

Initial diagnosis and review of past actions

Nakai-Nam Theun National Protected Area (NPA) and its peripheral Impact zone (PIZ)



**Livelihood component –
COTE – August 2018**



**SOCIO-ECONOMIC ASSESSMENT OF THE NAKAI-NAM
THEUN NATIONAL PROTECTED AREA AND ITS PERIPHERAL
IMPACT ZONE**

Preface

This report is a summary of various studies undertaken within the framework of the Socio-Economic Assessment of the Nakai-Nam Theun National Protected Area and Its Peripheral Impact Zone, from January to May 2018 by COTE: Agrarian diagnosis, Village socio-economic Profile, Socio-economic family profile survey, Food Consumption Score survey, and Participatory forest user inventory.

This report presents the opinions, points of view and perceptions of the villagers within the target villages (NPA and PIZ). Using social sciences and RRA (Rapid Rural Appraisal) methods for data collection, the information collected can be subject to bias regarding the objectivity of the respondents, their willingness to share information, and the language used by the data collectors. During the field phase, the COTE team was accompanied with government officers who supported data collection. Without time to gain the confidence of the villagers, it is not possible to assess the total accuracy of the responses given, especially those regarding taxable commodities and illegal activities like hunting and sale of wildlife.

Acknowledgement

This Socio-Economic Assessment would not have been possible to complete without the contribution of different stakeholders from different organizations.

Our sincere thanks go to the village authorities and villagers in the 20 target villages/hamlets in Gnommalath and Nakai districts, Khammouane Province and Khamkert district, Bolikhamxay Province for their valuable time and for sharing their experiences, perceptions and information, which are significantly useful for this study.

The study would not have been implemented without the assistance of the district authorities and the district teams including staff from District Agriculture and Forestry Office (DAFO), District Office of Natural Resources and Environment (DONRE), District Office of Public Health (DOH), District Office of Planning and Investment (DOPI), District Office of Education and Sport (DOES), District Cabinet Office and District Lao Women Union (DLWU) in Gnommalath and Nakai districts, Khammouane Province and Khamkert district, Bolikhamxay Province for their support in the preparation and implementation of the data collection.

Last but not least we also would like to acknowledge the World Bank who provided financial support for this survey.

Background

The Nakai Nam Theun National Protected Area (NNT-NPA), located in Central Laos, is the second largest protected area in the country, covering around 3,445 ha. The NNT-NPA, created in 1993, is part of the watershed of the Nam Theun River, and thus critical to ensure water flows with low sediment load for the Nam Theun 2 (NT2) hydropower project – the largest hydroelectric project in Laos – that was initiated in 2005.

The biodiversity of the NT2 watershed is equally rivalled by its cultural diversity. It is home to approximately 7,500 indigenous people of two main ethno-linguistic groups of Mon-Khmer (including Vietic) and Tai-Kadai backgrounds in 11 enclave villages (31 hamlets). Each of these groups speaks their own dialect and has unique cultures and traditions, and their livelihood depends largely on natural resources for daily subsistence, both for food and incomes, including NTFPs collection, hunting of wildlife, and fishing. Additionally, another 38 villages (59 hamlets) with a total population of about 35,500 people located in the Peripheral Impact Zone (PIZ), also rely directly and indirectly on the watershed resources for their subsistence and livelihood.

In 2001, the NT2 Watershed Management and Protection Authority (WMPA) was created with the mandate to preserve NNT-NPA's unique biodiversity with several endemic species, and to foster livelihood improvement and cultural diversity preservation among watershed inhabitants. WMPA's role is also to guarantee that sufficient volume of water with low sediment load flows into or from the NT2 reservoir. Nakai-Nam Theun Power Company (NTPC), under a 31.5-year concession agreement, allocates US\$ 1 million per annum as payment for environmental services (water) to the WMPA.

The WMPA's management is guided by a Social and Environmental Management Framework and Operational Plan (SEMFOP), which established the framework to implement activities, setting out the objectives, approach, and institutional arrangement for the sustainable development of the NT2 watershed and its inhabitants. From 2005 to 2016, two SEMFOP have been implemented by WMPA with relatively low results. Participatory process in decision-making involving the local population is being questioned. The most recent SEMFOP 3 utilizes a community engagement framework (CEF) that emphasizes participatory planning with villages and is sensitive to the different ethnic groups and natural resources in the area.

As up to now, the effectiveness of the activities implemented by WMPA have been problematic, a new institutional arrangement for co-management of the NNT-NPA in partnership with National and International NGOs has been created.

This socio-economic study is part of this project “Strengthening the capacity of the WMPA to effectively manage the NT2 Watershed and Nakai-Nam Theun NPA” to be implemented between 2017 and 2021 as a part of the SEMFOP 3.

Glossary of acronyms

CEF	Community Engagement Framework
DAFO	District Agriculture and Forestry Office
DLWU	District Lao Women Union
DOES	District Office of Education and Sport
DOH	District Office of Public Health
DONRE	District Office of Natural Resources and Environment
DOPI	District Office of Planning and Investment
FCS	Food Consumption Score
FQ	Frequency/Quantity
HH	Household
LANN	Linking Agriculture, Natural resource management and Nutrition
NGO	Non-Government Organization
NNT-NPA	Nakai Nam Theun National Protected Area
NPA	National Protected Area
NT2	Nam Theun 2
NTFP	Non-Timber Forest Product
PIZ	Peripheral Impact Zone
RRA	Rapid Rural Appraisal
SEMFOF	Social and Environmental Management Framework and Operational Plan
VN	Vietnam
WMPA	Watershed Management and Protection Authority

Summary

❖ Survey implementation	5
❖ Localization of the study	6
❖ Framework of the study	7
❖ Agro-ecological zoning of the study area	8
❖ Village socio-economic situation	10
- The demographic situation	10
- Settlement patterns and housing conditions	11
- House commodities	12
- Access to villages and market opportunities	13
- Social organization and land use planning	14
❖ Farming systems	15
❖ Off-farm activities	23
❖ Income-generating activities	26
❖ Food security and Food Consumption Score	30
❖ Health and education services	36
❖ Access to saving and loan services	40
❖ Forest use	41
❖ Past development activities	51
- Livelihood activities	51
- WMPA involvement over the years	54
- Households' satisfaction regarding WMPA past actions	55
❖ Conclusion	56



SURVEY IMPLEMENTATION

Objectives of the assessment

The main objectives of this Socio-Economic study were:

- To assess how the initial approach used by the WMPA was genuinely participative with watersheds inhabitants and to evaluate livelihood and conservation activities implemented by the WMPA and its partners in the enclave and PIZ villages since 2005;
- To assess the socio-economic situation and the improvement in the quality of life of the enclave and PIZ villages since 2005. To update the associated relevant indicators, to be compared with the former assessment established during the preparatory phase of the NT2 project, and to be used as a baseline for the evaluation of the forthcoming project; and
- To identify community priorities for livelihoods as well as living standards investments that can be included in community action plans.

Method

This study has applied a mixed method for data collection that consisted of both qualitative and quantitative approaches. It has integrated different research techniques which includes literature review, key informant interviews, focus group discussions using RRA methods, household surveys and observations. Different tools drawn from the Community Engagement Framework (CEF) Manual had been adapted and applied for some of those assessments.

In this study, five main surveys were conducted. These included:

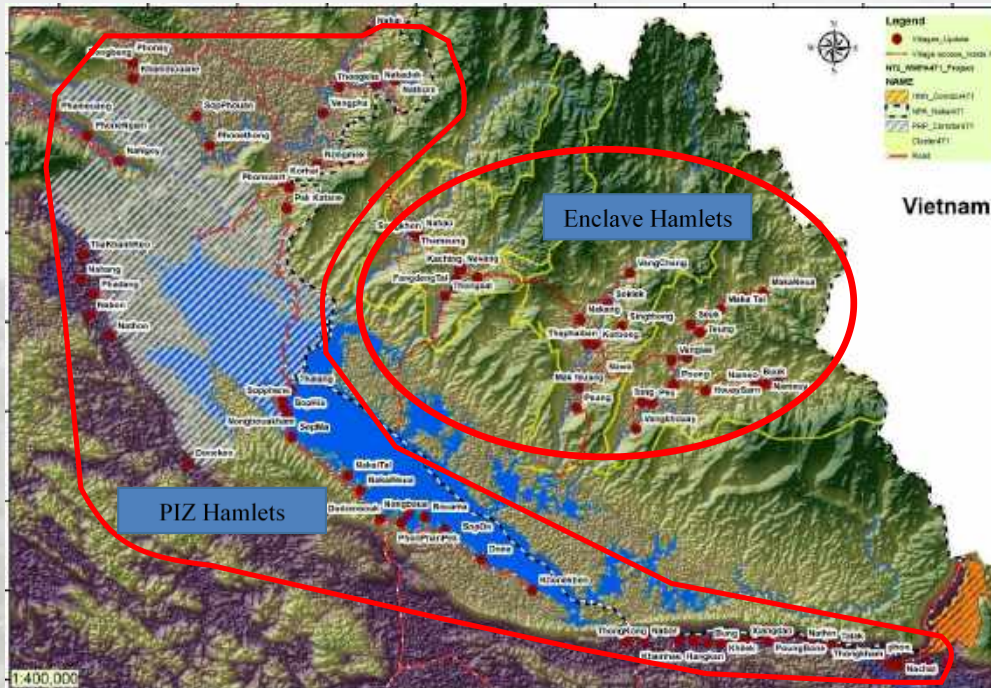
1. Village/hamlet socio-economic assessment,
2. Village/hamlet education and health assessment,
3. Initial agrarian diagnosis,
4. Family socio-economic profile, and
5. Forest use analysis.

In this research, key informants including District authorities, District Agriculture and Forestry Office (DAFO), District Office of Natural Resources and Environment (DONRE), District Office of Public Health (DOH), District Office of Planning and Investment (DOPI), District Office of Education and Sport (DOES), District Cabinet Office, and District Lao Women Union (DLWU) were interviewed. Focus group discussion (FDG) and individual interview were also implemented with communities in target villages/hamlets. FDGs consisted of groups from 5-15 people (men, women, health staff, education staff, health, village authorities...). Individual household were interviewed using tablets to collect data on household socio-economic profile and Food Consumption Score (FCS).

To achieve the objectives of the assessment, this survey consisted of several important tasks. Firstly, staff capacity building through the Training on Socio-Economic Survey for the three district teams were implemented. Secondly, data collection arrangements with village/hamlet authorities were made, and finally the data collection in the field was implemented.

LOCALIZATION OF THE STUDY

The NT2 Watershed covers two different classification zones. It consists of the National Protected Area (NPA) located in the North-Eastern part of the watershed and the Peripheral Impact Zone (PIZ) that covers the Southern and Western part of the NT2 watershed (see Figure below). 49 villages (90 hamlets) with the total population of approximately 18,000 inhabitants live in the two zones of the NT2 watershed. This study covered some selected samples of the hamlets in both zones. An hamlet (ຮຸ້ມ) is a small group of households depending of a village (ບ້ານ). Some villages have geographically grouped hamlets, while others villages have hamlets distant hamlets scattered over their territory.



National Protected Area (NPA) or watershed

The NPA encompasses the Nakai-Nam Theun Protected Area (NNT); the Southern Corridor that links NNT with the Hin Nam No Protected Area to the south; and the Corridor which links NNT to the Phou Hinpoun National Protected Area. Most of the villages in NNT are located in three river basins: The Nam Sot (with its tributary the Nam Mone); the Nam Theun itself, and the Nam Noy (with its tributary the Nam Pheo). Altogether 31 villages are located in these three basins. These villages/hamlets have no connection and access to roads and can only be accessed by boat, while some need to go further by foot. They also have very limited facilities such as electricity, schools, healthcare, and agricultural land. There are 11 villages including 31 hamlets with the total population of approximately 7,500 people.

Peripheral Impact Zone (PIZ) or buffer zone for the NPA

38 villages including 59 hamlets are located in the Peripheral Impact Zone, for a total population of about 35,500 people. Most of these villages are accessible by roads, but some of them are quite difficult to reach during the rainy season, due to poor road condition. Generally, they are also better equipped in livelihood facilities including electricity, schools, and healthcare than the NPA villages. However, some relocated hamlets still have limited agricultural land. These PIZ villages/hamlets are located in Nakai, Gnommalath, Khamkert, and Bualapha districts in 2 Provinces.



FRAMEWORK OF THE STUDY

Target Villages/Hamlets

The target villages/hamlets were selected among the target villages of Livelihood component for the year 2018, in consultation with concerned district authorities. This study covered the total of 18 hamlets of 7 villages in 3 selected districts of 2 different provinces, which include 16 enclave hamlets and 2 PIZ hamlets. Three other NPA hamlets were also included but only in the agrarian diagnosis: Vang Chang hamlet (Brou and Vietic population; 62 HH) and Naphou hamlet (Brou population; 17 HH) in Taphaiban Cluster; Seuk (Brou and Seak; 22 H) in Teung.



Family interviewed sample size

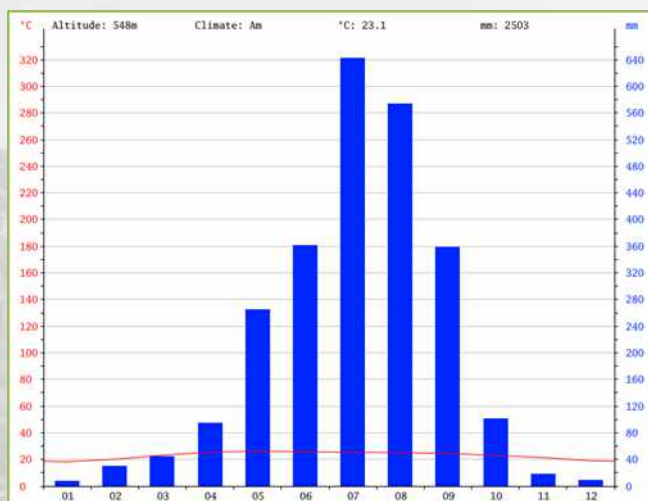
In the 18 target hamlets, there are 1,157 households. Out of the total population, this study covered the samples of 593 households or 51.3% for the household socio-economic profile survey and 374 households or 32.3% for Food Consumption Score (FCS) survey. Identifying a common sample size for all target hamlets was problematic, as some of them have a very small population size; some households were not available; and some were only elderly household members. As the result, the study tried to cover a maximum sample size in each village/hamlet as possible and applied a conventional sample method for the Socio-Economic Survey. For the FCS survey, the target sample was 20 households per village/hamlet, with mainly female household members.

No.	Hamlet	Total Population	No. of Sample in Socio-Economic Survey		No. of Sample in FCS survey	
		HHs	HHs	%	HHs	%
I	Enclave hamlets					
1	Buak	23	19	82.6	18	78.3
2	Huay Masong	24	23	95.8	22	91.7
3	Kaching	44	39	88.6	20	45.5
4	Korbong	84	32	38.1	20	23.8
5	Nahao	64	33	51.6	20	31.3
6	Nakang	47	30	63.8	20	42.6
7	Nameo	39	39	100	20	51.3
8	Namey_Kunae	50	26	52.0	20	40.0
9	Navang	69	58	84.1	23	33.3
10	Fangdeng Neua	44	35	79.5	20	45.5
11	Fangdeng Tai	55	46	83.6	20	36.4
12	Singthong	26	20	76.9	20	76.9
13	Songkhone	59	35	59.3	20	33.9
14	Thamuang	109	36	33.0	23	21.1
15	Thaphaiban	62	31	50.0	20	32.3
16	Thongsad	31	26	83.9	20	64.5
	Sub-Total I	830	528	63.6	326	39.3
II	PIZ hamlets					
17	Phonsaart	213	33	15.5	24	11.3
18	Thongkong	114	32	28.1	24	21.1
	Sub-Total II	327	65	19.9	48	14.7
	Total	1,157	593	51.3	374	32.3

AGRO-ECOLOGICAL ZONING OF THE STUDY AREA

Key geographical features

High hills and mountains of the Annamite Range form the bulk of the NNT NPA. They rise gently from NT2 reservoir (on the Nakai Plateau) on the west edge of the protected area, and climb northeast to the Annamite crests. They are crossed by NE-SW oriented river valleys, which emerge through gorges in the dividing hills onto the Nakai Plateau. Elevations range from 500-2,200 m above sea level (asl), with 500-580 m on the Nakai Plateau, 600-1,100 m in the dividing hills, and 600-2,200 m in the central and southern mountains. The watershed can be divided into seven sub-watersheds that are formed by the major rivers or their main tributaries: from north to south the Nam Kata, Nam Xot, Nam Mon, Nam Theun, Nam Noy, Nam Pheo and Nam One. All start in high slopes near the Vietnam border and flow down through the reserve to the NT2 reservoir on the Nakai Plateau.



Climate data for Oudomsouk, Nakai District centre
(Source: climate-data.org)

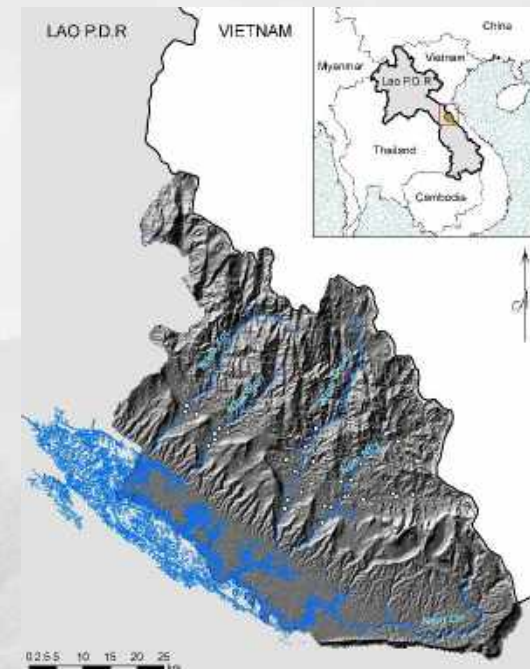
Climate

The NNT NPA has a tropical humid climate. Although seasonal patterns and precipitation vary across the reserve, three distinct seasons can be distinguished: (i) a dry and cold season from November to February, with night temperature down to 5°C in the mountains; (ii) a dry-hot season in March-April; (iii) a 6-month wet season between May and October. Annual rainfall on the Nakai Plateau is about 2,500 mm, but can go up to 3,000 mm in the upper, eastern reaches of the NPA near the Vietnam border (Robichaud, 2005).

In particular, eastern sections of the reserve are affected by a northeast 'winter' monsoon that crosses Vietnam from about November to February, and penetrates into Laos through low passes in the Annamite ridge. These areas experience extensive periods of overcast and cold mist and rains at a time when most of Laos is invariably dry and clear (Robichaud, 2005).

Soils

The two common categories of soils are Acrisols (mostly haplic Acrisols and a few spots with gleyic Acrisols) and Eutric Cambisols (moderately developed soils). The low fertility of Acrisols and their toxic amounts of aluminum pose limitations to their agricultural use; they often support forested areas. Overall, soil texture is mainly clay loam. Alluvial soils along rivers are mostly sandy loam soils. On relatively flat and lower areas, it is not rare to find soils with poor water holding capacity. On the opposite, there are large, bare grassland areas with poorly draining or waterlogged clay soils, especially around Navang and Fangdeng (Navang cluster).



AGRO-ECOLOGICAL ZONING OF THE STUDY AREA

Agro-ecological and livelihoods zones

The NNT NPA has three main landscape units and broad types of land use: (i) the flatter portions of the larger river valleys, which comprises most of the villages and paddy lands; (ii) a mosaic of swidden plots, fallows and regenerating secondary forests on small hills and slope lands around each village, and (iii) remoter and higher hills and mountains, which are widely covered with dense forests and uninhabited or very sparsely populated; such forests can be found upstream of the main rivers as well as on the dividing hills on the north-eastern shore of the reservoir.

The NNT NPA is a relatively homogeneous area in terms of farming systems and livelihoods. Differences have more to do with ethnicity and settlement patterns than agro-ecological factors as such. The following tentative zoning is based on three main criteria: (i) the availability of paddy land, (ii) the level of reliance on shifting cultivation and (iii) the degree of diversification towards other crops than rice and non-farm livelihoods, notably fishing and the gathering of forest products. The table below provides the main features of each zone based on field observations, satellite images and secondary data.

Zone	Availability of paddy land	Reliance on shifting cultivation	Crop & livelihood diversification
1- Nam Xot watershed	Highly variable from one hamlet or ethnic group to another	Still high but strongly constrained by local authorities	Fishing and NTFPs as primary sources of income
2- Nam Mon watershed	Highly variable from one village to another Steady extension process	Still high but moving towards more permanent cultivation systems (tractor tillage)	Maize and cassava cultivation
3- Nam Theun watershed	Overall low but steady extension process and good potential for rice double cropping	High	Limited except fishing in downstream part (Makfeuang village)
4- Upstream part of Nam Pheo & central part of Nam Noy	Fair, with small irrigation systems & double cropping Gradual extension process	Low	Limited
5- Maka village & downstream parts of Nam Noy & Nam Pheo	Low to very low	Very high	Likely high reliance on wildlife and forest products

Main farming systems and other livelihoods

The following table provides an overview of the main cropping systems in the NNT NPA, which are described in more details in the following sub-sections.

Cropping systems	Zone / Location	Crops	Main growing season
Swidden cultivation	All zones but to varying degrees depending on ethnic groups On hills, slope lands and unlevelled lowlands	Mostly rice, mixed with other crops Maize & cassava on part of the plot or during 2 nd year	rainy season
Rice paddies	All zones but to varying degrees depending on location and availability of suitable lowlands	Rice (sometimes maize in dry season)	rainy season and/or dry season
'Gardens' & other cropping systems	All zones: near homes, on upper flatlands or riverside	Vegetables, culinary herbs, maize, cassava, sugar cane, etc.	Mainly dry season Several perennials or long-cycle rainy season crops

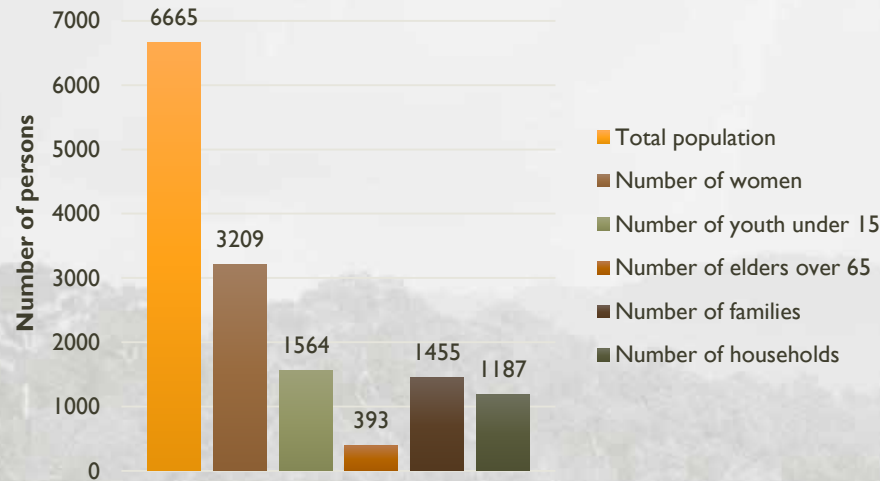
A majority of households combine paddy and swidden cultivation, together with a small plot of maize and/or cassava.

VILLAGE SOCIO-ECONOMIC SITUATION

The demographic situation

Data were collected directly with the village authorities using a form named “Village socio-economic analysis” from the CEF manual. Here are the combined results obtained.

Composition of the village population



Within the 18 hamlets surveyed during the socio-economic assessment, the total population is of 6,665 persons, including 48% of women, 23% of young persons under the age of 15, and 6% of elderly people over the age of 65 years old.

The demographic situation is very close between NPA and PIZ villages:

- **NPA villages:** 48% of women, 23% of youth and 5% of elderlies.
- **PIZ villages:** 49% of women, 24% of youth and 8% of elderlies.

