annex 4: Exchange rate and date of USD

USD/LAK course 31.3.2016 8099,00

Used in all calculations.

The latest referred to: 4.4.2017. Source: <http://www.xe.com/currency-charts/?from=USD&to=LAK&view=1Y>

Annex 5: The distribution of households' total income and forest product income data



Annex 6: The average prices of different product groups

The average prices of different product groups used in subsistence value estimates per unit in alphabetical order.

Forest product	Average price per unit (Lao kip)	Average price per unit (USD)	Unit
Bamboo poles	1 125 000	138,9	tractor load
Bamboo shoots	3 708	0,5	kg
Wild animals	20 432	2,5	animal
Wild animals	83 333	10,3	kg
Fish	16 357	2,0	kg
Frogs	24 921	3,1	kg
Fruits	17 500	2,2	kg
Insects	12500	1,5	kg
Medicinal plants	4 000	0,5	plant
Mushrooms	25 310	3,1	kg
Oils and resins	2 122	0,3	kg
Timber	132 075	16,3	tree
Vegetables and rattan	16 528	2,0	kg