These villages represent a sample of the three ethno-linguistic groups present in the area:

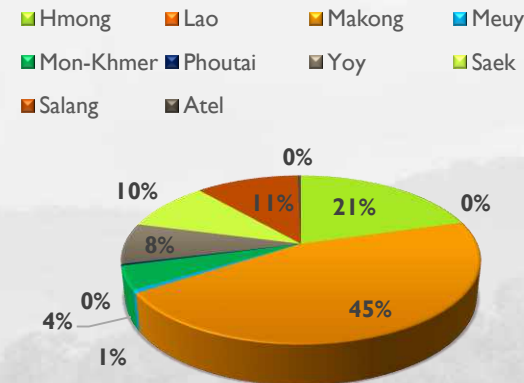
- **Mon-Khmer:** Katuic (Makong/Bru), Vietic (Atel, Salang) → **61%**
- **Tai-Kadai:** Lao, Saek, Yoy, Phouthai and Meuy → **18%**
- **Hmong-Mien:** Hmong → **21%**

In terms of wealth, the majority of the families are classified as “average” (46%), while 30% are poor and 24% wealthy. However, the situation in this case is very different between the NPA and PIZ villages:

- **NPA villages:** 42% of poor families, 44% of average families and 14% of wealthy families.
- **PIZ villages:** 3% of poor families, 51% of average families and 46% of wealthy families.

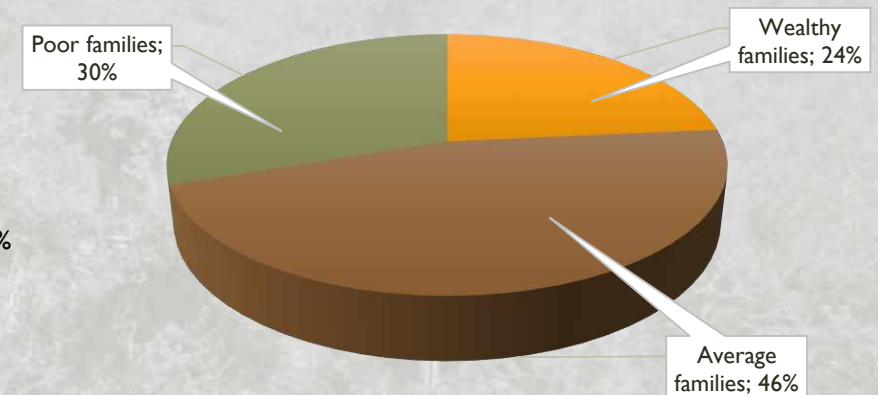
There is a important difference in terms of wealth between NPA and PIZ villages that needs to be taken into account during the analysis of the socio-economic data.

Ethnic composition of the villages



Ten ethnic groups have been identified with a vast majority (45%) identifying themselves as **Makong**. The second largest group is the Hmong with 21%, all being located in the PIZ village of Phonsaart. The third group is the Salang (11%) all from Nahao village. Then come the Saek (10%) and the Yoy (8%). The Saek are mainly located in Teung Cluster in the NPA, while the Yoy are all from Thongkong PIZ village. In Phonsaart, minorities have been classified as Mon-Khmer without indication if they are Makong or Salang, but in general, in the NPA, the Mon-Khmer ethno-linguistic group are dominant in terms of population size.

Wealth composition of the villages



VILLAGE SOCIO-ECONOMIC SITUATION

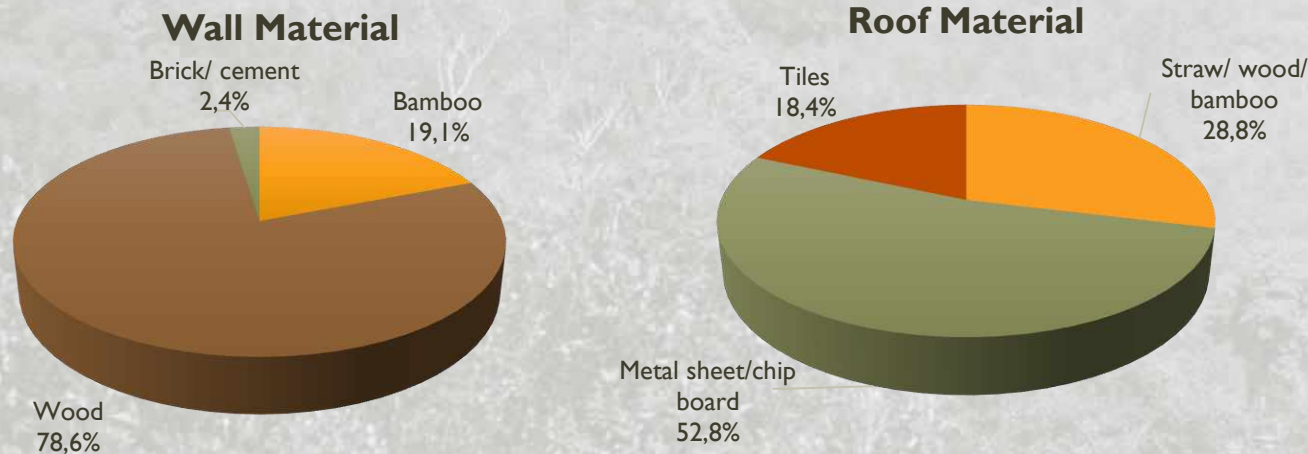
Settlement patterns

Human settlement has been remarkably stable in NNT since at least the 1940s, with few changes in the number or location of villages (Robichaud, 2005). Human settlements are presently located along five major stream valleys, either clustered (villages along Nam Xot and Nam Mon) or spread out (other villages along Nam Theun, Nam Noy and Nam Pheo). Almost all villages are located on lower, flatter areas and surrounded by a mosaic of forest, swidden fields and fallows. Hills and mountains along the border with Vietnam as well as the southern fringe of the reserve (Nam One watershed) are virtually empty and covered with unbroken forest.

Following the Lao government policy of village consolidation, hamlets have started to merge into bigger administrative units since about 2010. However, the actual situation in the ground is sometimes different from the official version, with some hamlets still highly remote although they are officially part of a larger village. As a consequence, village size, which averaged 40 households in 2015, is highly variable, from small isolated hamlets with only 15-20 households to larger, consolidated ones with more than 130 households (e.g. Navang, after it incorporated Kaching and Huay Masong).

Housing conditions

Housing conditions vary a lot from one household to another and tend to reflect socio-economic disparities: from small bamboo huts with thatch roof to larger wooden houses with corrugated iron roof or even concrete roof tiles. Overall, there have been obvious improvements in housing conditions in the past 10-15 years if compared with descriptions from the literature about the NNT NPA. Construction of new, bigger houses is still going on at a quick pace, especially in villages that have easier access to Nakai District centre. It is frequent to see extended families sharing the same house (typically the parents, their recently married daughter and son-in-law). It is why the number of families in the village census is always higher than the number of households. It is particularly true for Hmong village like Phonsaart (321 families for 213 households).



Wooden walls and straw roof house in Navang village



Yoy house in Thongkong village with bamboo walls and metal sheet roof

According to the Family Profile survey which interviewed 593 households with NPA and PIZ villages, the houses are now mainly built with wooden walls (78,6%) and corrugated iron roof for roof (52,8%). However, the poorest households such as those belonging to the Salang ethnic group are still living in bamboo huts in different degrees of degradation.

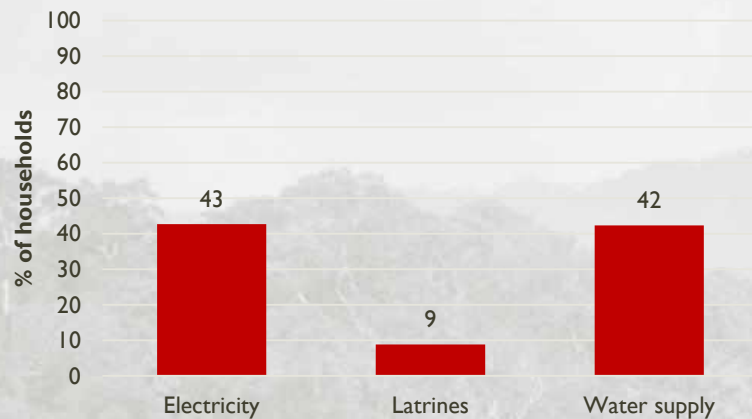
Richer villages, like Phonsaart, can be spotted according to the types of house present in the village. In Phonsaart, the households surveyed have house walls made from wood (65%) and concrete (35%) with tiles for roof (74%).

VILLAGE SOCIO-ECONOMIC SITUATION

House commodities

Basic commodities and services are still sparse in most enclave villages. There is no electricity but individual and temporary supply from generators, storage batteries, solar panels or small hydropower units. Water for domestic purpose is collected from gravity flow systems (installed by WMPA or other projects) or directly fetched from the river. Water is systematically boiled before drinking. Open defecation is practiced; only about 4% of households have access to a latrine in the watershed.

% of HH with access to commodities



Electricity

According to the data collected by filling Village socio-economic analysis form in each hamlet, access to electricity, latrines and water supply system remains low in the targeted villages. Only 43% of households have access to electricity in their home (only 36% if we removed from the analysis the PIZ villages which have access to the national electricity grid). 81% of the households who have access to electricity are producing it with solar panels. These solar panels have been provided in Navang Cluster by the Upland project from 2002-2003. Other have been provided by WMPA in 2007 in Taphaiban, Navang and Nahao villages. Some families have also bought solar panels by themselves through companies.

The prices to acquire these solar panels was between 12,000 to 30,000 kips/month for 10 years, before achieving full ownership. However, most of the families were not able to afford these costs. Those who acquired them have paid at the beginning and then stopped. Many batteries are already dead and have not been replaced by the projects or companies. Some families have managed to buy new ones by themselves and are still using the solar panels. Many are not in use anymore.

For the PIZ villages connected to the national grid (2005 – 2009), households had to pay 1,6 to 2,4 million LAK to be connected.

Water supply system

As for the access to water via gravity-fed water supply systems, WMPA had installed several of them within the NPA from 2006 to 2010. In the case of the 17 enclave hamlets targeted by this survey (separating Namey and Kunae), 13 have been supported by WMPA for their gravity-fed water supply system. 5 are still in good condition and in use. 5 are in need of rehabilitation with low water flow or none coming to the reservoir due to broken pipes, limiting the access to water for the villagers. 3 are not working at all and can't be use. In villages where the system is functioning, some families are contributing to the water user fund for maintenance (1,000-2,000 kips/month), but it is not the case in all villages. In the 2 PIZ villages, water supply systems were built by projects: IRD and then NT2 projects in Phonsaart in 2010; IRD and then World Vision in 2009 for Thongkong.

Latrines

Access to latrines in NPA and PIZ villages is low. Only 9% of households have access to latrines. Two reasons can explain this: the lack of water in most of the villages discourages families to use or build latrines; villagers prefer to resort to open defecation by habit.



Water supply system tap in Nahao village



House equipped with solar panel



School latrines in Fangdeng village

VILLAGE SOCIO-ECONOMIC SITUATION

Access to villages

Two rivers – Nam Xot and Nam Theun – are navigable all year round up from the reservoir to Nahao (Navang cluster) and Makfeuung (Thaphaiban cluster) respectively. These are the two main routes to transport goods and people from Nakai District centre to the NNT NPA. Since the reservoir impoundment, water level has significantly increased in most rivers of the NNT NPA (which all used to be tributaries of Nam Theun), especially the Nam Xot. Boat navigation became easier, making it much faster to access to Nakai District town than before 2008 (2-3 hours on motorboat instead of 2-3 days by walk or rowing boat). Boat transportation however remains relatively expensive (about 50,000 kip per person from Makfeuung to Nakai, that is more than the average daily wage rate).

To the north, a rural track connects Lak Xao town to Thamuang. There is also a network of motorbike trails and footpaths between villages. However, many villages are still highly remote and hard to reach: water is too shallow during the dry season; steep motorbike trails are impassable after heavy rains. In the target enclave villages, all dirt roads have been created in 1994-1995, they are maintained by the villagers themselves each year. Among the 18 hamlets of the survey, 11 have a dirt road access to the hamlet, but only 3 of them are usable all year round. For the hamlets of Namey village in Teung Cluster, none of them have road.

The PIZ village of Phonsaart in Khamkert District is accessible all year by a dirt road built in 2010 by the villagers, 10 minutes from the asphalt road. In Thongkong village in Gnommalath District, a dirt road was built in 2007 by a logging company as a mean to evacuate timbers. It was improved in 2014 by World Vision, but it still can't be used all year because of flooding during the rainy season. Maintenance is done every year by the villagers.

Market opportunities

Market opportunities are few. Enclave villages are mostly connected to shopkeepers in Oudomsouk (Nakai District centre) and also deal with some livestock brokers coming from Lak Xao. Some larger villages by the main rivers (e.g. Nahao and Makfeuung) have retail/grocery shops. Some better-off households who have better connections with Nakai traders sometimes act as middlemen when there are opportunities to sell non-timber forest products (NTFPs) for example. Villagers actually go to Nakai mainly to purchase clothes, other consumer goods and construction materials.

Transportation assets

Transportation assets are also still sparse in most enclave villages. Only one quarter of the families own a motorbike while in the 2 PIZ villages targeted by the study, it's 82% of the families. Without proper road in the NPA, there is fewer needs for motorbike or car. Boat is an interesting asset to have in NPA villages, but it is also an expensive investment that most families can't afford. In PIZ, 69% of families have hand-tractor against 25% in NPA. The hand-tractor can be used to plow the land, as transportation mean and as motor for the rice mill. The following data are showing transportation assets available to households in the NPA villages:



Bicycle
2%



Motorbike
26%



Car
3%



Hand-tractor
25%



Boat
18%



Transportation of goods by boat, Navang



Transport of NTFP in Navang village



Crossing the stream in Navang village

VILLAGE SOCIO-ECONOMIC SITUATION

Social organization, government policies and development programs

There are neither farmer associations nor other economic interest groups at village level. Village development committees have been established but few of them seem to be functional. Collective action at community level mostly consists in the yearly maintenance of village footpaths or small irrigation systems (intakes and channels).

Several past rural policies had major influence on NNT population distribution, land use and farming systems (Robichaud, 2005):

- In the mid-1970s: forced settlement of non-sedentary hunter-gatherer Vietic groups into existing villages of other ethnic groups. The consequences were disastrous, since the groups adapted poorly to village life and separation from their traditional territories, and many died.

- Since the mid-1990s: Hmong commonly clear large slopes of forest, cultivate it to nutrient exhaustion and past the point of recovery, then move to another mountain, leaving in their wake swales of Imperata grass. For this reason, in the nineties, Hmong expansion to the south has been barred and no settlement has been allowed in upland areas of Khammouane Province bordering the NNT NPA.

- Since the mid-2000s: Village land allocation (as part of the government programme to stabilize swidden cultivation nationwide) has reduced the amount of land legally available to villages for swidden cultivation. It is not clear to what extent it has been systematically implemented or followed in enclave villages. For instance, villagers from Nahao-Songkhone acknowledged that some farmers keep on encroaching the forest because of poor soil fertility after repeated cultivation on allocated plots.

Participatory Land Use Planning and Village Development Plan

Participatory land use planning (PLUP) were conducted in most villages, though many are now outdated. Previous WMPA livelihood/agriculture support included the creation of conservation and development committees at village level so that communities establish their own set of rules and regulations regarding the use of forest and natural resources. Some villagers have been trained and are now employed as NPA rangers. However, during the socio-economic survey, the village authorities have been asked to give the names and roles of the members of the Village Development Committee (VDC) in their village. Within the 18 hamlets interviewed, only 7 have declared having creating a VDC. It is unclear to what extent these committees have received proper training and if they played their roles in conservation and development activities.

Hamlet	Village	Cluster	Composition of the committee	Ethnicity of the members	Hamlet Ethnic composition
Nameo	Namey	Teung	4 Men	Saek	100% Saek
Namey			4 Men	Saek	100% Saek
Buak			3 Men	Saek	100% Saek
Thamuang	Nahao	Navang	6 Men	Salang	95% Salang, 4% Atel, 1% Makong
Kaching	Navang	Navang	3 Men	Makong	100% Makong
Phonsaart	Phonsaart	Thongsen	9 Men	Hmong	82% Hmong, 18% Mon-Khmer
Thongkong	Thongkong	Nabo	8 Men and 2 Women	Yoy	99% Yoy, 1% Lao



Swidden plot in forest area



PLUP map of Fangdeng Tai hamlet



PLUP map in Phonsaart village

FARMING SYSTEMS

Swidden cultivation

Except in Saek villages on the southern portion of NNT NPA (Teung Cluster), swidden cultivation or 'slash-and-burn' (hay or ray in Lao) is practiced by most households but the ones without sufficient workforce or with large surface area of rice paddies. Although on the decline, it is still considered as the number one livelihood and cropping system in most enclave villages.

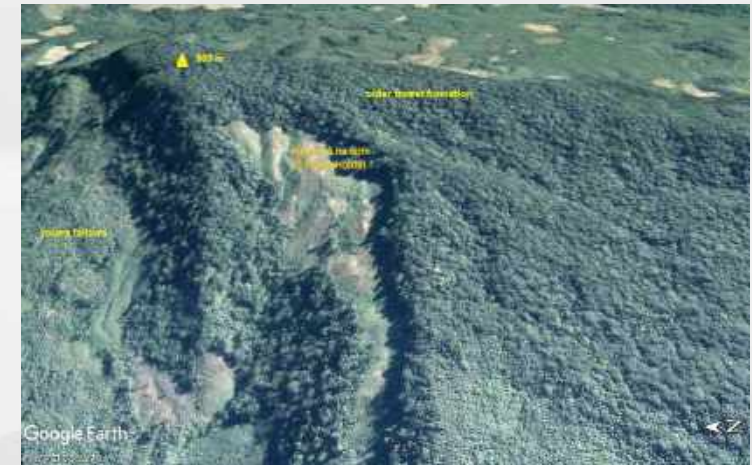
Depending on household profile and farmer strategies, "hay" encompasses different locations, cropping patterns and plot sizes: (i) average-size swidden in secondary forest mosaic around the village; (ii) swidden located further away, by the river (downstream or upstream of village); (iii) small plots by the paddy fields; (iv) bottomlands and flat terrains that farmers plan to convert into rice paddies; (v) larger hay that involves encroachment of older forest formations on remoter and higher hillsides (up to 850-900 m asl). Criteria for plot selection vary accordingly: for instance, farmers who focus on swidden cultivation will typically look for patches of forest with big trees and dense canopy (an indication of good soil fertility), if possible with moderate slope; whereas farmers who just combine hay with rice paddies will prefer plots that are near their fields, with smaller trees (easier to clear).

Farmers cut a piece of forest in February, allow the slash to dry and set fire in April to prepare the field before the first rains, grow rice during the rainy season and then shift to another plot the next year. Fallows last for 3 to 7 years. Upland rice is planted and harvested earlier than lowland one. Mixed cropping is the rule: together with rice, a number of vegetables, gourds and tubers, maize are also grown in the hay, for home consumption. Due to its height and possible competition for light, cassava is often planted alone in one small portion of the field or as live fence.

Chemical fertilizers, insecticides and herbicides are not in use so far (even on allocated lands with repeated cultivation and very short fallows). All works are done with manual tools such as machetes and hoes. It is common for several households to group and cultivate the same hillside so that mutual aid is possible (if needed), especially to build the fence and protect fields from cattle and wild animals. During work peaks, labour exchange is very common and a few better-off households also hire some manpower. Yet most of the farm works are done individually by each household.

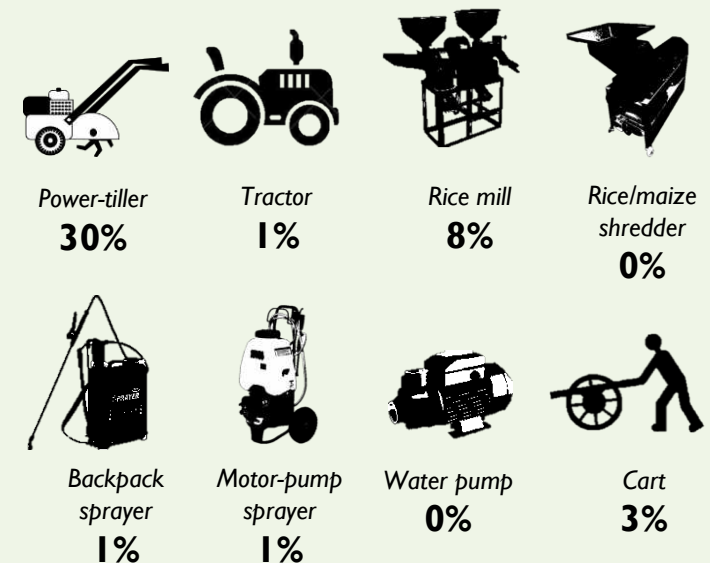
Weeding, which needs to be done at least two times per cycle, is the work peak and main bottleneck of this cropping system. The workforce availability for weeding is therefore the limiting factor of the hay farming area: in other words, the surface area is determined by the household capacity (in terms of manpower but also financial means to hire casual labour) to complete the weeding in time. The quality and time of weeding has a direct impact on yields. One of the strategies used by local farmers is to grow several paddy varieties in the same hay (up to 3 varieties with different growth cycles) in order to spread the workload.

In 1994, the government decided that shifting cultivation should be eliminated by the year 2000; in 2000, the goal was postponed until 2020 (MAF, 2000) and then in 2003, brought back to 2010. In some areas of the country, accelerated crop rotations are seriously endangering this type of farming (Roder et al., 1997). If land is left fallow for less than six years, yields decrease and the soil erodes. Yet, as long as the population density remains low, shifting cultivation can be sustainable (Dufumier, 1996, 1999; Kleinman et al., 1995). Long-term fallow makes it possible to contain the invasion of weeds and to re-establish the soil's structure and mineral fertility (Ramakrishnan, 1992). **Extract from "Land Policy and Farming Practices in Laos", Olivier Ducourtieux and al. 2005 (p.6)**



Large swidden fields at 850 m asl near Navang
(Source: adapted from Google Earth (December 2009 satellite image))

Household agricultural assets (% of families owning), according to the Family Profile Survey (January 2018)



FARMING SYSTEMS

Cultivation area and yield on upland fields

Most upland farmers do not know their surface area but refer to the quantity of seeds they plant. According to our estimations, discussions with farmers and satellite image observations, the surface area of hay for an average-size household with two workers would probably range between 0.6 and 1.5 ha. In past years, land access restrictions have however reduced the cultivated area under the actual capacity and needs of local farmers (less than 0.4 ha). This is particularly true in NPA villages that are easier to access, where control from authorities over shifting cultivation is tighter (e.g. in Nahao-Songkhone).

Under normal circumstances, rice yield is about twenty to one bag of paddy seeds (20:1). Assuming that farmers sow 60-80 kg per hectare, yield should average 1.4 MT/ha. Upland rice fields have lower yields than paddies and are more prone to weather hazards. Hay yields vary greatly, from only 1:4 up to 1:40. Hay however provide a wide range of food products, and local upland rice varieties, which have bigger and heavier grains than lowland ones, show higher paddy-to-rice milling ratio (estimated at 75% and 65% respectively).

The main yield factor is soil fertility, which is directly related to the duration of fallows. Land access restrictions tend to pull hay yields down and make them highly variable from one year to another. Work productivity is also getting poorer since shorter fallows mean more weeding work. In Vang Chang, farmers also raised issues of soil erosion and nutrient loss on slope lands due to repeated cultivation and short fallows (mean yield estimated at 1:10 only). Crop destruction by wild animals (e.g. boars and rodents) is also frequent. Occasional problems of dry spells, high winds (at rice blooming stage), pests (notably grasshoppers) and diseases have been reported in some villages.

The rotation usually involves one cropping year, sometimes two when soil fertility is good enough and farmers have no alternatives (due to restricted access to forested hillsides). The second crop can be rice but also maize and/or cassava, usually as monocrops (no association). In case of second-year cultivation, farmers only select the best part of the plot and the surface area is usually smaller than the first year for two main reasons: weeding becomes increasingly difficult and time consuming; household needs for maize/cassava are lower than rice.

For now, swidden cultivation seems to be confined within existing swidden/forest mosaic area. While pressure on wildlife populations and high-value timber certainly remains, forest cover has largely been maintained in the protected area (World Bank, 2018).

Household agricultural land area on average per family, according to the Family Profile Survey (January 2018)



Lowland rice field



Upland field



Garden area (souan)

	Lowland rice field	Upland field	Garden area (souan)
All target villages	0,4 ha	0,5 ha	0,2 ha
Navang Cluster	0,3 ha	0,7 ha	0,1 ha
Taphaiban Cluster	0,2 ha	0,6 ha	0,05 ha
Teung Cluster	0,8 ha	0,04 ha	0,07 ha
Phonsaart PIZ village	0,7 ha	0,5 ha	1,2 ha
Thongkong PIZ village	0,8 ha	0,03 ha	0,4 ha

The analysis of forest cover patterns from the 1940s to early 2000s conducted by Robichaud (2005) showed that the NNT NPA retained more than 95% forest cover until the mid-1960s. Subsequently, forest declined at 0.5% per year until the 1980s, followed by an increase of 0.3% per year. “The earlier deforestation that occurred in NNT, to the 1980s, expanded little into the unbroken forest of the reserve, but was contained almost entirely within a swidden/forest mosaic whose boundaries already existed in the 1960s. At present, the main pressure on NNT forest is from villages outside the reserve’s northern border, not within.” According to Robichaud, two factors best account for the stability of NNT forest cover: (i) the stability of human settlement, which places practical limits on the extent of forest clearance by NNT residents, together with a population density within the existing swidden/forest mosaic still below carrying capacity for swidden livelihoods; (ii) an unprecedented escalation in wildlife trade in the 1980s and 1990s, which incomes allowed NNT’s residents to purchase rice to feed growing populations, instead of clearing more forest to grow it.

FARMING SYSTEMS

Lowland paddies

In enclave villages, about 40% of households grow permanent rice paddies, but this strongly varies from one village to another. The cultivated area ranges from 0.4 to 3 or 4 ha per farmer, with an average close to 0.5 ha in most villages. Paddy fields are located on lowlands near villages, but also secondary valley bottoms and peripheral flatlands.

Some of the paddy fields around villages are quite old and probably date back to the Thai occupation during the 19th century. Paddy development in the NNT NPA was historically constrained by several factors: (i) unsuitable soil (with poor water-holding capacity), (ii) cool and cloudy climate, and (iii) lack of level ground. The practice of paddy cultivation is also determined in part by culture and history, with some ethnic groups such as Vietic tribes who used to be semi-nomadic hunter-gatherers, have settled down only recently and are still not familiar with rice paddies. This is however changing fast, with a strong dynamic towards the conversion of most suitable lowlands into paddies. To develop new paddies, local farmers increasingly use hand-tractors or rent 4-wheel tractors equipped with disk ploughs (from Nakai town private business people). The total cost to convert one hectare ranges from 7 to 15 million kip depending on the plot location and topography. It is mostly financed by the sale of livestock. Temporary use of tractors in the NPA area should normally be authorized and supervised by the WMPA. With the shutdown of the WMPA in recent years, it seems that farmers have decided to do without the authorization.

The majority of paddy fields are rainfed and produce one crop a year, though a significant number of plots receive water from stream-fed gravity irrigation systems. Local technologies comprise small earth dams and channels and in some cases larger stone dams and intakes built on secondary streams. In soils that have poor water-holding capacity, irrigation enables to secure water availability during the rainy season. In more suitable soils, rice double cropping is common. During the dry season, a few farmers grow maize instead of rice in paddies that receive insufficient amount of water, particularly around Navang. There are virtually no off-season irrigated vegetables on paddy fields after harvest.

One reason for this specific trend observed in Navang could be the availability of nearby, fertile, non-irrigated lowlands which soil keeps sufficient moisture during the cold season, making maize the most suitable crop. This is also certainly due to the much higher farm mechanization rate in this village (about 60 power tillers as against 3-5 in other villages).

In Saek villages, farmers have reportedly been practicing traditional irrigation for more than a century (Chamberlain et al., 1996).

However, the wider development of dry season rice cultivation in the NNT NPA is relatively recent: in most cases, it dates back to the late 1990s and has been introduced with the support from Lao soldiers who knew the techniques. It is still hindered by the lack of irrigation facilities but also by fencing requirements and pest attacks (since birds and other pests tend to concentrate in the few rice-growing areas). The cold weather also affects rice germination, which farmers compensate by over-seeding.

On Nam Moey river, WMPA and District authorities supported the construction of a larger dam in 2011-2012 through food-for-work, which enabled to extend paddies and dry season cultivation for about 60 farmers in Namey and Nameo. This dam is already damaged and it seems little has been done to build community capacities for maintenance.



*Paddy land extension in a small valley bottom near Nameo
(Source: adapted from Google Earth (October 2012 satellite image))*

According to Navang villagers, the population increase and growing rice needs led to a gradual extension of paddy lands starting from the 1990s, which was then boosted in the 2000s by the greater availability of power tillers: Navang reportedly had 37 ha for 28 paddy farmers in the late 1980s as against 57 ha for about 50 farmers around 2010. This trend has continued with an accelerated pace since 2016 owing to the use of 4-wheel tractors (from Nakai): today, there are 72 ha of paddies for 64 farmers (i.e. almost half of the total number of households in Navang). Similarly, in Korbong, about a dozen farmers recently arranged 4-wheel tractor services from Nakai to convert some lowlands into paddies. In remoter villages such as Seuk or Nameo, paddy land extension is also going on but more gradually since 4-wheel tractors have not gone that far yet.

FARMING SYSTEMS

In water-saturated soils such as the ones typically found in newly converted narrow bottomlands, where water flows from hillsides, waterlogging occurs making monsoon cultivation difficult if not impossible (risk of prolonged flooding, poor yields). In such cases, farmers prioritize dry season cultivation. This is also the case for low lying paddy fields along rivers such as the Nam Noy, which are known to be prone to destructive flash flooding (Chamberlain et al., 1996). Dry season single cropping is also practiced on some of the older paddy fields located by the main rivers, which are flooded and not cultivable anymore during the rainy season as a result of NT2 reservoir creation.

For the rainy season crops, land preparation starts in June. The motorization process, which probably started in the late 1990s, is nearly complete: many paddy farmers now have their own power tiller (hand-tractor); others borrow from relatives, rent one (at about 500,000 LAK/ha) or barter tillage service for rice or in exchange for other works (e.g. transplanting on tractor owner's farm). There are only a few remote and poorer villages where paddy farmers still use buffaloes as draught animals.

Rice is sown in nursery (pre-germinated seeds) and transplanted in July. Farmers mostly grow local seed varieties (a few also still use high-yielding hybrid varieties introduced some years ago by WMPA and DAFO). They generally use their own saved seeds (the ones they keep from previous crop). Seed rate is around 40 to 60 kg/ha. Synthetic fertilizers are not in use. Farmers rarely apply animal manure except on rice nurseries. However, night paddocking of livestock near their fields (during cultivation season) as well runoff from village / housing allow for some fertility transfers to rice paddies. There is very little to no use of pesticides. Only a few farmers have backpack sprayers. Some of them occasionally spray insecticides (e.g. in Nameo, against grasshoppers).

Although most of the work is done by family workforce, paddy growers usually hire daily workers during work peaks (mainly transplanting and harvest). Work exchange (mutual aid) between farmers is also common.

Rainy season paddy is harvested with manual tools in October-November. A few farmers have motorized threshers. Yields usually range from 1.5 to 3 MT/ha, with a mean around 2 T/ha. One main yield factor is the control of water level in plots, with recurrent problems of both lack and excess of water. On newly converted bottomlands where waterlogging conditions often prevail, rainy season yield can be much lower (down to 1.2 T/ha) due to flooding; farmers often prioritize dry season cultivation (single crop) since they can obtain better yield (up to 1.8 T/ha). Besides irrigation water availability, the main factor that affects dry season yields is crop damage by pests such as rodents (which tend to concentrate in the few rice-growing areas) as well as by cattle (which freely roam).



Individual earth weir in Navang

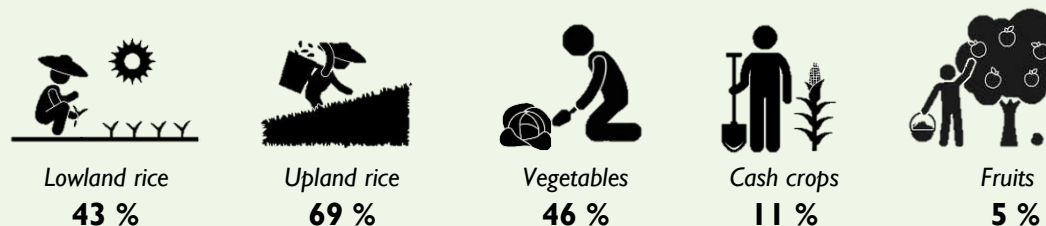


Collective stone intake in Seuk



Gabion basket dam in Nameoy

Household crop activities (% of families practicing), according to the Family Profile Survey (January 2018)



FARMING SYSTEMS

Other cropping systems

While they are commonly referred to as 'gardens' (*souan* in Lao), other cropping systems encompass various types of farmlands and different cropping patterns. In the NPA villages, they can be broadly categorized as follows:

- i. Dry season home gardens include a wide range of vegetables and culinary herbs (mustard leaves, salad, lemongrass, onion, chives, coriander, mint, etc.) along with perennial crops such as sugar cane, pineapple, banana or papaya. They are located near houses or on upper lands near seasonal houses by the paddy fields. Their size varies from raised wooden boxes (mostly dedicated to culinary herbs) to more diversified plots fenced with bamboo fences or nets.
- ii. Small dry season riverside gardens (maize, mustard, onion, tobacco, cabbage, peanut, etc.) on sandy slimy soils of the banks of the main rivers – provided that riverbank is not too steep – and along smaller streams;
- iii. Relatively larger maize or cassava gardens are cultivated on upper lands near the paddy fields or on flatlands that are unsuitable for paddy cultivation. Plot size usually ranges from 0.1 to 0.3 ha. Such gardens are generally fallowed for 2-3 years before being cropped again. Cassava is planted in March and tubers are progressively harvested one year later for one or two years. Maize is primarily grown as a rainy season crop, but sometimes also planted in March depending on the particular features of each plot.

There are no orchards as such, but a range of isolated fruit trees (mango, jackfruit, pomelo, etc.) are grown inside villages and near houses, and there are also some small tea groves.

Except the ones who do not have access to suitable land and/or do not have sufficient workforce, most households have at least one of these gardens. Due to free grazing of livestock during the dry season, fencing is critical for most crops. Some farmers are reluctant to extend their surface area owing to high fencing requirements.

Whatever the crop, most of it is kept for home consumption. Small quantities of vegetables and culinary herbs are sometimes sold to other villagers when there is a surplus. Cassava – and to a lesser extent, maize – are also commonly used as animal feed. This is particularly true in villages where the double cropping of rice is widespread, so that other starchy foods are only consumed in case of bad harvest and strong rice deficit between two crops (e.g. in Nameo and Seuk).

Like swidden and paddy cultivation, farmers do not use any chemical input for these cropping systems, but usually apply animal manure on vegetable gardens. Manual watering is considered as one of the main bottlenecks, which explains why vegetable gardens are small size and not too far from houses. On riverside, if the bank is not too steep, farmers directly fetch water from the river and use watering cans. In some villages (e.g. Songkhone, Navang), water can be accessed from gravity-fed water supply systems (installed by WMPA). There are only a few water pumps (belonging to wealthier households in villages such as Makfeuung).

Yields are difficult if not impossible to estimate since farmers harvest most of these crops as and when they need. Regarding maize, most farmers use 3 to 5 kg of seeds, from which they can obtain 250 to 600 kg of maize ears (unshelled).

A recent practice, which was observed in Navang, is to till maize and cassava farms with hand tractors – and sometimes upland rice too (e.g. one farmer we met ploughs 0.4 ha where he grows upland rice and maize). This more permanent cropping pattern has been adopted by farmers who have adjacent paddy fields, but also on flatlands they plan to convert into paddies. Ploughing also starts to be practiced on uplands that have been allocated by the government in past years (e.g. in Fangdeng, one farmer grows almost one hectare of upland rice and maize on a 2-ha plot that was allocated in 2006).



0.1 ha cassava plot near paddy field



Small dry season garden near paddy field



Vegetable garden in Thongkong village

FARMING SYSTEMS

Cropping calendar

During Focus group discussions in the targeted hamlets of the 3 villages of Navang Cluster (Navang, Fangdeng and Nahao), cropping calendars have been designed with the villagers in a participatory manner. All calendars have been identical from one hamlet to another.

Activities and Tasks		Seasons											
		Dry and cold		Dry and hot		Wet rainy season						Dry and cold	
		Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Paddy Field Cultivation													
1	Rice nursery												
2	First plowing (Land preparation)												
3	Rice Transplanting												
4	Weeding												
5	Harvesting												
Upland Rice Cultivation (Slash and Burn Cultivation)													
1	Bush and Tree cutting (Land clearance)												
2	Fencing												
3	Seed planting												
4	Weeding												
5	Harvesting												
Upland Maize Cultivation (Two cycles)													
1	Bush and Tree cutting (Land clearance)												
2	Burning of crop residues												
3	Fencing												
4	Seed planting												
5	Weeding												
6	Harvesting												
Cassava Cultivation													
1	Bush and Tree cutting (Land clearance)												
2	Burning of crop residues												
3	Fencing												
4	Stem planting												
5	Weeding												
6	Harvesting												

Post-harvest management and crop final destination

Rice is the staple crop and virtually all the local production goes for home consumption. Some lowland paddy growers produce enough rice for their consumption and manage to sell some surplus to other households. Other uses include in-kind payment of workers, rental costs of power tiller or other agricultural services bartered for rice (e.g. thresher). The cost of a rice mill is around 6 million kip (725 USD). Owners charge 500 kip per kilo of paddy for milling or 1 kg of rice for 10 kg milled.

Paddy is dehulled according to home consumption needs, either with a rice pounder or engine mill. Rice mill owners often are the wealthiest farmers. The main by-product is rice bran which is obtained when milling and used as animal feed (pigs, poultry). Paddy straw is barely used and is not really valued by farmers. Besides rice mills, there are no other crop processing units. Maize cobs are husked and plucked manually. Cassava is chopped and sundried before cooking. All three crops (rice, maize and cassava) can be processed into local alcohol, either for consumption or for sale to other villagers. There are no cash crops at all in the NNT NPA, only in PIZ villages.

Land access and rights

Uplands and forests

There is no ownership on hillsides and forests where villagers collect wild products, firewood and timber. Villagers thus have an open access to forest resources outside protected and conservation areas. Overall, there are no reported conflicts over the use of forest resources between villages or farmers of the same village.

For shifting cultivation, customary land tenure arrangements prevail. Most farmers do not own the hay they cultivate but only have short-term land use rights. According to CARE report (1996), Saek farmers have property rights on previously used swidden plots. It seems likely that such rights are related to the more permanent cultivation pattern among this ethnic group, with swidden often intended to be converted into paddies on the long run.

Access to farmland is free of charge. Farmers can basically clear and cultivate wherever they wish within the village 'agricultural land' (as defined in the PLUP) i.e. outside protected forest areas – provided that there is no crop anymore and the previous occupier is no more maintaining the land. However, a limit of 1 ha of upland rice, 15 ha of pasture, 3 ha of cash crops and 3 ha of orchards, is set by the Government of Laos in its farming law (105/PDR 6/11/1998). This limit is more or less followed, especially for hay. Farmlands are directly chosen by farmers themselves. Before clearing a piece of land, it is common to 'book' the place they selected by marking some trees at each corner of the plot. Villagers say they theoretically must seek approval from the village headman before clearing a patch of forest, but this is not clear to what extent this is followed.

Access to suitable, fertile land has been significantly constrained in the past 20 years due to government restrictions (swidden reduction campaigns and stronger enforcement of conservation laws within NNT NPA) and fixed land allocation for permanent farming (since about 2005); yet, forest encroachment is likely to remain common in remote hillsides (especially for farmers without rice paddies) since there were no accompanying measures to support such a shift in cropping systems and the allocated farm area (about one hectare) is insufficient to cover household food needs. A current trend is the use of barbed wire fences on lower and level lands, which indicates a willingness to secure land rights on swidden or fallows that farmers plan to gradually convert into paddies or other permanent fields.

Paddy lands

In studied villages, the proportion of households who have access to rice paddies ranges between less than 5% to 100%. The majority of paddy farmers are very small holders (who cultivate 0.5 ha or less). Private ownership is the rule: most paddy growers have their own land. Renting and sharecropping are uncommon. Farmers usually do not have official land titles. Paddy land transactions are relatively rare. On paddy lands, barbed wire is gradually replacing more traditional fencing methods (bamboo, wood) to protect rice from animal destruction. As noted earlier, the creation of NT2 reservoir caused the loss of fertile paddy lands by the river, especially along Nam Xot and Nam Theun.

Other lands

Besides rice paddies, other lands with property rights include riverbank gardens, other flatlands with permanent cultivation, and small hillside plots by the paddy fields, which usually belong to adjacent paddy land owners. Land transactions are relatively frequent for flat areas near villages and narrow bottomlands because of their potential for conversion into rice paddies. In contrast, flat areas with little potential for paddy cultivation (for example, due to low soil fertility or poor water holding capacity), which are typically covered with grass or brush and mostly used for grazing, remain under communal tenure and common property.

FARMING SYSTEMS

Livestock raising

Within the households interviewed for the Family Profile Survey, 51% declared raising cattle, 20% goats, 73% pigs and 66% poultry.

Cattle

Water buffaloes and the more recently introduced cows are the main way to accumulate capital for better-off households. While they now rarely serve for draft work, buffaloes are still highly valued and used for both social (ritual sacrifices) and economic purposes, notably as a source of cash to buy rice in years when harvest is poor but also to invest in productive assets, housing materials, etc. Cattle owners in NPA villages typically have about 2-3 heads of cattle, but some have up to 10 or 20. Cattle freely roam in the forest, brush and grasslands throughout the year and graze on single-cropped paddy fields during the dry season after harvest until tillage. While this management system is relatively easy for cattle owners, it entails high fencing requirements to protect crops. According to villagers, buffaloes are regularly affected by epizootic disease, which cause massive loss.

Buffaloes and cows are usually sold to Lak Xao traders, who come to the villages on foot on occasional basis, as and when they receive information from several villagers willing to sell at the same time. Farm gate price for live animals ranges from 2 million kip for a small cow up to 7 million for a 5-year old male buffalo. Farmers can expect about 3 to 5 million kip for an adult female buffalo. For comparison purpose, prices on Lak Xao market range from 3-5 million kip for a small cow, 8-12 million kip for a 5-year old buffalo, 9-11 million for an adult female buffalo. Brokers' margins are therefore huge, which highlights the cost NPA farmers have to pay for their remoteness and isolation.

Poultry and pigs

Small-scale livestock rearing is practiced by most households except the very poorest. Chickens and pigs are the main backyard animals. Duck rearing is less common. Their numbers vary from 5 to 10 chickens (plus possibly 2-3 ducks) and rarely more than 5 pigs per household. The size of poultry flocks and pig herds is mainly limited by the quantity of feed produced on the farm (especially maize and cassava) as well as the incidence of diseases. Small livestock freely roam and scavenge for their own food during the day and are kept in pens under or near houses at night. Poultry and pigs are fed with kitchen waste, food leftovers, cassava, maize surpluses (if any), crop by-products (e.g. rice bran) and sometimes broken rice. Since most of it is produced on the farm, the quality and quantity of feed is directly related to the crops farmers grow and their production levels. For instance, wealthier farmers with rice surplus manage to feed their pigs with rice bran while the poorer tend to provide cassava only. Supplementary processed feed is sometimes given to small chicks. Chicken and pigs are very frequently affected by diseases, which explains why the number of animals each household has greatly varies from one year to another. Animal diseases spread quickly due to limited local knowledge and the absence of animal health services. Villagers do not vaccinate their animals.

Although it does not provide regular cash incomes, small livestock represents the main household savings and a small capital that is readily available and villagers can use during the lean season or in case of urgent or unexpected financial needs. Broiler chickens and pigs are usually sold to other villagers or bartered for rice (during the lean season). Brokers from Nakai and Lak Xao occasionally come to the most accessible villages (e.g. on Nam Xot) to buy pigs. Villagers can obtain 200,000-300,000 kip for a year-old pig.

Goats

Goats have been introduced in NPA villages by WMPA. They were completely new to local farmers. Herd size thus varies greatly from one village to another. For instance, there are plenty of goats in Navang but none in Vang Chang. Goats have adaptable but destructive feeding habits. They freely graze around the villages, often causing damages to crops and home gardens, which is a potential source of conflicts between farmers. This is why villagers consider that they are more difficult to raise than other animals, and they are also prone to diseases. On a more positive note, goat marketing is relatively easy and goats are a good source of disposable income: they are sold to Lak Xao merchants as and when they come to the village; current price is around one million kip. However, farmers often sell their goats without really renewing their herds, which tends to indicate that goat rearing is already on the decline in the NNT NPA.

Average number of livestock per family, according to the Family Profile Survey (January 2018)



Cow
0,8 head



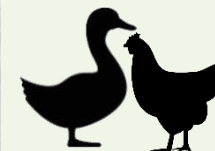
Buffalo
1,4 heads



Goat
0,7 head



Pig
2,3 heads



Poultry
6,7 heads

For large animals subject to taxes, villagers' claims may be knowingly underestimated.

OFF-FARM ACTIVITIES

Other livelihood activities

Casual labour

Casual labour is one of the main household strategies to procure cash and supplement rice production, though it is a quite unstable and intermittent livelihood since it depends on local opportunities in others' farms. Labourers mostly work for farmers within their village. Farm labour in paddy fields during work peaks (i.e. transplanting and harvest) as well as clearing and fencing swidden plots provide the bulk of job opportunities. The preparation of new paddy lands also has high labour requirements and therefore provides temporary jobs. Labourers are either hired on daily basis or contracted for a specific task. They are paid in cash or in kind (paddy or rice) depending on the type of work and their preference. Current farm wage is around 40,000 kip or 5 kg of rice per day. Farm labour in exchange for goods and services (such as piglets or rice milling) is also common. There are very few off-farm jobs but the ones sometimes offered by WMPA or development programmes. There is little to no out-migration for work.

Firewood and timber collection

The forest is an essential source of firewood for cooking. Some of it is also collected from swidden plots after trees are felled before cultivation. Villagers mostly use manual tools (knives, machetes, axes and saws). A few households also have machine saws. There is no charcoal production in the project area and processing of wood products (e.g. plank or beam making) is almost entirely aimed at own housing needs. Some households also probably make significant incomes through the cutting and sale of high-value timber such as rosewood. Before 2016 and the tightening of regulations on wood cutting, this was certainly one of the main sources of cash, making it possible for some villagers to purchase expensive construction materials and improve their housing conditions. It is however difficult to get accurate information on timber trade since most of it is illegal, and therefore under-reported by villagers.

Non-timber forest product gathering

Gathering non-timber forest products (NTFP) is predominantly a women activity. There is a wide range of edible plants villagers forage either for their own consumption or for sale. The main ones are rattan shoots (big and small). Other wild foods include bamboo shoots and different leaves, ferns, mushrooms and vegetables that people use for making soups or curries. Some forest products are also used for basket, mat and utensil making for villagers' own use.

In some villages – especially the most accessible ones on Nam Xot and Nam Theun – the sale of NTFPs provides irregular but critical income. During the dry season, NTFP gathering is one of the main activities for those who do not grow off-season paddy. Collecting commercial NTFPs such as kisi (dammar resin) often involves overnight stays in the forest. Currently, the intensity of collection of commercial NTFPs depends on their availability locally but also their price, which significantly varies from one village to another depending on their remoteness. For instance, kisi fetches a much higher price (about twice more) in Makfeuung or Nahao than in Seuk. Villagers usually sell NTFPs on individual basis (i.e. no collective marketing). There are also a few middlemen who collect from other villagers and then transport to Nakai through waterways.



Collecting broomgrass

Household off-farm activities (% of families practicing), according to the Family Profile Survey (January 2018)



Fishing
62 %



Casual labour
56 %



NTFP collection
53 %



Hunting
19 %



Small business
& services
5 %



Remittances from
relatives
5 %



Official/employee
4 %



Handicraft
3 %

OFF-FARM ACTIVITIES

Main NTFPs currently traded by NPA villagers

Several NTFPs used to be collected twenty years ago in the NNT NPA but are now almost depleted due to increasing population pressure and the opening of markets. This includes fragrant wood (may heuang) and rattan cane (thoun, a stem from palms of Calamus genus).

NTFP	Product description	Main collection season	Resource availability	Location	Product use and marketing
Small rattan shoot (saan)	Edible shoot from small palms of Rhaps genus	Most of the year	Abundant	All enclave villages	Mostly for home consumption, but villagers sell surpluses, especially during dry season
Big rattan shoot (boun)	Edible shoot from Daemonorops palm	Most of the year	Abundant	All enclave villages	Mostly for home consumption, but villagers sell surpluses, especially during dry season
Dammar gum (kisi)	Resin obtained from trees of the dipterocarp family	Dry season (January-February)	- Found in forested hillsides and riverbanks - Decreasing (villagers have to go further away and/or dig the ground)	Nam Xot	Can be stored and thus represents a saving that households can sell as and when they need Sold to a village middleman or directly to brokers coming from Nakai (currently at 2,000 LAK/kg)
Cardamom	Dried seed of black or false cardamom	July-August	Decreasing	Nam Xot	Sold to a village middleman or directly to brokers coming from Lak Xao (currently at 50,000 LAK/kg for dried seed)
Broom grass (kham)	Tall grass (Thysanolaena) which is used to make brooms	Dry season	Abundant in fallows, especially on riverbanks	Nam Xot	Sold to a village middleman who transport to Nakai as raw product or ready-made (currently at 600 LAK/kg raw)

The fragrant wood (may heuang) is *Aquilaria crassna*, a tropical tree living in the forest sub-floor of tropical forests of Southeast Asia, still dispersed and generally shelter of the canopy. It is the object of a centuries-old exploitation, in old Cochinchine and in Cambodia. *Aquilaria crassna* is the major source plant for agarwood, the valuable resin produced by some *Aquilaria* species. It is classified by IUCN Red List as critically endangered. In Viet Nam, its wood is used in traditional medicine, and in Japan as incense. Lao PDR is the only country in which *A. crassna* resides where harvesting of wild trees is still legal. Commercialization of agarwood in Lao PDR began between 1975 to 1976 and by the 1980's this has spread across the entire country (Jenson and Meilby 2008). While, in Vietnam, local people have been collecting seedlings from natural forests since 1986 and planting them in their home gardens (Loc and Luu 2002). Good income can be made in Vietnam from selling *A. crassna* trees for agarwood production.

The dammar gum (kisi) resin exudes naturally, falls off the tree and is collected on the ground. It can also be collected in fossilized form after digging the ground.

		Dry and cold		Dry and hot		Wet rainy season					Dry and cold		
		Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
NTFP Collection													
1	Big rattan shoot												
2	Small rattan shoot												
3	Rattan Cane												
4	Cardamom												
5	Bamboo shoot												
6	Wild mushroom												
7	Wild Vegetable												

OFF-FARM ACTIVITIES

Hunting

According to the villagers, hunting also used to be a very good source of cash incomes but it is not the case anymore. They reported that this activity became more time consuming since hunters have to walk further away in dense forest to find game. There are also risks associated with a now strongly restricted activity. Moreover, hunting large games requires specific skills that new generations do not always have. This said, small-scale hunting of birds and small animals, using traps, crossbows or catapults, remains an important source of meat for NPA villagers. Testimonies from villagers could also be minimizing the real scale of wildlife hunting since most of it is illegal.

Fishing

All enclave villages are located by large rivers or secondary streams. Small-scale fishing is thus practiced by most households all year round, although there are no specialized fishermen. Villagers use locally-made wood canoes, with or without engine. During the dry season, they also fish from the riverbank or on foot. Different types of fishing gears are used such as nylon gill nets, small cast nets, landing nets and fish traps. Some are locally made with bamboo (basketwork), others are purchased from Nakai. Fishers either buy ready-made nets or materials that they assemble to make nets. It is also common to fish in flooded rice fields and channels using fish traps.

Fish catch is mostly for home consumption. If any, surpluses are primarily sold in the village. Villagers sell fresh fish (i.e. no processed products). There are no fish dealers or middlemen. Villages that have better access to Nakai (such as Nahao and maybe Makfeuung too) are the notable exceptions: some villagers go and sell directly their fish to Nakai. One positive impact of NT2 reservoir is actually the development of fisheries, with bigger fish available in rivers and easier market opportunities, especially for Nam Xot villages, where fishing is now considered as one of the main sources of cash incomes.

Other activities

Petty trade opportunities are quite limited. At village level, there are at best one or two households who have a small shop and/or work as middlemen (and are primarily involved in NTFP trade). Only larger villages with waterway connection throughout the year (e.g. Nahao, Makfeuung) have several small grocery and retail shops. They usually sell condiment, snacks, processed foods, clothes and non-food items.

The 2000-2010s witnessed the development of mechanized agricultural services supplied by better-off farmers (tillers, rice threshers and rice mills) as well as new transportation services (engine boats and 2-wheel carts pulled by hand tractors). Moreover, some households managed to earn some income during the construction of schools and other community infrastructures with support of WMPA or other development programmes (e.g. transportation of construction materials on boat from Nakai).

Other off-farm livelihoods are very few. Handicraft is limited to small-scale basketwork and woodcraft (e.g. to make hunting devices). A few households get regular cash incomes as retired soldiers or WMPA rangers (around 1 million kip per month). Others received money from children or relatives who left the village.



Emerald dove in a trap in Thongkong village



Preparing a fishing net

INCOME-GENERATING ACTIVITIES

Family main sources of incomes

In most visited villages, buffaloes, small livestock (poultry and pigs) and casual labour were mentioned as the three main sources of cash incomes, with a different ranking depending on household wealth status (e.g. better-off households usually mention cattle first while the poor primarily get cash from casual labour). Nahao and Songkhone are the notable exception, with fishing often ranked first, followed by small livestock, kisi and rattan shoot.

Household main sources of incomes (% of families interviewed), according to the Family Profile Survey (January 2018)



As we can see after the analysis of the households' responses on the Family Profile Survey, only 43% of them have declaring farming activities as their main sources of incomes (37% livestock rearing, 5% cash crop production, 1% lowland paddy and 1% vegetable gardening), while 57% of the households derive their incomes from off-farm activities. Results are also very different when you separate the families living in the NPA villages from those in the PIZ villages. In the 2 PIZ villages targeted by the survey, households declared at 43% that cash crop production is their main source of incomes (0% in NPA villages), casual labour concerned only 20% of villagers (34% in NPA), and livestock rearing 18% (39% in NPA). Being more accessible by road, the PIZ villages have some income-generating agricultural activity opportunities like cash crop production that NPA villages can't have. However, considering the low agricultural land available per family in the NPA villages, as well as the low quality of their soil fertility, it is preferable that cash crop production, such as maize and cassava that require important quantity of soil nutrients, have not been introduced in the protected area, as this would most likely have led to the opening of new pioneer fronts in protected forest areas.

The following table presents the results of the economic review of livelihood activities during the Family Profile Survey. Families were asked to recall data from the year 2017.

Livelihoods (year 2017)	% of HH practicing / HH surveyed	Estimated production (kg/HH)	Estimated quantity consumed (kg/HH)	% of HH selling / HH practicing	Estimated quantity sold (kg/HH)	Estimated cash incomes (in LAK/HH)
Lowland Paddy production	42 %	1,395	1,275	8 %	1,122	2,176,000
Upland Rice production	68 %	784	749	0,7 %	193	717,000
Cash crops (mostly cassava)	11 %	8,765	0	66 %	8,765	9,725,000
Casual labour	56 %	-	-	-	-	1,538,000
NTFP collection	51 %	-	-	54 %	107	418,000
Hunting	18 %	-	13	14 %	15	252,000
Fishing	62 %	-	37	19 %	76	434,500

INCOME-GENERATING ACTIVITIES

For livestock rearing, the data are separated by type of animals in the database. As economical results are quite different from one animal to another, it is preferable to present it in details. For livestock, as the cycle of production can be longer than 1 year, the data here will only present the results for the families who used their livestock during the year 2017.

Livelihoods (year 2017)	% of HH practicing / HH surveyed	% of HH consuming / HH practicing	Number of heads consumed per HH	% of HH selling / HH practicing	Number of heads sold per HH	Estimated cash incomes (in LAK/HH)	Remarks
Cow	7 %	25 %	2,5	86 %	1,5	5,542,000	From 1 to 4 sold; From 1 to 15 consumed
Buffalo	15 %	19 %	1,1	93 %	1,4	7,398,000	From 1 to 5 sold; From 1 to 3 consumed
Goat	8 %	74 %	2,2	92 %	2,2	825,000	From 1 to 6 sold ; From 1 to 10 consumed
Pig	47 %	70 %	2,1	64 %	1,9	870,000	From 1 to 13 sold; From 1 to 12 consumed
Poultry	57 %	91 %	8	59 %	5,9	257,000	From 1 to 80 sold ; From 1 to 90 consumed

The economic results for livestock rearing for the year 2017 show that the number of families using their livestock, for consumption or sale, are quite low for the large animals (7 to 15 %) compared to smaller animals like pigs and poultry (47-57 %). Consumption as well is lower for large animals, except for goat. Sale of livestock is widely practiced by the households with significant differences from family to family. Poultry is the domesticated animals the most consumed by family, with wide difference, from 1 poultry consumed for the year 2017 for 16 families to more than 40 for 8 families. On average, families consumed 8 heads of poultry per year.

Other data on other livelihood activities have been collected but will not be presented here in details as the number of families or economic impact on livelihood is quite low. For details, the database of the Family Profile Survey is available. Only vegetable production can be introduced here, as it represents 46% of families producing with 100% of families consuming their production (29 kg on average per family per year) and 3% of families selling 36 kg on average (465,000 LAK).



Transplanting rice in lowland area



Rice plants in nursery



Buffalos on river banks

INCOME-GENERATING ACTIVITIES

The needs local farmers have expressed are related to food security problem. Lowland farmers wish for access to grants, credit or implements (in particular tractors) in order to convert more bottomlands into rice paddies as well as the access to irrigation water to develop a second rice crop during the dry season. Swidden farmers request to have access to more land for shifting cultivation and/or to receive training and agro-inputs to develop more permanent cultivation patterns.

The poorest households and vulnerable groups – in particular women – ask for more job opportunities and some start-up capital or other support to raise small livestock. According to villagers, other livelihood needs include: (i) livestock funds to raise more cattle (the ones provided in the past by WMPA being insufficient); (ii) improvement of small tracks between villages for better access to navigable rivers (e.g. between Navang and Nahao; from remote villages to Makfeuang).

Based on the expressed needs, WMPA objectives and the main findings from this assessment, the following strategies and technical orientations are proposed:

Recommendation 1: Support the paddy field development process by providing counselling services (identification of most suitable lands, soil analysis, etc.) and financial means (either through grants or credit systems).

→ Past experiences should be taken carefully into account. For instance, in the late 1990s, government attempt to level land with bulldozers and make new rice paddies in Songkhone failed for a lack of analysis of soil conditions and socio-cultural preferences.

Recommendation 2: Extend or improve small-scale irrigation systems to secure water access and develop dry season cultivation.

→ The potential for development of small-scale gravity flow irrigation systems should be better assessed with the view to secure water availability in case of dry spells during the rainy season and develop double cropping on paddy fields. Villagers show high interest and are willing to provide labour if they receive technical support and materials. WMPA should draw from past, successful experiences of labour employment schemes that enabled to build durable irrigation systems. For instance, the canal in Seuk was built through food-for-work in the late 1990s with the support of army, and is still operational. In addition, infrastructure maintenance, increased water demand and potential disputes around the use of water should be anticipated through preliminary awareness and basic training on the collective management of irrigation water.

Recommendation 3: Test leguminous or other dry season crops than paddy, notably pulses, which have lower water requirements, high nutritional value and can improve soil fertility.

→ This should be combined with awareness sessions on the nutritional aspects of legumes/pulses and the different ways to process/cook them.

Recommendation 4: Promote improved fallows, intercropping (leguminous) or other practices to ensure soil fertility renewal on slope lands and optimize land use and crop interactions.

Recommendation 5: Provide counselling service / technical training and promote knowledge sharing among farmers to develop vegetable farming, especially on riverbanks.

Recommendation 6: Better identify the livestock animal main diseases and their causes, support basic veterinary services and test new feeding practices (e.g. fenced enclosures, cut-and-carry fodder systems).

→ Livestock development measures could be combined with new ways to enhance the value of crop residues such as paddy straw.

Recommendation 7: Where some NTFPs are identified as a key source of food or income for the poor, assess their potential for domestication and/or value-adding, and the feasibility of introducing community-based NTFP management strategies.

→ Any attempt to develop marketable forest products (or cash crops in case of cultivated products) in the NNT NPA should take into account transportation costs and priority should be given to merchandise of high value added per unit of weight and volume.

There is strong socio-economic differentiation between and within villages, meaning that there is no one-size-fit-all solution. WMPA should develop inclusive approaches and promote activities that can benefit the poorest households. There should also be a specific focus on activities in which women can participate or take the lead. Testing of improved techniques and innovative technologies could be done through demonstration plots/sites, followed by the training of interested farmers/villagers, farmer exchanges or other cross-visits between different villages.

Outlines of food consumption patterns and main food sources

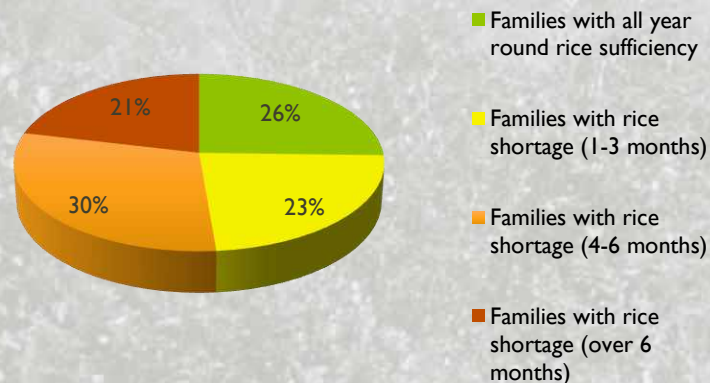
The staple meal is made of (mostly glutinous) rice served with wild or cultivated vegetables, leaves, roots and tubers as well as fish, wild animals or insects depending on the season and the daily catch. Cooking with oil is rare. People consume very few pulses (and probably have a limited knowledge of their nutritional value). Chicken, duck and pork are eaten for special occasions only. Fish and other aquatic products are eaten almost every day and are therefore the main sources of proteins.

As much as possible, people source their staple food from their own production, which they complement with rice obtained from farm wage labour. The minimum requirements for an average household of five members can be estimated at 75 kg of rice per month, meaning that farmers need to produce almost 1.5 ton of paddy a year. Maize and cassava are critical substitutes for rice during the lean season; they are often cooked together with glutinous rice. Maize is sourced from the hay or small upland plots during the rainy season, and from dry season gardens. Cassava is available most of the year since farmers harvest tubers as and when they need from their gardens. Its consumption however varies between villages and ethnic groups (e.g. it is seldom eaten by Saek people).

Many households need to borrow or purchase rice during part of the year, from better-off households (surplus farmers) or local retail shops (if any) within their village or in wealthier villages. When traveling to Nakai District centre for shopping (to buy farming tools, clothes, condiment, etc.), people sometimes purchase rice there because it is cheaper than at village level; the quantities they can transport are however limited by the load-carrying capacity of their boats or by high transportation costs on public boat. The price of milled rice currently peaks at 7,000-8,000 kip per kg during the food gap (July-October).

Vegetables are mainly sourced from the hay (during the rainy season), home gardens (during dry season) and the wild (all the year, but more specifically from April till June). By combining these different sources, most households manage to cover their needs throughout the year. The large (boun) and small (saan) rattan shoots are one of the main foods. Wild meat is gathered from the forest at different times of the year.

Rice sufficiency in the village



According to the Socio-Economic Form filled by the head of village and his officers in each hamlet, none of the villages have achieved full autonomy in rice production for family consumption. The compiled data from the 18 hamlets shows that only 26% of the families have enough rice production to be self-sufficient all year. 23% have a rice shortage from 1 to 3 months, 30% from 4 to 6 months and 21% more than 6 months. The situation is worse in the NPA villages, with 33% of families having 4 to 6 months rice shortage and 29% more than 6 months.

The main food gap is from June-July till rice harvest (October-November depending on cropping system and rice varieties), but often starts earlier (around April) for households who only rely on swidden cultivation. Among paddy farmers, the ones who have enough land and/or can double crop usually are self-sufficient; for others, the food gap typically lasts 2-3 months between July-August and September-October. The rice shortage period is shifted in time to February-June for paddy smallholders who can double crop but do not grow supplementary hay (e.g. most paddy farmers in Seuk).

As mentioned earlier, the number one strategy to bridge the gap is to consume other starchy foods (maize and cassava) mixed with rice. Other coping mechanisms comprise farm labour (often paid in rice), borrowing rice or cash from neighbours/relatives that are better-off (without interest), selling poultry/pigs/goats or bartering them for rice, and cattle depletion. Secondary strategies include fishing/hunting (i.e. sell fish/game or barter them for rice) and in suitable locations such as Nahao/Songkhone, foraging and selling NTFPs (especially cardamom, which harvest coincides with the hunger gap). In case of very poor harvest, rice deficits are also made up for by eating food substitutes (wild roots and tubers).

FOOD SECURITY AND FOOD CONSUMPTION SCORE

Food Consumption Score (FCS)

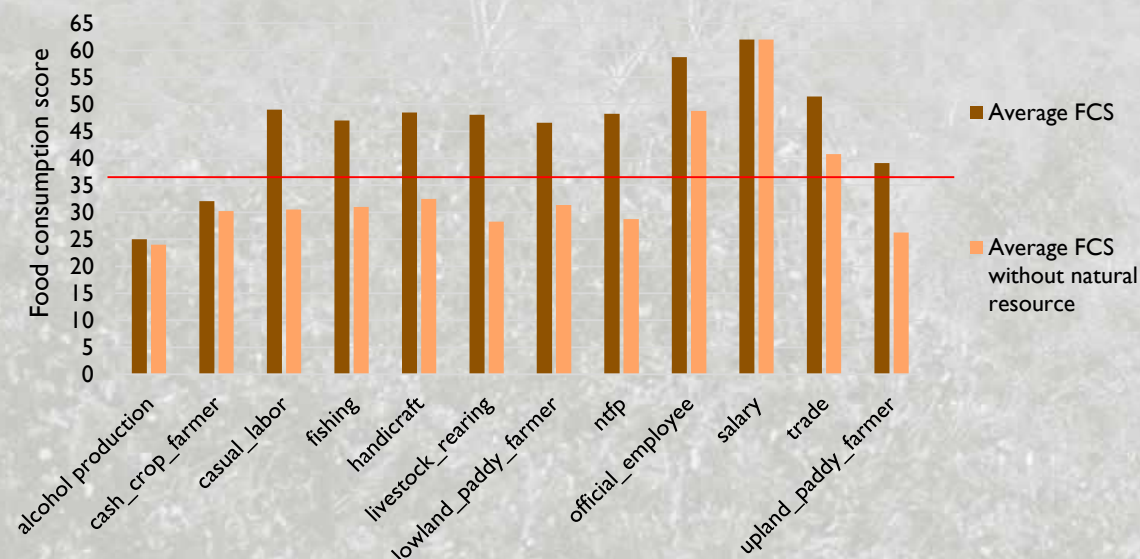
The Food Consumption Score is a composite score based on dietary diversity, food frequency, and relative nutritional importance of different food groups. It is also a useful survey to record family expenses.

In the FCS questionnaire, households are asked to recall the expenses for food and non-food items for the past month, as well as the foods that they consumed in the previous seven days. Each food item is given a score of 0 to 7, depending on the number of days on which it was consumed. Each food group is assigned a weight, reflecting its nutrient density. The household FCS is calculated for each household by multiplying each food group frequency by each food group weight and then summing these scores into one composite score. Finally, the household score is compared with pre-established thresholds that indicate the Food Consumption Group (FCG) which is the status of the household's food consumption (food poor, borderline or acceptable).

The FCS results might give a better idea of the reality of the households' nutritional status and consumption pattern, as the interviewees are only asked to remember the food types consumed over the past 7 days. WFP advises a recall of 7 days to ensure both good time coverage and "reliability" of respondent's memory. According to practical data collection experience (WFP and others), 7-day seems to be the most appropriate recall period to capture information about household's habitual diet, taking into account the limits given by possible seasonal consumption. Food Consumption Scores are ranged between 0 to 35. **Scores from 0 to 21 are considered as poor and signs of nutritional problems. Between 21.5 and 35, the FCS score is considered borderline and over 35, it is acceptable.**

During the socio-economic assessment conducted in the 18 hamlets (16 NPA and 2 PIZ), FCS data were collected among 374 households. Among the interviewed, 228 were women (61%). The average age of the interviewed is 38 years old. 9 ethnic groups were represented in this survey, with a large majority of Makong (57%). Two new ethnic groups not mentioned in the "Village socio-economic analysis" form filled by village authorities were added: Bo from the Tai-Kadai linguistic family and Khmu from the Mon-Khmer.

Average FCS per main source of incomes



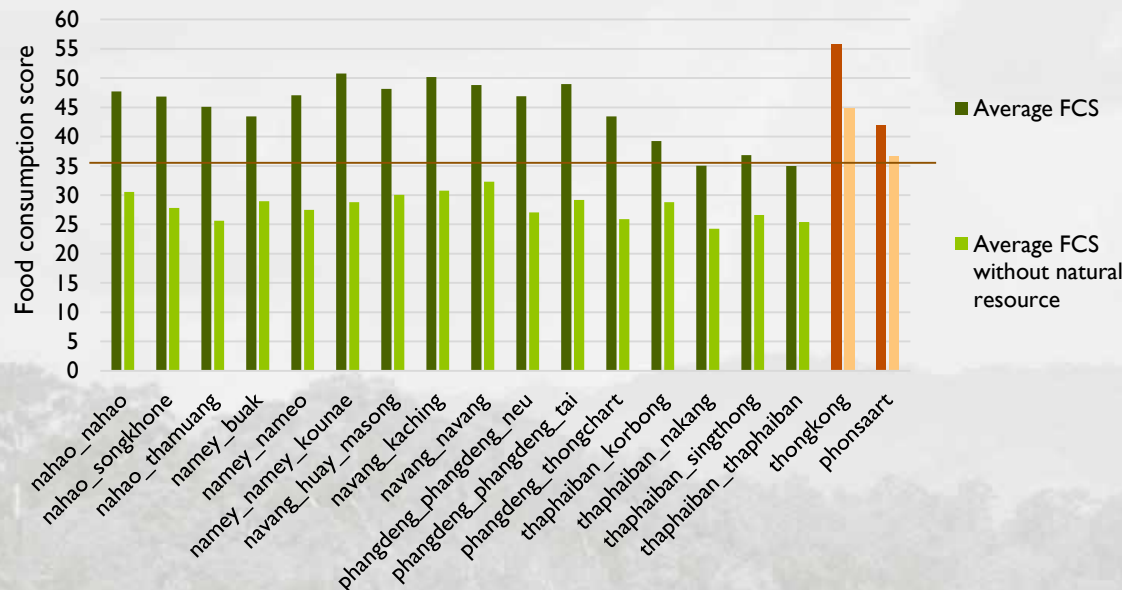
In general, the data are showing acceptable level of Food Consumption Score for most of the households, apart from the ones who declared that alcohol production and cash crop production are their main income-generating activities. Among the 374 households interviewed, only 2 were having a poor FCS of 21. These results are showing that incomes are not the most important factor when it comes to a diversified diet.

However, the food items listed by the households for their consumption over the last 7-day period did not include only the purchased and produced foods, but also the food collected from the wild (wild meat, wild vegetables, aquatic life...). Once, we remove the wild food consumed from the calculation of the Food Consumption Score, the results are quite different.

Without access to food collected from natural resources, only the families having incomes from salary and trade can reach over the acceptable FCS of 35. These results show that the consumption of wild food for villagers, especially those living within the NPA, is utterly important to secure their nutritional diversity. New access restrictions on the use of natural resources from natural conservation area might impact negatively on the food security of the villagers if the forest area allocated for village use is not big enough and/or if no solution is proposed to improve the household agricultural production in terms of quantity and diversity.

FOOD SECURITY AND FOOD CONSUMPTION SCORE

Average FCS per hamlet



The NNT NPA is a rice deficit area. In normal years, household food security is made possible by the combination of different livelihoods and food sources to complement locally produced rice. However, food production levels and economic access to food vary greatly from one type of household to another.

There are important wealth gaps between the poorest swidden farmers who have few assets but their workforce and better-off paddy land owners who have cattle and other valuable assets such as power tillers or rice mills.

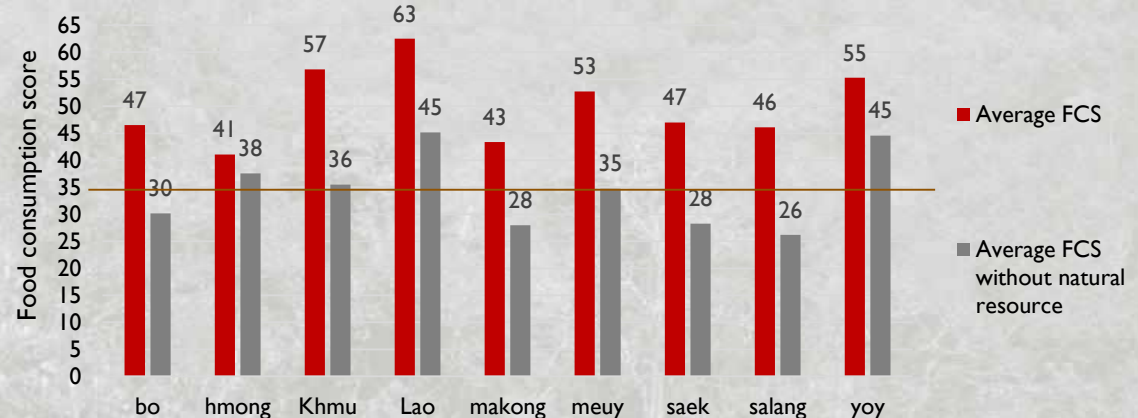
According to Chamberlain (1996), in Nakai plateau, Salang is a local term for this group, and Arem is the Brou term for the same group. It is part of the subgroup Vietic within the Mon-Khmer linguistic group. It reported that they might be the last ethnic group to have been sedentary. Until recently, they were only hunters and gatherers and did not practice agriculture. In Vang Chang, a Brou village where they are in minority, they are among the most vulnerable families. Chamberlain reported that in this village, it appeared that the Salang women were using traditional medicine as natural birth control contributing to the slow declined of their population, in an unconscious form of cultural suicide in response to radical changes in their way of life. Their population size is very small and considered as threatened.

When looking at the data in the perspective of the hamlets and the difference in FCS from one another, the results are showing that, with the exception of Nakang and Thaphaiban hamlets, in Thaphaiban village (NPA), who are barely reaching an average score of 35, all the other hamlets are over the acceptable line.

But, when wild food is removed from the calculation of the food consumption score, only the PIZ villages (in red and orange), less dependent to natural resources and with more access to food from the market, are reaching the acceptable line. However, there is no hamlet whose score drops under the poor FCS line, which means that nutritional status in the NPA can be improved, but has not reached yet a critical level of vulnerability and food insecurity.

The same data analyzed per ethnic group are showing that Hmong, Lao, Meuy, Khmu and Yoy are the only groups whose FCS does not drop under the acceptable line when the wild food is removed. The groups mostly find in the NPA, such as Mon-Khmer groups (Bo, Makong, Salang) and Saek ethnic group, are the ones depending the most on natural resources as food source. Their FCS is highly impacted when wild food is removed from their score, dropping from an average score of 46 to 28.

Average FCS per ethnic group

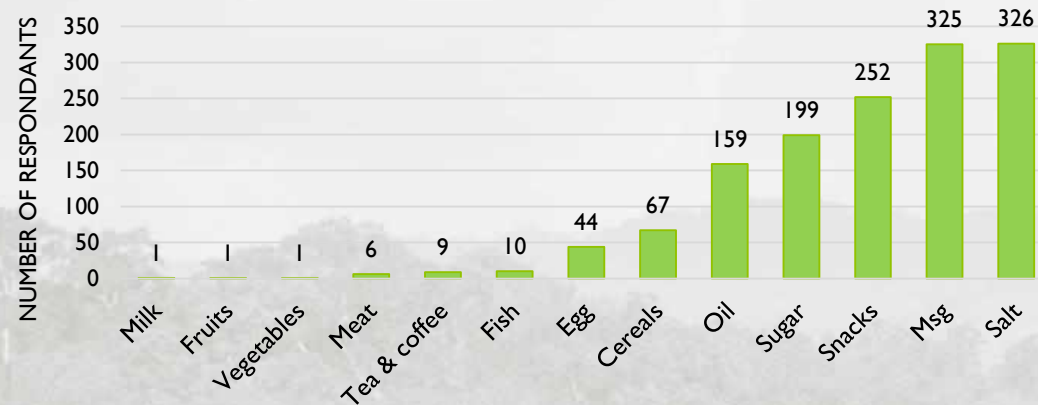


FOOD SECURITY AND FOOD CONSUMPTION SCORE

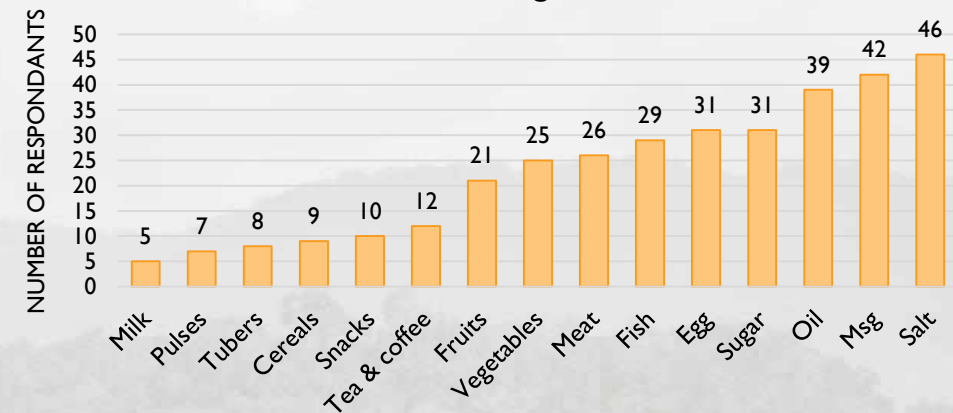
Household Food access

In the survey, the interviewed households were asked to list the type of food they purchased within the past month. These foods were classified into main categories. The results are very different from the NPA hamlets and the PIZ villages.

Purchased food consumed in the past month in NPA villages



Purchased food consumed in the past month in PIZ villages

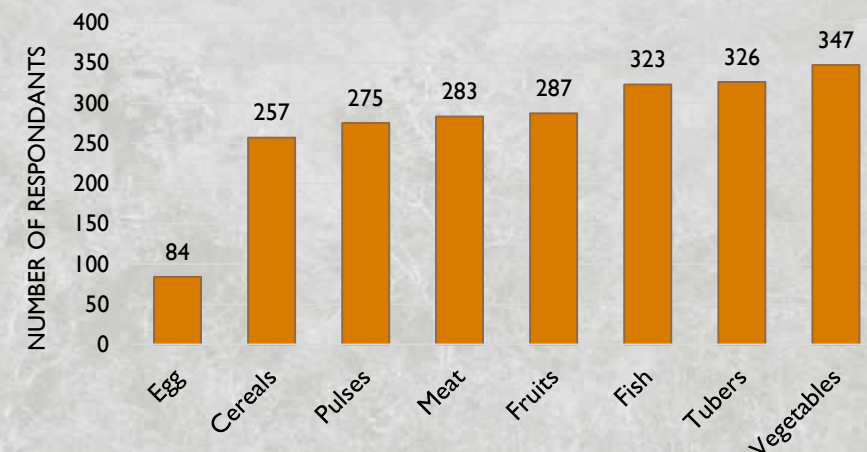


If processed food such as salt, MSG, snacks, sugar and oil have been highly listed in both type of area, there is a clear distinction when it comes to fresh products such as eggs, fishes, meat, fruits and vegetables. In the PIZ villages, as the household occupations are less diversified than in the NPA, it is quite normal to see that many food items are purchased to fulfill the consumption needs of the family members, while in the NPA mostly processed foods are purchased by the families. However, cereals, such as rice, are purchased by 19% of the households interviewed in the PIZ hamlets, while this percentage goes up in the NPA hamlets with 21% of the respondents. These data are consistent with the village data survey which shown a high percentage of families suffering from rice shortage in the NPA hamlets.

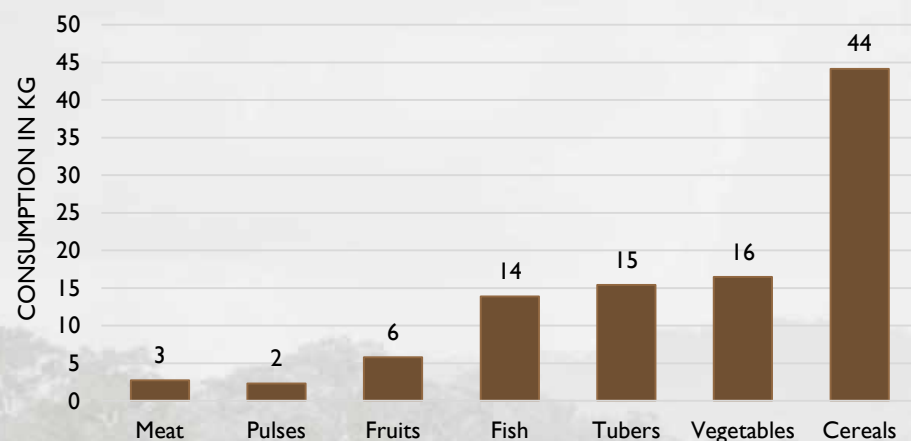
Data analysis according to the main sources of incomes declared by the families is also showing that the main occupation of the family has a direct impact on the access to purchased food. For example, households who are producing cash crops as their main source of incomes rely more on purchased food than families depending on NTFP collection as their main incomes. The first type of families has converted most of its fields and spent most of its labor available to market-oriented production (cash crops such as cassava, maize), which means that they have cash flow but low self-consumption production. The type of families is mostly found in PIZ villages. The second type of families is relying on natural resources for its subsistence, which also includes their food sources.

The second source of food that was surveyed was the food produced directly by the households. When looking at the data, we can see that the food consumed coming from production is quite diverse and fulfill the requirements for a balanced diet. With the exception of eggs, all the other food types have been produced and consumed by at least 65% of the interviewed households. However, if it shows the great variety of produced food types, this data cannot be used to assess the nutritional status of the households as it does not inform on the frequency of consumption and the quantity consumed.

Produced food consumed in the past month



Average consumption of produced food the past month (in kg/HH)



The final question of the Food Consumption Score (FCS) questionnaire is related to the water drunk by the villagers. Indeed the type of water used for consumption is very important to determinate access to clean water and potential threats to family health. 92% of the respondents have declared boiling the water before drinking. The water can either originate from the water springs, the water supply system of the village and/or the rivers. The fact that most of the interviewees have declared boiling their water before consumption means that they already understand that the water from the springs, rivers and/or water supply can be contaminated and unsafe to drink directly from. 35% of the families are also declaring drinking medicinal herb water, which is boiled water with medicinal herbs. As the sources of this water, 60% of respondents are fetching water from the river, 72% from springs, but only 1 family have declared drinking water from the water supply system. Three reasons can be speculate to explain this: non-existence of water supply system or broken water taps in the village (only 28% of households have declared having access to water supply system in the Family Profile Survey); use of the water supply mostly for showers and laundry ; water from water supply have been included in the boiled water answers.

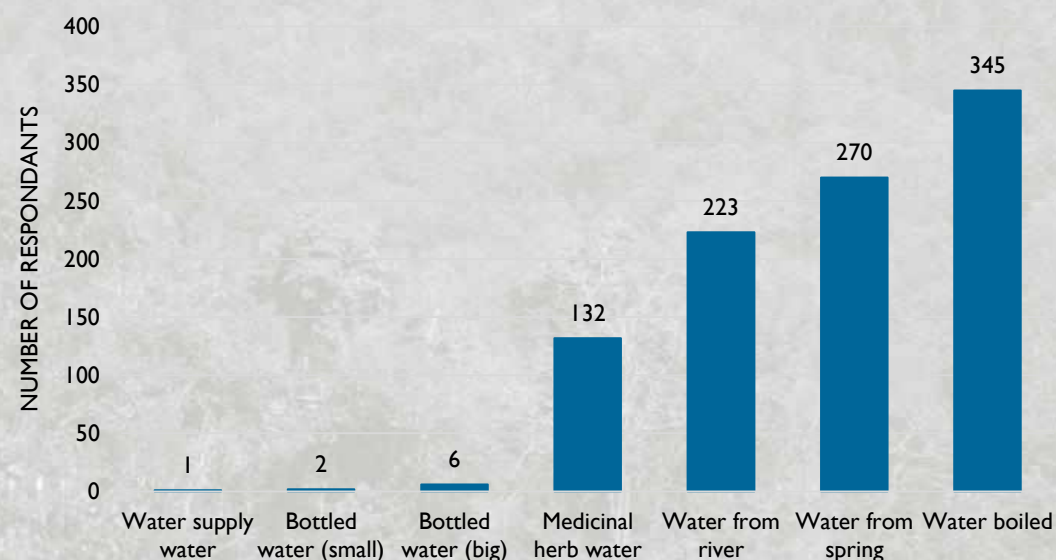
In conclusion, villagers seem to be already well-informed of the risks to drink unsafe water and are already applying safety measures such as boiling the water before consuming it.

To get a better understanding of the reality of food consumption the households in the target hamlets, questions have been asked about the quantity consumed for each type of food produced over the past month. These data are recording the quantity consumed for an average family of 5,6 persons (average size of families according to the Family Profile Survey).

While the previous data were showing a good diversity in food produced consumed over the course of one month, the quantities consumed are not always conformed to the household diet needs. A family of 5,6 persons should consumed at least 84 kg of rice (Cereals), which is the main staple food in the area, per month (15 kg per pers. per month), but the data is showing a consumption of 44 kg per month on average. Families are either buying rice to complete their needs or substitute it with tubers (15 kg/month on average). Fruit consumption remains low. Foods rich in proteins (meat, pulses and fish) seems to meet the daily dietary requirements. Wild food (NTFP, hunting and fishing games) is also playing an important part on family diet and supports the fulfillment of parts of the daily dietary requirements.

These data are only indicative as they are based on people's memories and are used for gross estimation. The results are showing that the people's perception of their monthly food intake is mostly focused on cereals, vegetables, tubers and fishes.

Type of water drank by the villagers interviewed



FOOD SECURITY AND FOOD CONSUMPTION SCORE

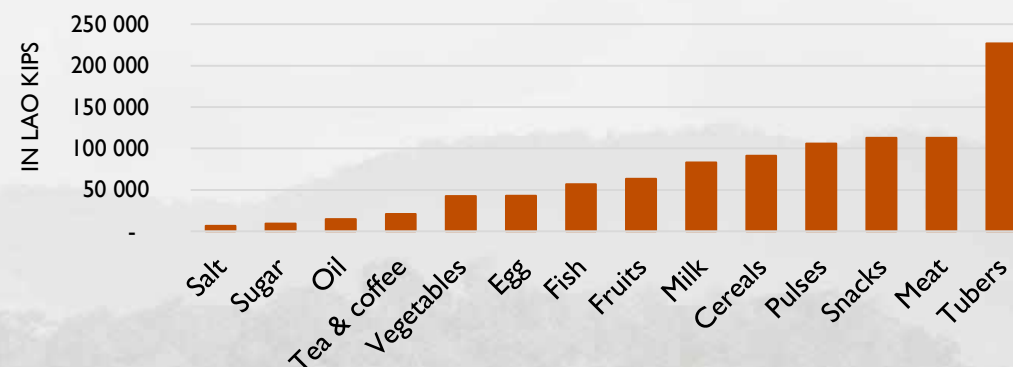
Family expenses

On average, the interviewed households have not spent a lot on food items over the past month. Most of the food expenses have been for cereals purchasing (rice) and meat. While processed foods are widely purchased by almost all households of the survey, the expenses are showing that it has been in quite small quantities. Also, the results show differences between PIZ and NPA hamlets on the type of food products that are purchased the most by the interviewed households.

Average costs for food in the past month in the NPA villages



Average costs for food in the past month in the PIZ villages

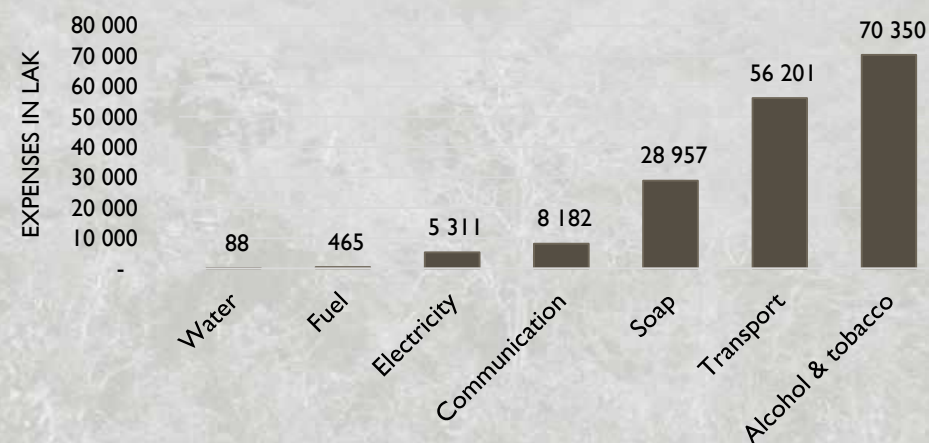


Expenses over cereals are multiplied by 2.5 in the NPA hamlets (227 000 LAK) compared to the PIZ (91 000 LAK), which reinforce the hypothesis that the villagers in the NPA villages are not producing enough rice to meet their needs. The expenses on meat are more surprising, as they are quite high for hamlets classified mostly as poor, but the period of data collection has to be taken into account as a possible explanation.

The data for the FCS survey were collected in January 2018 which is placing the period of recording the food expenses of the past month within the celebrations of Hmong New Year, Khmu New year, as well as the Village Ghost celebrations for the Makong ethnic group. It has to be expected that these celebrations have influenced the meat consumption of these ethnic groups to explain why their meat expenses are up to 119 000 LAK on average (210 000 LAK for Mon-Khmer groups and 114 000 LAK for Hmong). Other expenses recorded over the past 6 months on health, education, debt, infrastructures... are showing that the Hmong ethnic group has declared an average expense of 1,211,00 LAK for celebrations, while all the other ethnic groups (with the exclusion of the Lao) have an average expense ranged between 118,000 LAK for Salang to 267,000 LAK for Khmu.

Other expenses from the past month of the survey related to non-food daily items are mostly alcohol and tobacco, transportation costs and soap. Communication and electricity costs are mostly in PIZ villages (respectively 36,000 LAK and 57,000 LAK per month on average). Transportation costs are also more important in PIZ villages (141,000 LAK on average in PIZ against 44,000 LAK in NPA). Alcohol and tobacco expenses are more important in NPA villages (74,000 LAK) than in PIZ villages (46,000 LAK).

Average non-food expenses in the past month



Recommendations

In 1996, Chamberlain wrote, in his “Socio-Economic and Cultural survey”, in page 40, that “traditionally most of these groups [indigenous people surveyed] have cultivated rice, hunted animals for meat and gathered plant products for immediate use, or for future depending upon storage. In other words enough food has been obtained a family’s welfare and well-being, but without surplus. Traditional livelihood systems in the forest, on streams and in agriculture has reflected this concept of “enough”. In pages 44 and 45, he presented the situation for rice sufficiency in these terms: “It is rather difficult to calculate rice production and deficits because of the fear of having to pay additional taxes. All villages reported deficits. It was possible to get a better approximation of rice supply by asking the number of months that they were sufficient in rice. Even here, though, the picture is not good.”

In 2018, in light of the data collected with the FCS survey, the situation seems similar to that described by Chamberlain in 1996. Ethnic groups within the NPA are still highly dependent to hunting, fishing and gathering to meet their nutritional needs. Rice sufficiency is still unachieved in all hamlets interviewed, with only 26% of the families who have enough rice production to be self-sufficient all year.

To insure the good nutritional status of the villagers living inside the National Protected Area (NPA), it is very important to secure their access to wild food. To do so, sensitization campaigns can be organized to promote the consumption of non-protected natural resources over the protected species. Regulations and quotas for hunting, fishing and collection of non-protected natural resources can also be set to insure the sustainability of the resources in the authorized area. Home gardens producing diversified types of vegetables can be promoted to lessen the pressure on natural resources, as well as small livestock and egg production. Rice production, especially lowland paddy cultivation, could be reinforced to improve the production and decrease the needs for the families to buy rice to cover their needs.

As the results are showing that some households who are doing mostly income-generating activities, like alcohol production and cash crop farming, are not better-off than poorer families in terms of nutrition, it will also be important to organize sensitization campaigns on the importance of a diversified diet with balanced meals. Nutrition-Sensitive Agriculture should be promoted, alongside with nutrition sensitization programs. In Lao PDR, the LANN program (Linking Agriculture Natural resources management and Nutrition) is being implemented since 2009. First developed for the Northern Uplands of Laos, it has now been upscaled to many Lao Provinces and in other countries. Agrisud International has experiences implementing LANN to rural communities in Lao PDR, Cambodia and Madagascar.

LANN, Linking Agriculture, Natural resources management and Nutrition

LANN is a community-based training approach to family nutrition for remote areas with low access to public health services. Initially, LANN was developed for 7 INGOs in Lao PDR in 2009. Initial partners were Agrisud International, CARE, CCL, CRWRC, Helvetas, WCS, and WHH. In 2010, FRC and VFI joined.

LANN aims at generating awareness and knowledge on causes and consequences of malnutrition and generate community action to address some of the key underlying causes and improve family nutrition, but needs to be strengthened as far as the nutrition of pregnant women, infants and small children is concerned. It includes the analysis of linkages between nutrition and agriculture, natural resource management and the income generating activities. LANN approach should be coupled with supportive agricultural activities (e.g. home gardens, intercropping of nutritious crops), natural resource management activities (e.g. land use planning, promotion of sustainable harvesting practices) as well as access to safe water supply.

HEALTH AND EDUCATION

Education access

During the data collection in the field, the COTE Livelihood team collected data on education infrastructures and school enrollment with DOES, village chiefs and education staff.

Hamlet	Cluster	School infrastructures		Education staff		Ratio pupils/teacher	School enrollment			
		Primary School	Secondary School	Teacher	Volunteer teacher		PI-P3	PI-P5	MI-M4	M5-M7
Fangdeng Nua	Navang (NPA)	PI-P3	-	1	2	36,7	80%	70%	70%	30%
Fangdeng Tai		-	-	-	-	-	70%	70%	60%	20%
Thongsad		-	-	-	-	-	80%	80%	70%	20%
Navang		PI-P5	MI-M4	7	1	30,8	-	80%	80%	30%
Kaching		-	-	-	-	-	-	80%	70%	30%
Houay Masong		-	-	-	-	-	-	80%	50%	20%
Nahao		-	-	-	-	-	-	90%	70%	80%
Songkhone		PI-P5	-	4	0	10	-	80%	70%	80%
Thamuang		PI-P5	-	2	0	20	-	80%	50%	60%
Thaphaiban	Thaphaiban (NPA)	PI-P5	-	1	1	29,5	-	95%	80%	85%
Singthong		PI	-	1	0	25	-	90%	70%	-
Korbong		PI-P5	-	2	1	19,7	-	100%	50%	-
Nakang		PI-P4	-	-	2	23,5	85%	-	-	-
Nameo	Teung (NPA)	PI-P5	-	3	2	28	90%	90%	80%	80%
Namey		-	-	-	-	-	-	90%	80%	80%
Kunae		PI-P3	-	1	0	29	65%	-	-	-
Buak		PI-P2	-	-	1	14	80%	90%	80%	80%
Thongkong	Nabo (PIZ)	PI-P5	-	2	1	19,7	-	90%	-	-
Phonsaart	Thongsen (PIZ)	PI-P5	-	14	0	25,5	90%	90%	-	-

HEALTH AND EDUCATION

The data presented in the table about school infrastructures and enrollment rate are showing that in general, education level have improved in all hamlets (NPA and PIZ) in access to primary education. Overall, village and school authorities are reporting schooling rate in primary school from 70 to 100%.

Using the data from the Family Profile survey in 2018, on average 46% of household heads (91% male) have never been to school and 33% have achieved only the lower part of primary school (P1-P3). Only 15% have achieved to finalize their primary school education. In this survey, the average age of the head of household is 43 years old. When the same data are categorized by age group, the education level changes drastically from one group to the other. We can see that the non-schooling rate is decreasing the younger the household head is:

- ✓ 18-20 years old: No education 10%, Lower primary School 80%, Secondary School 10%
- ✓ 21-30 years old: No education 35%, Lower primary School 34%, Higher primary school 24%, Secondary School 6%
- ✓ 31-40 years old: No education 39%, Lower primary School 37%, Higher primary school 16%, Secondary School 2%
- ✓ 41-50 years old: No education 52%, Lower primary School 35%, Higher primary school 8%, Secondary School 5%
- ✓ Over 51 years old: No education 55%, Lower primary School 26%, Higher primary school 14%, Secondary School 3%

While looking at the women who are head of household, the data from the Family Profile survey show that non-schooling is more prevalent among women, with 75% of no education degree at all, all ages, and 18% have completed lower primary school. It is also confirmed by the data of the level of education of the second head of household, only women, all ages, 62% have declared having received no education and 27% only lower primary school level access.

With the reinforcement of the school system, in infrastructures, equipment and education staff, the schooling rate have greatly improved over the past 15 years, for boys and for girls. Access to primary school is facilitated by their presence at hamlet level. However, these rural schools are still under-equipped and are lacking of trained staff for most of them. According to the DOES and school authorities, they are missing teachers, school classes, and equipment. In some schools roofs are leaking, tables and chairs are missing, as well as basic school equipment. In the sample of hamlets and villages selected for this survey, only the hamlet of Navang has a secondary school. However, secondary school rate remain higher than before in most villages, from 50 to 80%. Only the two PIZ villages, as well as Nakang NPA hamlet in Thaphaiban cluster and Kunae NPA hamlet in Teung cluster, have declared 0% of schooling in secondary school. If it is not too surprising in very remote and difficult to access hamlets like Nakang and Kunae, it is more surprising for the two PIZ villages that are more accessible and developed. It is possible that they chose not to include these data as the secondary school is located in another hamlet.

For secondary school, the students from Navang Cluster who can afford it are going to Navang high school. In Thaphaiban cluster, they are going to Makfuang high school. In Teung cluster, while they have declared an high schooling rate of 80% in 3 out of 4 hamlets, the data do not specify where students go to study in secondary school. The data must therefore be considered with caution.

Indigenous language preservation

In most of the target hamlets, indigenous languages are still known and used by youth, at various degrees. In Teung Cluster, a quite isolate cluster, in the South-eastern part of the NPA, 78% of the inhabitants of the 4 target hamlets are Saek and 22% Makong. They reported that 100% of the youth were able to speak and understand their native language fluently. In Thaphaiban Cluster where all 4 target hamlets are Makong, they also declared that 100% of the youth were fluent in Makong language. In Navang Cluster, the situation is different from one hamlet to another. In Fangdeng village, all 3 hamlets are Makong and all have declared that 70% of the youth could understand and speak Makong, while 30% could only understand it with low level of speaking. For the village of Nahao, Nahao hamlet having 88% of Makong, 7% of Meuy and 5% of Phoutai, 20% of the youth can speak fluently Makong and 70% Phoutai. In Songkone hamlet (94% Salang and 6% Meuy), only 20% of the youth can speak fluently Salang and Meuy dialects. In Thamuang hamlet, composed of 95% Salang, 4% Atel and 1% Makong, 80% of the youth speak fluently Salang, 70% Makong and 50% Atel. Finally, in Navang village, 100% Makong, only 50% of the youth can speak their native language fluently.

As for the PIZ village, in Thongkong, 100% of the youth speak and understand Yoy language, which is quite close to Lao language according to them. As for the Hmong of Phonsaart village, 100% of the youth are fluent in Hmong.

In his socio-economic and cultural survey in 1996, Chamberlain analyzed the patterns of language transmission and disappearance. Inter-marriage practices have been observed where the language of the mother is adopted while the lineage still belongs to the ethnic group of the father. A more extended study than this one would better explain the differences in preservation of native language from one hamlet to another within the NPA.

HEALTH AND EDUCATION

Health access

During the data collection in the field, data were collected with health staff and groups of mothers during interviews and focus groups to understand health access.

Hamlet	Cluster	Health and sanitation infrastructures		Access to health services			
		Health centre	Water supply	Prenatal visits	Vitamins	Vaccinations	Birth at hospital
Fangdeng Neua	Navang (NPA)		Broken pipes	✓			✓
Fangdeng Tai			Broken pipes	✓			✓
Thongsad			Limited access: 24% of HH	✓			✓
Navang		✓	Broken pipes	✓	✓	✓	✓
Kaching			No water in reservoir	✓	✓	✓	✓
Houay Masong			No water in reservoir	✓	✓	✓	✓
Nahao		✓	Low flow in dry season	✓	✓	✓	✓
Songkhone			Functional	✓	✓	✓	✓
Thamuang			Low flow in dry season	✓			✓
Thaphaiban	Thaphaiban (NPA)		No water in reservoir	✓	✓	✓	
Singthong			Blocked pipes, no water reservoir	✓	✓	✓	
Korbong		✓	Good access: 93% of HH	✓	✓	✓	✓
Nakang				✓	✓	✓	
Nameo	Teung (NPA)	✓		✓			✓
Namey				✓			✓
Kunae							
Buak			Functional				
Thongkong	Nabo (PIZ)		Functional	✓	✓	✓	✓
Phonsaart	Thongsen (PIZ)		Functional	✓	✓	✓	✓

HEALTH AND EDUCATION

Among the 19 hamlets/villages reviewed, 15 have a water supply system. But discussions with women and men groups, as well as observations at village level, are showing a serious need for repairs and maintenance on 8 of these systems: 3 hamlets have reported broken pipes; 4 have no water coming to the reservoir anymore; 1 reported access for only 24% of the families. Among the 7 systems considered as acceptable, 5 are fully functional and 2 lack of water during the dry season (May and June).

In light of the data collected in the hamlets and presented in the previous table, access to health structures and services varies from hamlet to hamlet. In Navang Cluster, with two health centres, in Navang and Nahao hamlets, access to health services seems better than in other clusters. All women focus groups in the 9 hamlets have declared to have access to the health centre to deliver their baby if they wished. Indeed, if the access is possible, not all women are using this service. Some prefer to continue with their traditional way of giving birth. The same observation applies for all services provided by the health centres: prenatal visits, vitamins and supplements for mother and child, and vaccinations for small children. In Fangdeng village, it seems that the population of the 3 hamlets are not aware or not using vitamins and vaccinations. It is the same for Thamuang hamlet, in Nahao village. In Thaphaiban cluster, there is one health centre in Korbong hamlet. All hamlets declared having access to prenatal visits, vitamins and vaccinations. However, only women in Korbong village have mentioned childbirth at the health centre. In Teung, the situation is the worse compared to the other clusters in terms of access to health services. Despite an health centre in Nameo hamlet, Kunae and Buak hamlets have not mentioned any health services during the focus groups. Namey hamlet has only pointed out prenatal visits and birth at the health centre. As for the PIZ villages, they have access to health centres in their cluster (Nabo village for Thongkong and Phonsi village for Phonsaart) and are aware of the services available there.

Recommendations

The improvement of the health and education sectors in the hamlets is closely linked to the proximity of infrastructure and personnel. Over the past 15 years, access to education and health services has improved greatly, thanks in part to WMPA financial support to the education and health offices. Primary schools are available in almost all hamlets, and health centres are present in each village cluster.

In the families interviewed for the Family profile survey, the average number of under-aged children are: 1 children under 5 years old and 1,7 children from 5 to 15 years old. There is very few differences from one ethnic group to another, with the exception of the Hmong who seems to have more children (on average 1,4 children under 5 years old, and 2,7 children ages from 5 to 15 years old). It is the only ethnic group having on average more than 3 young children under 15 years old per family. However, these data does not take into account the children older than 15 years old that the households might have but it still shows that offspring of new generations of children are lower in number than they used to be.

Compulsory schooling for children, as well as the reduction of infant mortality, thanks to prenatal care and childbirth at the health center, have reduced the need for a large number of children, reducing the number of pregnancies. This will help stabilize the population growth of villages and protect mothers from the dangers of multiple pregnancies. On the other hand, the impact is felt in terms of labour available for agricultural work. To compensate for the reduction in the number of available full-time workers, families who can afford it hire casual labour, creating job opportunities for the most vulnerable families.

This momentum towards more access to education and health must continue in NPA and ZIP villages. Decentralized offices must now also focus on the sustainability of its infrastructure. Building maintenance systems and committees must be put in place as well as the training of new qualified education and health staff. Information campaigns on the services offered by the health centers should be launched in the hamlets.



Infrastructure village map in Fangdeng Tai



Infrastructure village map in Thongsad



Infrastructure village map in Navang

ACCESS TO CREDIT & LOAN SERVICES

Credit sources, debts and main reasons for taking loans

Villagers in the NNT NPA have no access to formal credit systems. There are no traders or money lenders they can easily deal with. Borrowing from relatives, friends or neighbours is therefore the only option (in addition to a few retail shops in some villages such as Nahao). People only borrow for food and other basic or urgent needs (e.g. to cover health care spending). They do not take farming loans.

Within the same village, relatives and friends can sometimes provide rice loans without interest but the quantities of rice are limited. Rice loans are usually returned back after the next harvest and/or through labour. In villages where rice banks established by WMPA are still operational, households can borrow rice with 30% interest during the food gap.

While a majority of households chronically face rice deficits, food-related debts are surprisingly relatively limited, even among the poorest households. This means that households have other strategies than borrowing to cover their food needs. When they have no other choice but borrow rice, they usually manage to repay a few months later with the incomes they get through casual labour. Their economic situation is however precarious and their food security can rapidly be affected by external shocks.

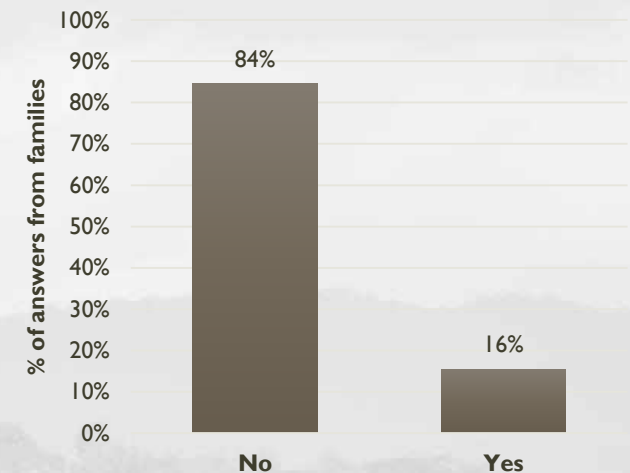
According to the Family Profile survey, only 16% of the households have declared being able to borrow money when needed. For them, the sources of loans are 55% from relatives, 41% from Village Fund (in Thongkong PIZ village, and Thongchaart and Navang NPA hamlets), and 5% from banks (APB or Choulaphak).

When asked if they currently have debts, only 9% of the households answered “Yes”, 6% said “No”, and 84% did not answered. For the families with debts, the average amount is 3,233,000 LAK (around 400 USD).

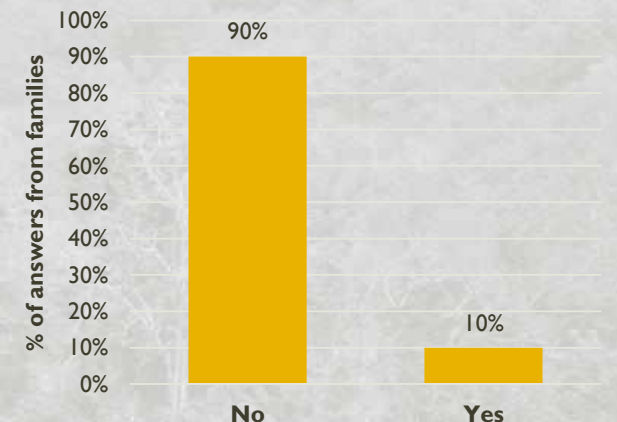
As for savings, only 10% of the interviewed families declared having savings. The savings are kept in majority (88% of the households) in the Village Fund (in Thongkong PIZ village, and Navang, Nahao and Kaching, NPA hamlets of Navang village). Other saving options, but less in use, are banks and even companies. On average, the families have 1,842,000 LAK (around 230 USD) saved in Village Funds. For those using banks and companies, savings are more important with 45,000,000 LAK on average (around 5,600 USD). For those households with large saving capacities, the main source of incomes is cash crop production (57% of them) and trade (43%).

In the database, one family stands out with 30 millions of LAK (around 3,700 USD) saved in APB bank without being the typical rich household doing trade or cash crop farming. It is an household of 12 persons including 5 labours, from Thonchaart hamlet, in Fangdeng NPA village. Their family is listed as average in terms of wealth despite the fact that their main source of incomes is only casual labour. Their house is made of bamboo/straw roof and wooden walls. They have no access to water supply system and have to go to the river to collect their daily needs. They have no latrine, but access to electricity with solar panels. They own a motorbike and an hand tractor, but no phone, TV, fridge, rice mill... Their other livelihood activities are upland rice cultivation, vegetable production and livestock rearing (6 cows, 8 buffalos, 2 pigs and 2 goats). In terms of agricultural land, they own only 2 ha of upland fields. In 2017, they produced 1,224 kg of upland rice consumed 100%, which is insufficient to feed such a large family (6-7 months of consumption only); All their vegetable production was consumed by the family (50 kg declared); They have sold 1 buffalo for 5,000,000 LAK; They consumed 4 of their pigs and 1 of their goats; They collected wild NTFP, hunted wildlife (8 kg), catch fishes, frogs, snails and crayfishes (50 kg) for their consumption; and declared earning 3,000,000 LAK in wage for casual labor. They don't have debts.

Access to loans



Existence of family savings



FOREST USE

Wildlife and aquatics law

Classification of natural resources in order of importance for protection and livelihoods have already been done by the Government of Laos. In 2009, they edited new laws for the protection of these resources. Protected wildlife and aquatic life listed in these laws comprises of Mammals, Birds, Reptiles, Amphibians, and Insects.

The Wildlife and Aquatic life regulations are divided into three categories:

1. PROHIBITION CATEGORY wildlife and aquatic = Category 1
2. MANAGEMENT CATEGORY wildlife and aquatic = Category 2
3. COMMON OR GENERAL CATEGORY wildlife and aquatic = Category 3

Wildlife and aquatic Prohibition category as defined in **CATEGORY 1** are listed as rare, near extinct, high value and are of special importance in the development of social-economic, environmental, educational, scientific research. The animals in this category as stated above shall be managed, inspected, preserved. The utilization of these animals shall be permitted by the government only under special circumstances, such as: for scientific research and breeding purposes, but shall require the permission from the government; If the animals capture caused damage to the individual's properties or an organization's properties, the individual/organization shall report the incident to the district authority or municipality to consider and resolve the issue; If an animal is destroying and endangering to human life, such an issue shall be resolved immediately and report to the concerned authorities.

Wildlife and aquatic management category, **CATEGORY 2**, comprises animals considered as beneficial in terms of national economic, social, environmental interests, and in addition are important for livelihoods of multi ethnic people and scientific research. It incurs restrictions and prohibitions on hunting, except in selected areas and/or in selected seasons. Customary hunt or catch will be allowed only if using tools and equipment which cannot cause any harm to the overall population of animals. The catching or hunting of animals for business purposes can be allowed only with the permission from the Ministry of Agriculture and Forestry.

Wildlife and aquatic general category or **CATEGORY 3** are wildlife and aquatic that are able to reproduce widely in nature, and are very important for social - economic development, and scientific research. The animals in this category can be used in accordance with the law as long as the use is not threatening the specie numbers or negatively impacting the ecological environment system. It means that they can be hunted only during specified seasons and by using tools and equipment not harmful to the animals' population. The catching and hunting animals for business purposes require the permission from the agriculture and forestry division of the province or Capital city.

The laws for wildlife and aquatic animals precise that domestication of protected animals for commercial purpose is possible as long as the wildlife animals used as breeding couples are not traded. This final restriction only applies for category 1, but not for category 2 and 3.

Forest laws

In Forest laws, **TOTAL PROTECTION ZONE** is the forest area that is main habitat, feeding and breeding place for various wild animals and it is the place of diverse and dense vegetation. In this zone, it is strictly prohibited to conduct any forestry activity, to harvest any forest products, including unauthorized entry in this zone. Transportation of plant and animal species is also prohibited, with some exceptions.

As we can see, the laws are very strict and clear on the regulations regarding the hunting and gathering of wildlife and aquatic life. However, it does not seem like the villagers are aware of all the subtleties of the different categories of protection. The reference to certain protected animals in the products hunted and fished during the inventory of forest products shows that they were not afraid of consequences or repercussions. Some big animals, like elephant, tiger and bear, are likely to be known as protected by the villagers, but it might not be so clear for smaller mammals like civet or giant flying squirrel. As for the animals listed in category 2 and 3, it might not even been considered as protected by them, outside of the Total protection zone. Because in the laws, animals in categories 2 and 3 can be hunted under certain circumstances – seasons, areas, tools and equipment – it might be unclear to the villagers that there is regulations in place and that they need to follow them in order to preserve the population of wildlife and aquatic animals.

FOREST USE

In each of the 16 enclave hamlets and 2 PIZ villages targeted by the socio-economic survey, a forest use inventory was conducted with the villagers to assess the situation about the existing fauna and flora in the village territories. Indeed, Humans and biodiversity are linked with particular depth in NNT, such that one researcher rightly noted that it makes most sense to speak of the "bio-cultural diversity" of the area (Chamberlain 2001). Using RRA methods, focus groups were organized and exercises were conducted with the participation of the villagers:

- The biodiversity assessment, an inventory non-exhaustive of forest resources identified by the villagers in their territory, including the use they have for these resources.
- The natural resource mapping, a map drawn by the villagers to locate the area where natural resources are collected, hunted, fished or protected.
- The forest walk, a walk made in selected forests to assess by observation the state of conservation or degradation of natural resources.

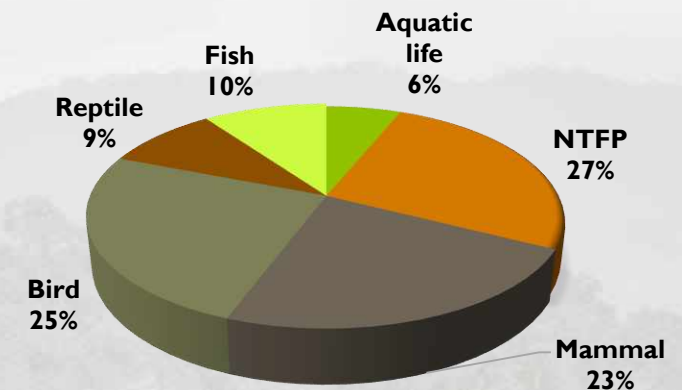
This inventory only presents the information that the villagers were willing to give. It is not an exhaustive study on biodiversity fauna and flora in the NPA.

The biodiversity assessment

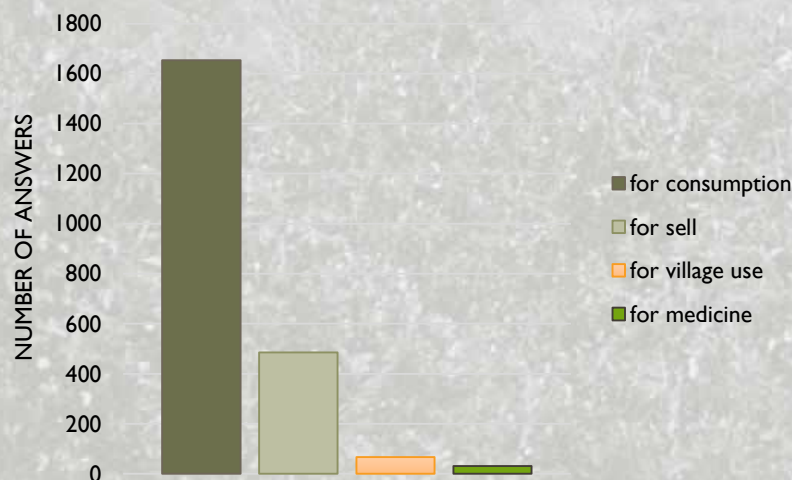
For the biodiversity assessment, focus groups have been set-up to identify the different natural resources existing in the village territory and the use by villagers. Once the list of resources (NTFP, mammal, birds, fishes, reptiles, other aquatic life) was made with the villagers, for each resource, their use was noted. A total of 12 aquatic life resources were identified, 80 birds, 29 fishes, 58 mammals, 92 NTFP and 17 reptiles. The list of forest resources is far from exhaustive, it only reflects on the ones used by the villagers. The results of all hamlets combined is showing that the type of resources that have been identified the most by the villagers are the NTFP with 27% of appearance in the database. After, come the birds with 25% and the mammals with 23%.

In the PIZ villages, the mammal types of resources decrease to 16% of appearance in the database, while NTFP is up to 29%. In the enclave villages, birds and NTFP types of resources are of equal importance in the database with 26% of appearance, and 24% for the mammal. In Navang Cluster, the mammal types are dominating the database with 26%, in Teung Cluster, it's the NTFP with 27%, and in Taphaiban Cluster it's the birds with 27%. But, in overall, we are not seeing major differences in the type of natural resource availability from one cluster to another.

AVAILABILITY OF RESOURCES BY TYPE



Main uses of forest resources



In general, these natural resources are reported to be used by the villagers for family consumption (96% of the identified products). 28% are also used for sell, 4% for other village uses (no detail on the uses). Only 2% were described as used for medicines, only in NPA villages. Some birds, mammals, reptiles and NTFP have been identified as medicines by the villagers, which lead to believe that the medicinal uses are under-estimated in this study and it would be interesting to deepen the question during the ethno-study.

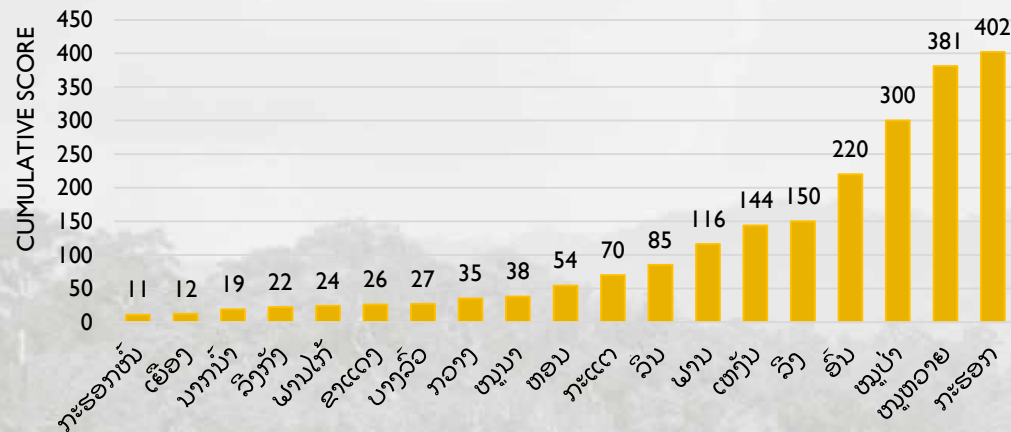
Only one forest resource has been listed only for sell. It is the ໄມ້ຟຸງ (false hemp tree). It was mentioned only in Phonsaart, a PIZ village, and listed as rare. ບັ້ວາ (mulberry tree) has been mentioned in both PIZ villages as a product for sell and for village use. These 2 products are not listed by villagers from the enclave villages.

Among the 281 forest products listed in the 18 hamlets, there was none mentioned with no use at all. Among these list of products, only 29 have been cited in some villages with no use (mostly ຜົງຕົວໜຶ່ງ one or more types of carnivore, ຊ້າງ elephant, ຂາດດອງ douc langur and ທະນີແກ້ມຂາວ gibbon). However, there are used in other villages, mostly for consumption.

FOREST USE

After listing all the natural resources available in their village they can think of, the villagers have been asked to select among these resources the more important ones for their livelihood. Once they were selected, each villager had to score these resources individually from the most important to the least important for their family. To do so, they used small rocks (or seeds) as points that they could attribute to one product or another according to their importance.

Natural resources used by villagers by importance for mammals



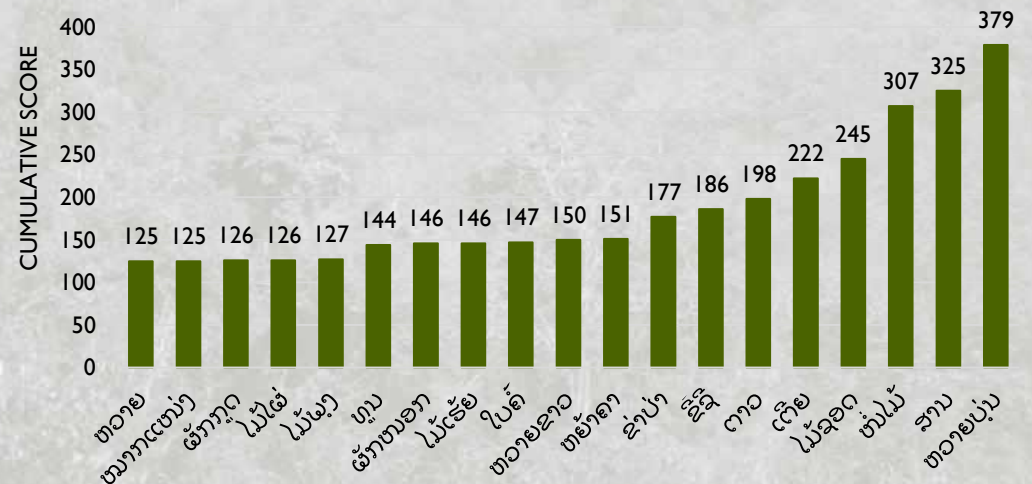
For mammals, 22 among the 58 listed are considered as important by the villagers in NPA and PIZ villages. In this adjacent graph, only mammals with a cumulative score superior to 10 are been presented.

Those with the higher cumulative scores (above 200) are - by order of importance - ກະຮອກ, ຫຼຸຫວາຍ (one or more types of squirrel and rat), ຫຼຸປ່າ (wild boar) and ອົນ (bamboo rat). The cumulative scores of these four products for consumption is 479, 575 for sell and 249 for other use. ກະຮອກ (type of squirrel) has been listed as still abundant in the forests, except in Songkhone hamlet, in Nahao village. ຫຼຸຫວາຍ (long-tailed giant rat) and ອົນ (bamboo rat) are not listed as rare as well. However, the wild boar ຫຼຸປ່າ is already considered as limited resource in 5 hamlets: Phonsaart and Thongkong (PIZ villages), and Namey, Kunae and Nameo hamlets in Namey village. Many protected animals under category I are hunted and consumed by villagers: ຕັງນ (Civet), ລິນ (pangolin), ກວາງ (sambar deer), ບາງລົວ (giant flying squirrel), ຂາດດງ (douc langur), ນາກນ້ຳ (otter) and ຄືອນ (southern serow).

As for the NTFP, a total of 39 products have been identified as more important for the villager livelihood, among the 92 NTFP products identified in the area. In the adjacent graph, only the NTFP with cumulative score over 100 have been kept.

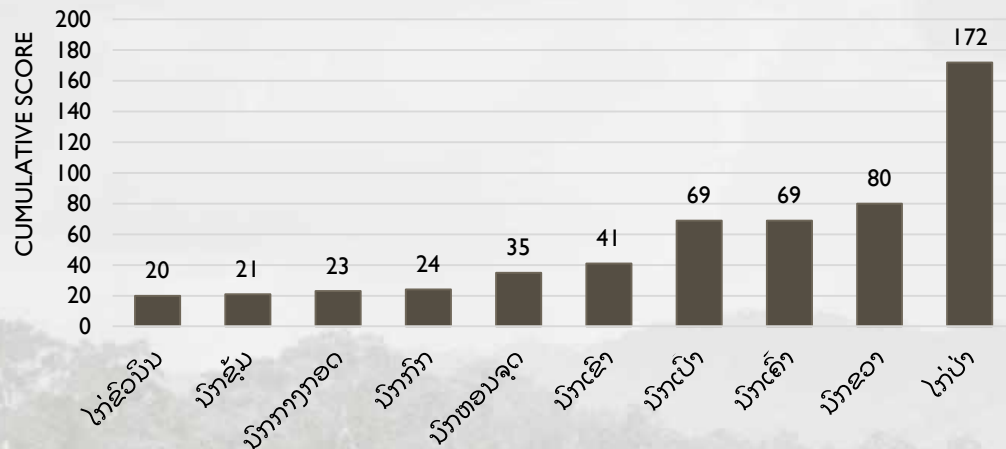
ຫວາຍບຸ່ນ (Rattan), ສາງ (Lao lady palm), ຫົ່ມໄມ້ (bamboo) and ຄື້ຍ (pandanus) are the products which have scored the highest (above 200). The villagers have identified different types of rattan: ຫວາຍບຸ່ນ (Rattan (bigger sp.)), which is used for both consumption and sale; ຫວາຍຂາວ (White rattan), not listed as important for consumption but for sale and other use; ຫວາຍ or ຫວາຍທຸນ (rattan) also identified as important mostly for sale and other use. According to the villagers living in the NPA, rattan species can still be found in abundance in the forests. ສາງ (Lao lady palm) is also used for consumption and for sale. It is still considered as abundant in the forests, except in Thamuang and Fangdeng Tai hamlets. Bamboo (ຫົ່ມໄມ້) is also listed under different names in the inventory database: the generic ຫົ່ມໄມ້ (bamboo) is used by the NPA hamlets; as the other names, such as ໄມ້ຜັ່ (bamboo used for construction); ໄມ້ແຮ້ວ (another type of bamboo); ໄມ້ແຮ້ຍ (Burmese bamboo); ໄມ້ຊອດ (Bamboo genus Schizostachyum sp.); ໄມ້ຂົມ (Bitter bamboo), are used only in the 2 PIZ villages. ຄື້ຍ (Pandanus) is used for consumption, sale and other uses. It is listed as abundant in the forests, except in Phonsaart, a PIZ village. It is listed as important mostly for sale and other uses. Only Buak hamlet has listed it as important for consumption.

Natural resources used by villagers by importance for NTFP



FOREST USE

Natural resources used by villagers by importance for birds



Among the 80 birds identified in the area, only 12 were listed as important by the families. In the adjacent graph, only the birds with a cumulative score over 10 are presented.

ໄກ່ປ່າ (Red Junglefowl or Wild chicken) is a protected species of birds in category 3. It is listed as the most important bird by the villagers, especially for consumption and sale. The resource has been considered as poor (depleted) only in Navang and Houay Masong hamlets in Navang village.

ນົກຂວາ (Pheasant) is another type of birds listed as important by the villagers. Unfortunately, they did not precise which type of pheasant, which makes it difficult to assess if it is a protected bird or not. However, it is common knowledge in the area by local Authorities and Research partners that Silver Pheasant (ໄກ່ຂວາຫຼວງຫຼັງຂາວ), a protected species in category 1, is one of the pheasant widely hunted by villagers for sale.

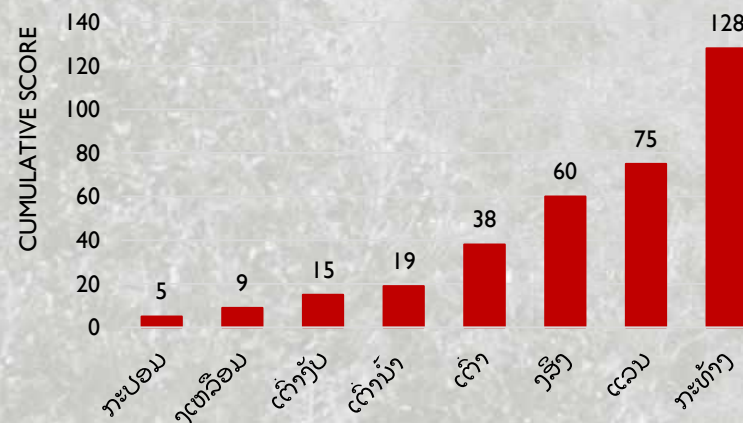
ນົກເບົາ (Green Pigeon) is a genus of bird in the pigeon family *Columbidae* containing 29 species. Green pigeons are classified in category 2. ນົກເຄົ້າ (type of large owl) is also a protected bird in the NPA (category 1). Large hornbill species like ນົກກົກ and ນົກເຂົາ are also listed as important for the villagers' livelihood.

For reptiles, the most important seems to be the ກະທົ່ງ (Water Dragon), protected under category 2, used for consumption, sale and other uses. It is not considered as rare by villagers. ຄວນ (Bengal monitor) is also a category 2 protected reptile considered important for villagers' use, especially for consumption and sale. It is already listed as rare in 8 hamlets: Phonsaart, Thongkong, Kaching, Fangdeng Neua, Thamuang, ເຕົາ (turtle) are also widely hunted with a score of 72 when cumulating the scores from the answers ເຕົາ, ເຕົານ້ຳ and ເຕົາງັບ. Most of the turtle types present in the NPA are protected under category 2. ງູເຫລືອມ (Reticulated python) is a protected species under category 1.

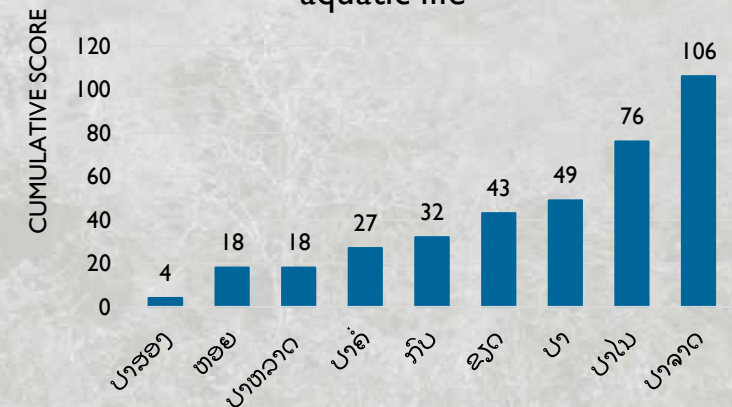
As for the fishes and other aquatic life, one fish ປາຈາດ (Poropuntius species) is listed as the most important for sale, consumption and other uses, in Taphaiban and Teung Clusters. The second fish listed as important is ປາໄມ (common carp). The rest of the fishes has been regrouped in the generic ປາ (fish).

ກົບ (Frog) and ຂຽດ (bullfrog) are protected under category 3. They are listed as important mostly for sale in Navang and Teung Clusters, but for consumption in Taphaiban Cluster. ປາຄໍ້ (snakehead murrel) and ປາຫລາດ (tire track eel) are also listed as least concerned by IUCN.

Natural resources used by villagers by importance for reptiles



Natural resources used by villagers by importance for fishes and other aquatic life

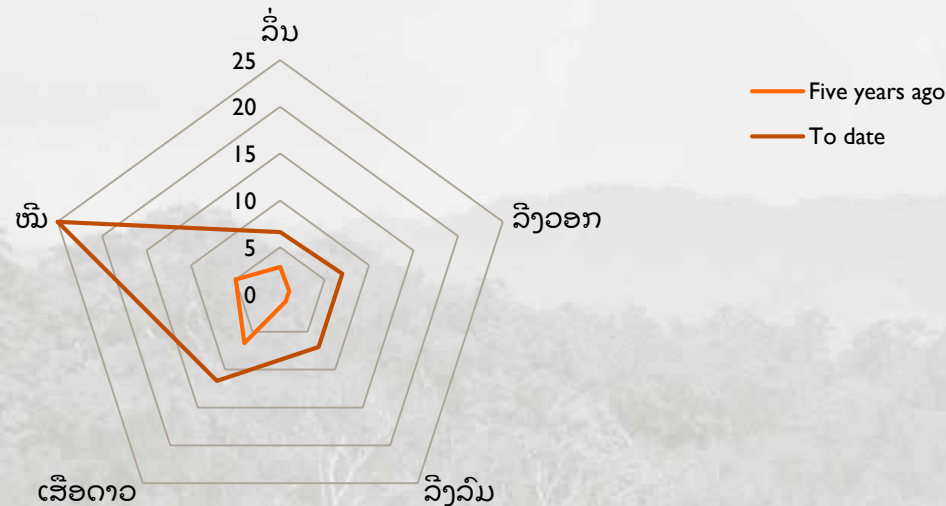


FOREST USE

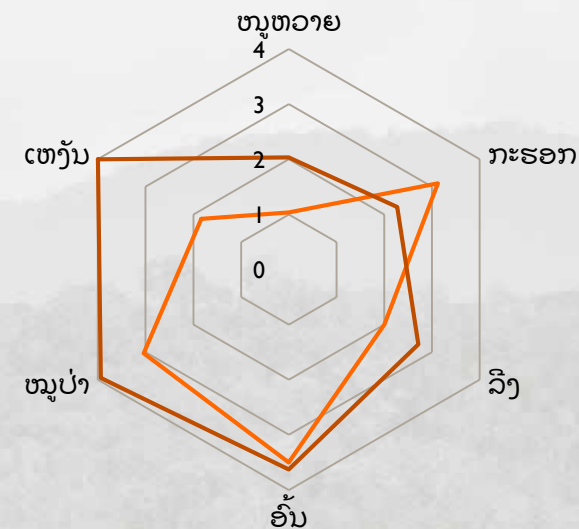
Threats on forest biodiversity

After the inventory of the natural resources used by the villagers on their territories and the classification by score according to their importance, the focus groups were asked to assess the disappearance or not of these resources. To do so, two indicators were used: the walking distance in hour to spot the natural resources, and the maximum quantity collected a day. These two indicators were asked at two dates: five years ago and now. These data reflect villagers' perception of resource extinction and can not replace scientifically established inventories.

Walking distance to spot mammals (in hour)



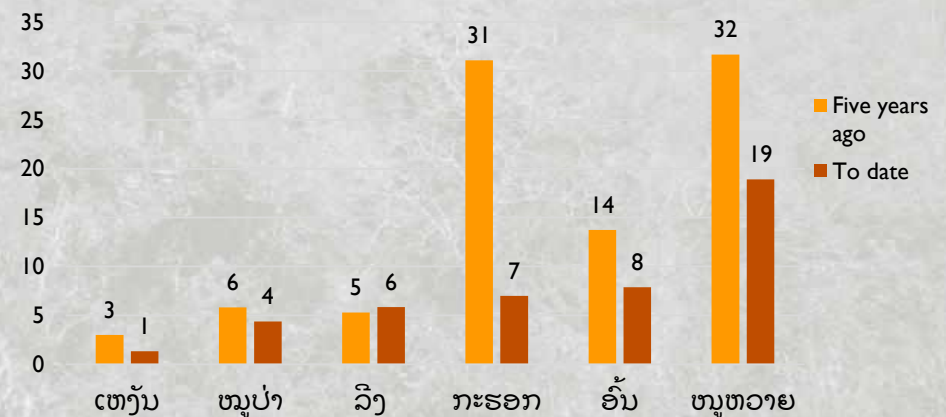
Walking distance to spot mammals (in hour)



For mammals, loss of biodiversity extends almost to all inventoried animals. When considering only the 6 types considered today as the most difficult to foresee, we note the presence of animals protected in category 1. These animals are now very difficult to spot close to the village territory. For example, ພື່ນ (bear), already difficult to see 5 years ago (5 hours of walking) are now very difficult to report (25 hours of walking). ລື (loris) and ສີງວອນ (type of macaque), nevertheless present near 5 years earlier (1 hour of walk) are today far from the villages (7 hours). When considering the data for the mammals presented as the most important by the villagers for consumption, sale and other uses, we can see that, with the exception of ກະຮອກ (one or more types of squirrel) and ອື່ນ (bamboo rat), all the 4 others are also getting scarce around villages.

The second indicator on maximum quantity collected on a good day of hunting is showing other information. If ລື (macaque) are a little further away now from the villages, their population does not seem to decrease much as villagers reported an increase in the number of catches per day, from 5 to 6. ກະຮອກ (one or more types of squirrel) and ພູຫວາຍ (one or more types of rat) are the two mammals the most affected by excessive hunting, going respectively from 31 and 32 per day down to 7 and 19.

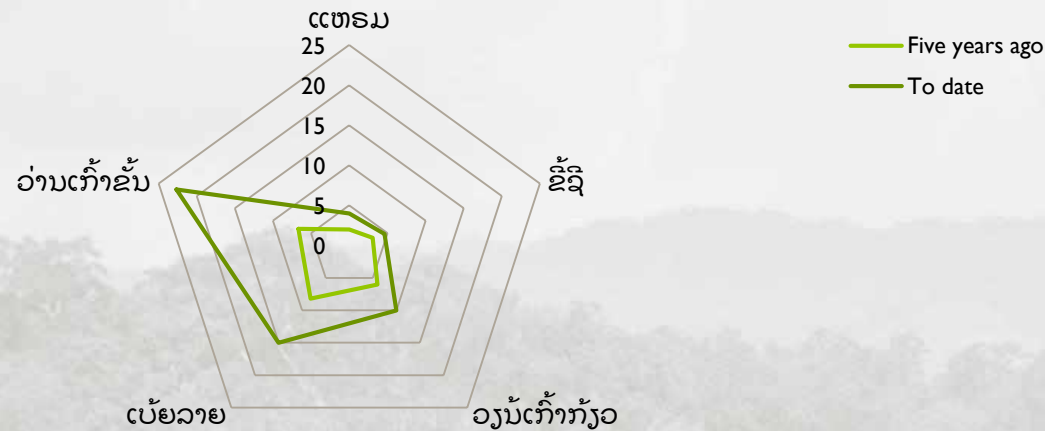
Natural resource maximum quantity collected (unit/day) for mammals



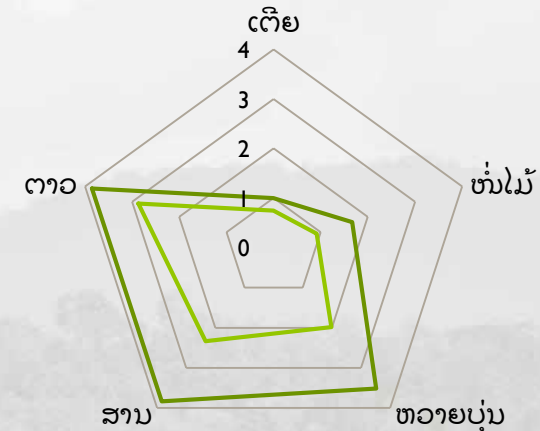
FOREST USE

For NTFP, the decrease in resources available nearby the villages is more obvious on the NTFP collected for trade. ວ່ານເກົ້າຂັນ (Cordyceps Sinensis) in particular has been harder to find, from 4 hours of walking five years ago to 23 hours now. Cordyceps is a type of mushroom entomopathogen growing on lepidoptera insect corps. It can be used for medicinal purpose. The Chinese have been using cordyceps for about 1000 years. Because of its rarity, it was mostly reserved for the Emperor and his court. It is highly sought after for traditional Chinese medicine. Its price is very attractive for the villagers, reaching 150,000 LAK per kilo.

Walking distance to collect NTFP (in hour)



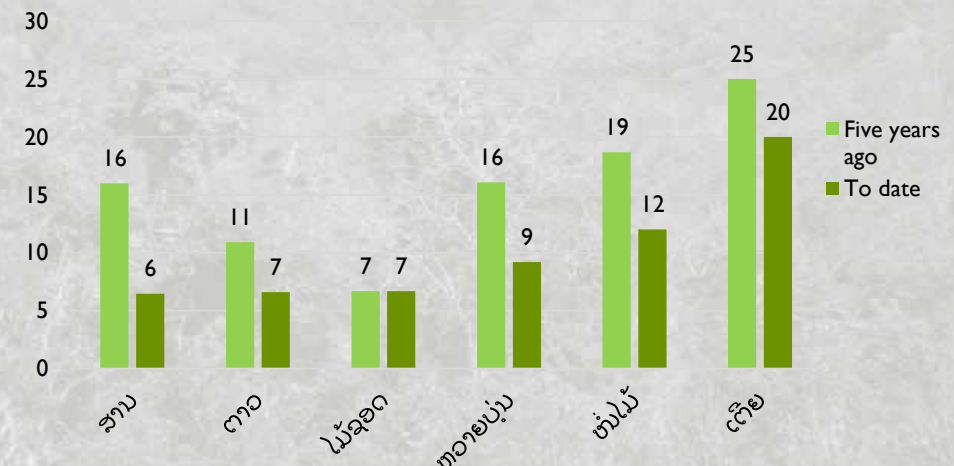
Walking distance to collect NTFP (in hour)



NTFP used for both consumption and sale such as ຫວາຍບຸ່ນ (Rattan bigger sp.), ສານ (lao lady palm) and ຫົ່ນໄມ້ (bamboo) are also decreasing in availability near the villages, as well as in quantity available for gathering. When gathering data on the quantity available, the villagers could not provide a similar unit, such as kilo or piece. Therefore, the data in the adjacent graph should be read in light of the fact that some resources were calculated in kilograms, others in pieces, in leaves or in bunches.

In terms of economical perspectives, the hamlets in Navang and Taphaiban villages have reported ຫາກແຫຼ່ງ (cardamom) as another lucrative NTFP collected. Five years ago, on a good day of collecting wild cardamom, most of the hamlets have declared being able to collect between 5 to 15 kg, while today, the quantity collected are down to 2 to 6 kg. Wild cardamom is sold at a different price from one hamlet to another, from 20,000 to 50,000 LAK per kilo. Five years ago, a good day of gathering could provide 270,000 LAK of incomes on average, while today, it is down to 127,500 LAK. Cardamom is one of the NTFP whose domestication is possible. It has been done in the Northern Uplands of Laos, mostly with ກວາງຕຸງ (Kuangtong) variety, a Chinese variety producing bigger fruits and more sought after by Chinese collectors. However, in NPA area, to preserve the specific biodiversity of these forests, only local varieties should be reproduced, in garden area in association with other trees, such as fruit trees.

Natural resource maximum quantity collected (unit/day) for NTFP



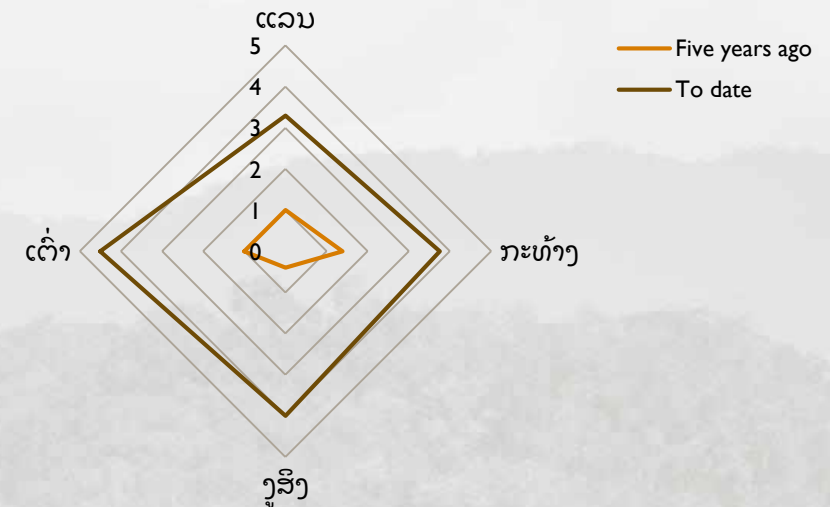
FOREST USE

For birds, ໄກ່ຂົວນົນ (one or more type of pheasant), which was already difficult to spot (4 hours of walking from the village) is now spotted only after 10 hours of walking on average. ນົກຂວາ (Pheasant sp.) are also decreasing in sight. ນົກເປົ້າ (green pigeon) is rapidly disappearing from the outskirts of villages due to excessive hunting. Only ໄກ່ປ່າ (Red Junglefowl) population seems to stay close for now, while ນົກກົກ (large Hornbill sp.) are even spotted closer to villages now. But in general, while looking at the maximum quantity reported for a good day of hunting by villagers, all population of these birds have decreased greatly over the past 5 years, according to the villagers.

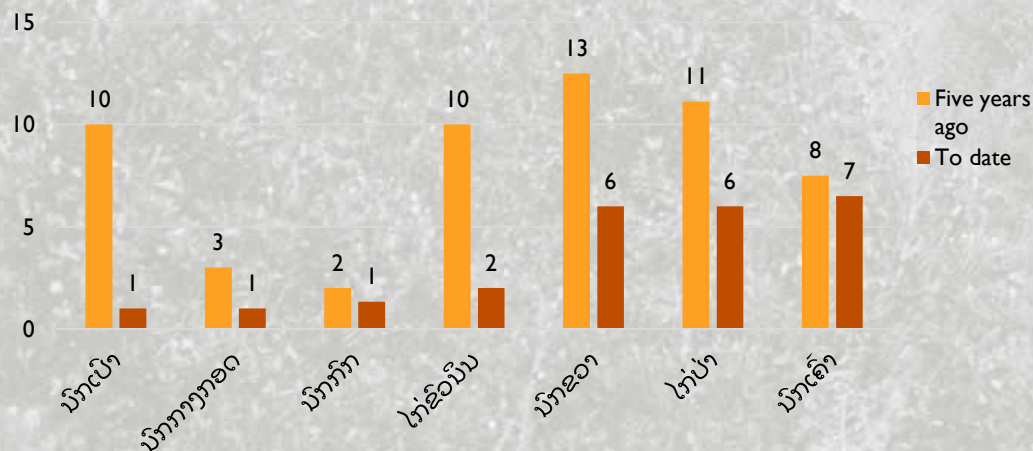
Walking distance to spot birds (in hour)



Walking distance to spot reptiles (in hour)



Natural resource maximum quantity collected (piece/day) for birds



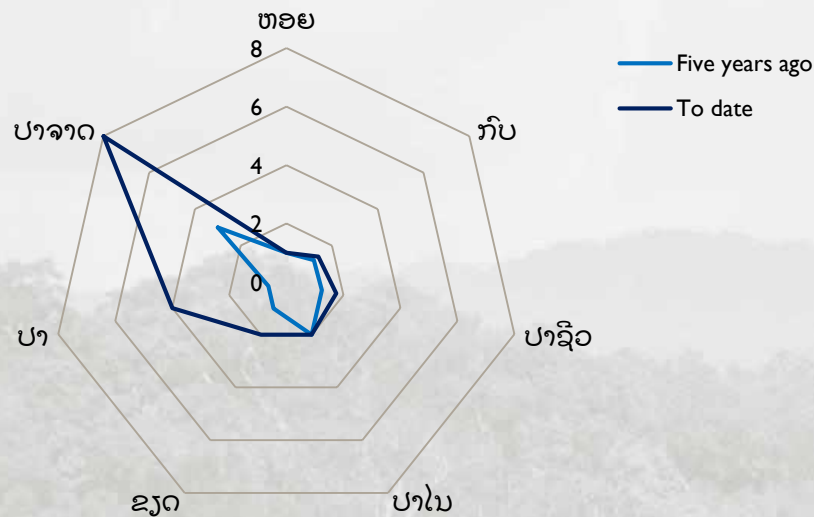
For reptiles, only 4 types were reported during this focus group exercise. These 4 reptiles seems to be greatly threatened in the area. Their population are decreasing in a fast path. ງູສິງ, one or more types of non-venomous snakes, have retreated further away from the villages - from 20 minutes to 4 hours of walking to spot them now – but they can still be find in equivalent quantity (15 to 14 snakes a day). While ກະທັ່ງ (water dragon) has decreasing in population: greater distance to spot them (1,4 to 3,8 hours) and lower quantity collected a day (10 to 4). ຄູ່ງ (Bengal monitor) is also threatened: 1 to 3 hours of walking, and 3 to 2 catches per day. ຕົ້ງ (turtle), with no specification on the species, have decreased from 6 turtles caught in one day to 3, and from 1 hour of walking from the village to spot them to 4,5 hours.

All these reptiles are protected under different categories. Turtles are sold at a higher price than the other reptiles (100,000 LAK/piece), which could be an explanation for their rapid depletion. ງູສິງ (one or more types of non-venomous snakes) are only used for family consumption. ກະທັ່ງ (water dragon) and ຄູ່ງ (Bengal monitor) are both sold for a price ranged between 20,000 to 50,000 LAK per animal depending on the size and the village location.

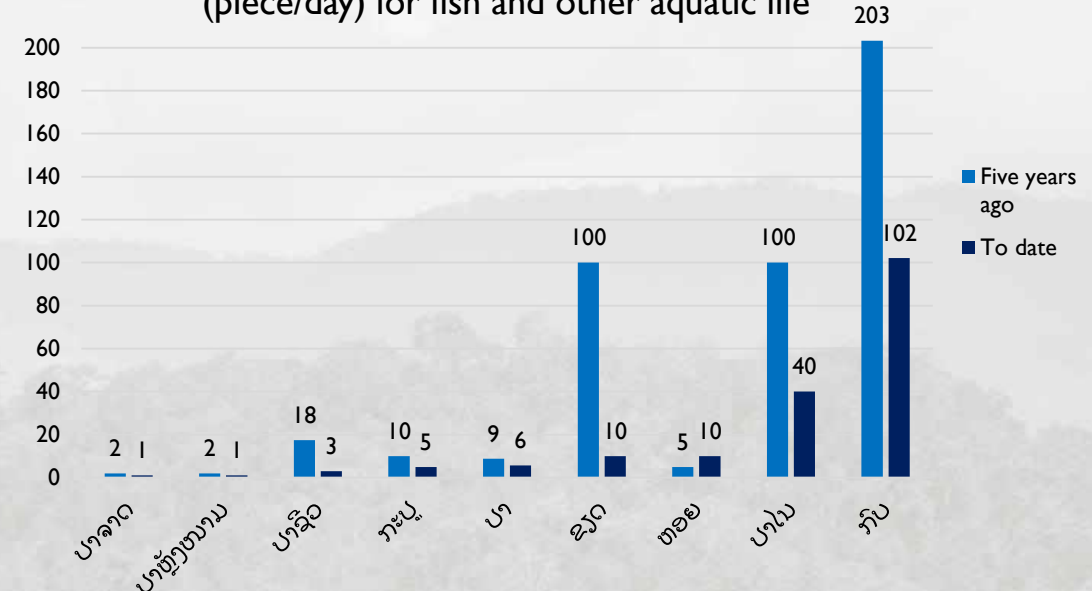
FOREST USE

For fish and other aquatic life, ກົບ (frogs) are collected in large quantity compared to other types of resources. While frogs seem to stay close to the villages, the maximum quantity available to catch in one day has been divided by 2, from 203 frogs five years ago to 102 now. ຂງວ (bullfrogs) are also decreasing in terms of availability near the villages (from 1 hour of walking to 2 hours) and in quantity (from 100 a day to 50). Frogs and bullfrogs are both been declared by the villagers for consumption and sale (from 15,000 to 50,000 kips per kilo).

Walking distance to collect fish (in hour)



Natural resource maximum quantity collected (piece/day) for fish and other aquatic life



ປາໄນ (common carp) is the only type of fishes, with ປາຈາວ (Poropuntius sp.), which have been named specifically by the villagers. All other fishes have been grouped under the generic term ປາ (fish). If ປາຈາວ (Poropuntius sp.) seems to be decreasing greatly in quantity and availability, compared to ປາໄນ (common carp), it was still listed by the villagers as an important resource. Villagers in Buak hamlet, Teung Cluster, have declared using it for consumption and sale, but in Namey-Kunae (Teung Cluster), Korbong, Singthong and Nakang (Taphaiban Cluster) it is reported for “other uses”. Unfortunately the team who collected the data did not specify what were these other uses.

“In a review of the conservation status of fish in mainland Southeast Asia, Kottelat et al. (2012a) reviewed the major threats affecting freshwater fishes. They found that alteration of river morphology is the most important threat since it modifies or suppresses the habitats and the hydrological features upon which the fish depend. Among these alterations, the development of dams and reservoirs is the most crucial threat. [...] In the inundated zone, the species requiring rapids and fast water are now absent or have populations with fewer individuals. As their range upstream of the reservoir is not inundated, a part of their habitat remains and is protected by the NPA. [...] Sampling was conducted in the upper Nam Theun in 1996, 2003, 2006 and 2012; several sites were visited twice and one site was visited 3 times. In 2012, the situation of the aquatic habitats in the upstream Nam Theun above FSL has not changed significantly since the original 1996 survey. However the human population has increased and is more present along the river, with more houses and new hamlets. [...] The species diversity at the uppermost point that can be reached by boat was comparable to that of previous years: 23 species collected in 2012, 18 in 2006, 26 in 2003. But compared to earlier years, there was no large fish in 2012. Although no conclusion can be reached from a single sampling, this might reflect an increased fishing pressure. It might as well reflect that at this site the water was shallower and flowing over a much wider bed while in the previous years the rapids were narrower and deeper.” **Extract from M. Kottelat, The fishes of the Nam Theun and Xe Bangfai drainages, Laos (2015).**

FOREST USE

When asked what was their opinions about the causes that might explain why some natural resources are disappearing, the villagers have mentioned several reasons they believe could be responsible for the depletion of natural resources. When asked to list and then rank the main causes for natural resources depletion, the villagers are blaming first over-harvesting and increase in human population, which are generally linked.

Main causes of natural resource decreasing



As we know from the FCS survey and the Forest Use inventory database, natural resources are an important part of the family diet. They contributed to their food security and their culture. Without them, the family diet diversity is dropping under the acceptable line.

In the case of human population increase, it is not surprising to observe an increase in the use of these natural resources and a decrease in the population of mammals, birds, reptiles, fishes and aquatic life used for consumption and sale. However, as it is threatening the preservation of endangered species, as well as the sustainability of human settlements in the NPA through their access to food, it is important to act now on this issue before it is too late.

To do so, two types of activities must be carried out together:

- ✓ The conservation activities: set-up of the Community Conservation Agreement (CCA); set-up of protected habitats and reproduction areas through PLUP; capacity buildings for the rangers to enforce the Wildlife and Aquatic Laws and land use regulations.
- ✓ The livelihood activities: set-up of the Community Action Plan (CAP) to reinforce agriculture activities; alternative sources of incomes, domestication or assisted natural regeneration for some of the natural resources used by villagers...

Recent data on wildlife poaching

Only recent data on wildlife poaching and illegal trade within the NPA has been provided to the consultancy team. Despite requests for the provision of WMPA activity reports for the last 10 years, these have not been provided to the consultancy team. Therefore this report can only provide analysis based on information collected in the villages in 2018, as well as databases and reports produced by the COTE.

According to the most recent data collected on wildlife poaching in the NPA, based on the incident reports from January to August 2018 issued by WMPA-COTE, 46 incidents have been reported with 23 followed by direct actions. 52 persons were involved in these incidents, including 20 persons from Nakai District, 19 persons from Gnommalath and Khamkert Districts, and 2 Vietnamese citizens. Among the 20 persons from Nakai District, 8 were villagers residing within the NPA, in Makfuang hamlet more precisely.

Wildlife resources involved in these incidents are:

- ✓ Mammals: ຫອນ (Brush-tailed porcupine), ລີງ (Macaque sp.), ຂາແດງ (Douc langur), ສັດຈຳພວກເຫງັນ (Civet sp.), ຫຼູບ່າ (Wild boar), ຟານ (Muntjac sp.), ສັດຈຳພວກເສືອ (Cat sp.), ຫນາໄນ (Dhole), ນາກ (Otter sp.), ເຍືອງ (Serow sp.);
- ✓ Birds: ສັດຈຳພວກໄກ່ຂົວ (Pheasant sp.);
- ✓ Reptiles: ຕົງ (Turtle sp.), ງູຈົງອາງ (Cobra sp.);
- ✓ Fishes: ປາ (no specification in the data received)

These recent data are consistent with the testimonies of the villagers about poached wildlife. It also shows that 85% of the persons apprehended for these illegal activities are living outside the NPA. It does not mean that the NPA villagers are not engaged as well in such activities, but it shows the importance of the threats coming from PIZ villages, as well as Vietnamese traders.

Conclusion

According to the WMPA (SEMFOP 2 report, 2014), threats to biodiversity and protected species in the watershed have multiple causes: encroachment into NPA by outsiders from peripheral impact zone; incursion by Resettlement Villagers; trans-boundary incursion by Vietnamese; use of natural resources by communities inside NPA; uncontrolled access – easy access to the NPA; and clearance of land for agriculture. In this assessment, the data is showing that threats to biodiversity and natural resources are still present in the watershed. In SEMFOP 2, livelihood activities provided by WMPA to the villagers in the NPA and PIZ villages should have contributed to achieving conservation targets set in a participatory manner between the villagers and the WMPA within Community Conservation Agreements (CCA). These agreements were supposed to be signed in exchange for the development activities provided to the villagers for the development of their villages. However, during the period of data collection, the consultancy team was not able to recover any CCAs from the target villages. Also, no evidence was found of involvement of local authorities and villagers in conservation activities, with the exception of some village rangers. The consultancy team did not received any documents supporting the idea that CCAs have been written over the past 10 years.

In the NPA, the villagers are still using protected natural resources for consumption, but hunting for sale is reported by them as more and more anecdotic, depending on opportunities more than being a full-time income-generating activity. For some, increased access to lowland paddy field has facilitated this transition from a self-subsistence agriculture coupled with hunting and gathering for food security to a more agrarian life. For the poorest families, casual labour work is more secured than hunting and gathering due to the rapid depletion of the natural resources around the villages and the risks of heavy fines or imprisonment in case of control by ranger patrols. As for swidden cultivation, the revision of the PLUP (Participatory Land Use Planning) in the NPA and PIZ villages, started by the COTE team in June 2018, is already showing, in Navang village, complains from villagers of increased population pressure and the need for more hay land. Since 1996 Chamberlain's Socio-economic and cultural survey, the complains are the same within the NPA: "increased population pressures on: available land for shifting cultivation; decline in soil fertility; increased weed infestation attributed to decreasing fallow periods of swidden fields; and decreasing numbers of fish in streams and wild animals in the forest attributed to an increase in the level of hunting and fishing" (p. 47).

Recommendations

During the years WMPA did not received funding from NTPC the ranger patrols within the NPA have came to an halt. Only four village ranger teams patrolling Nam Chae area were active, thanks to the support of Anoulak project. It is now urgent to reinstall these patrols in order to protect the natural resources within the NPA. Since the last quarter of the year 2017, this role has been undertaken by the COTE team of the component 2 of the project "Strengthening the capacity of the WMPA to effectively manage the NT2 Watershed and Nakai-Nam Theun NPA".

However, an intervention strategy for the protection of natural resources based solely on control and repression cannot be sustainable. Local communities living in and around the NPA must be truly involved in conservation activities. Remuneration for environmental services as solutions against the degradation of natural resources must be considered with caution. Conservation activities should not be dependent on external funding that may stop at any time, as has happened in the past. The motivation for preservation and conservation cannot be solely monetary or because of counterparties in the form of infrastructure. Development activities to improve access to food and incomes should be supported to reduce people's dependence on forest resources. Access to credit to invest in income-generating activities would be a more sustainable solution over time rather than compensation for environmental services .

The conditions are now met to work in this direction. SEMFOP 3 was published and funding resumed. A consortium of experts has been asked to support the WMPA for sustainable watershed/NPA management and livelihood improvement. A methodology called "Community Engagement Framework" (CEF) has been provided as guideline for participatory community consultation, planning and implementation of livelihood and conservation activities. Village Development Funds will also be implemented to support entrepreneurship through loans.

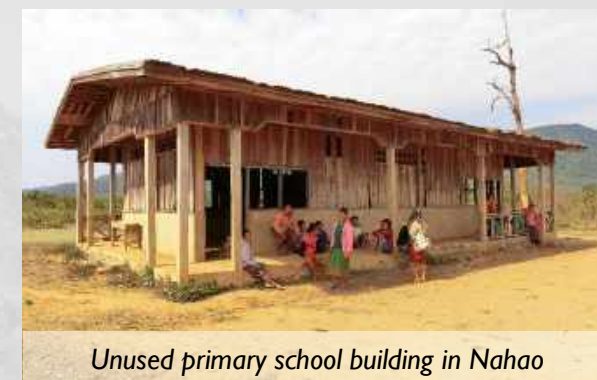
"All livelihood systems [...] clearly indicate that food security of all ethnic groups in the watershed and periphery is primarily relevant to hunting, fishing and NTFPs collection combined with agriculture. The WMPA has recognized that without sustainable use of forest resources, there would not be ongoing food security produced by forest, and the loss of biological resources will exacerbate the poverty, and likewise, poverty will become a major threat to biodiversity. [...] Therefore, achieving food security through agricultural development and improved management systems for forest resources are primary goals of the watershed management to ensure that current livelihood system are sustained in a manner consistent with conservation objectives." **Extract from WMPA NT2 SEMFOP 2 report, 2014.**

PAST DEVELOPMENT ACTIONS

Livelihood activities

Agriculture extension and livelihood support activities have been carried out in most of the target villages by WMPA since 2004 (rice banks, livestock funds, distribution of paddy seeds and tree seedlings, etc.), but there is poor institutional memory at WMPA level (no record of implemented activities) and an overall lack of evaluation and lessons learning about the results and impacts of these actions. This study had to rely on the villagers' memories to do an inventory of past actions in each hamlet and village. Using the form named "Village socio-economic analysis" from the CEF manual, the team collected data related to past projects in the target hamlets. From one table to another in the form, data were reviewed and dates readjusted if necessary.

Hamlet	Village	Cluster	WMPA support	Comments
Nameo	Namey	Teung	2004: Primary School (PI-P5)	For 2 hamlets: Nameo and Namey
			2007: Health Centre	Two health staff (one from District, one from village) for the all cluster
			2013: Irrigation system	To irrigate 5 ha of rice fields
Namey			2013: Irrigation system	To irrigate 3 ha of rice fields
Buak			2010: Water supply system	Still in use. Acceptable condition.
Kunae			2004: Village Animal Fund	6 big animals (cows or buffalos)
Nahao	Nahao	Navang	2006: Water supply system	Spring catchment, water reservoir and 5 taps. Still in use. Acceptable condition.
			2007: Solar panels	30,000 LAK/month for 10 years to acquire solar panels. 36 families.
			2007: Health Centre	Two health staff (one from District, one from village) for the village 4 rooms, 4 beds and 2 toilets
			2010: Village office building	Also serve as house for WMPA staff
Songkone			2006: Water supply system	Spring catchment, water reservoir and 5 taps. Extension of 5 more taps done in 2013 by NTPC2.
Thamuang			2006: Agricultural activities	Rice bank with 1 t. of rice, 1 granary, livestock, 1 hand tractor
			2010: Water supply system	27m3 water reservoir and 7 taps. Still in use. Acceptable condition.



PAST DEVELOPMENT ACTIONS

Hamlet	Village	Cluster	WMPA support	Comments
Navang	Navang	Navang	2006: Water supply system	47,5 m3 water reservoir and 5 taps. Currently broken. No water in reservoir.
			2007: Rice bank	3,000 kilos of rice
			2007: Solar panels	30,000 LAK/month for 10 years to acquire solar panels.
			2007: Health centre	Two health staff (one from District, one from village) for Navang and Fangdeng
			2012: Primary school	For 2 villages: Navang and Fangdeng Permanent building and equipment
			2014: Secondary school	For the 3 villages within the cluster: Navang, Fangdeng and Nahao
Houay Masong			2014: Village Animal Fund & rice seeds	3 cows, 24 pigs, 36 goats, 180 poultries & 2 ha of rice fields planted
			2006: Water supply system	Water reservoir and 4 taps. Currently broken. No water in reservoir.
			2007: Solar panels	30,000 LAK/month for 10 years to acquire solar panels. 9 families.
Kaching			2014: Village Animal Fund	
			2003: Rice bank	3,000 kilos of rice
			2006: Water supply system	Water reservoir and 3 taps. Currently broken. No water in reservoir.
			2007: Solar panels	30,000 LAK/month for 10 years to acquire solar panels. 10 families.
			2015: Village Animal Fund	



Other projects have been implementing activities in the NPA villages before WMPA or during their time, especially:

- ✓ The Khammouane Development Project (KDP) (2008-2016): Health centres in Korbong and Nahao hamlets.
- ✓ The Upland Project (2003-2006): schools, health centres, latrines, small irrigation, livestock, in the 3 NPA clusters.
- ✓ Others: Upland development company (1994-95) for road construction in Navang Cluster and small irrigation in Teung Cluster; FAO (1997-98) for rice varieties trial plots in Makfeang village (Taphaiban Cluster); Bequal (2013) for primary and secondary schools construction in Navang village.

PAST DEVELOPMENT ACTIONS

Many of the infrastructures and equipment provided are broken or not in use anymore. Lack of maintenance, capacities and funds has led to a gradual deterioration of the structures. Mechanisms to insure the sustainability of activities such as infrastructure maintenance committees, collective management of funds, animals or seeds, as well as reimbursement of equipment, have not been effective or followed-up effectively.

Hamlet	Village	Cluster	WMPA support	Comments
Fangdeng Neua Fangdeng Tai Thongsad	Fangdeng	Navang	2006: Water supply system	Water reservoir, 4 taps. Broken pipes and low flow going to the reservoir.
			2006: Village Animal Fund and Rice bank	2,700,000 LAK to support the purchasing of animals and 3,000 kilos of rice
Thaphaiban	Thaphaiban	Thaphaiban	2004: Village Animal Fund	15 goats
			2010: Water supply system	Including 4 taps. Actually, no water in reservoir. Not in use.
Singthong			2008: Water supply system	12 taps. Leaked pipes, no water in reservoir. Water collected next to the reservoir.
			2009: Small irrigation system	
Korbong			2007: Village Animal Fund	5 cows and 15 goats
			2010: Water supply system	4 taps. Acceptable condition. Still in use.
			2014: Health Centre	4 rooms, 2 bathrooms
			2015: Latrines	1 for health centre and 2 for WMPA staff house
Nakang			2007: Solar panels	30,000 LAK/month for 10 years to acquire solar panels. 20 families.

The 2 PIZ villages targeted for the survey in Gnommalath and Khamkert Districts have not received the same type of support from WMPA. The District authorities of Gnommalath and Khamkert Districts have declared that they were not able to work alongside the WMPA before the arrival of the COTE. In Phonsaart village, the local authorities have declared that WMPA has only supported the creation of a Village Fund for rural micro-finance service. The villagers needed the approval of their loans by DAFO before being able to borrow money from the Fund. So far, there have been no monitoring or evaluation of this activity, since its implementation.

Projects from CARE (2002-2005), IRD (2005-2011) and World Vision (2005-now) have been working as well for the development of these 2 PIZ villages,



Broken water tap in Fangdeng village



Pipes from irrigation system in Namey village

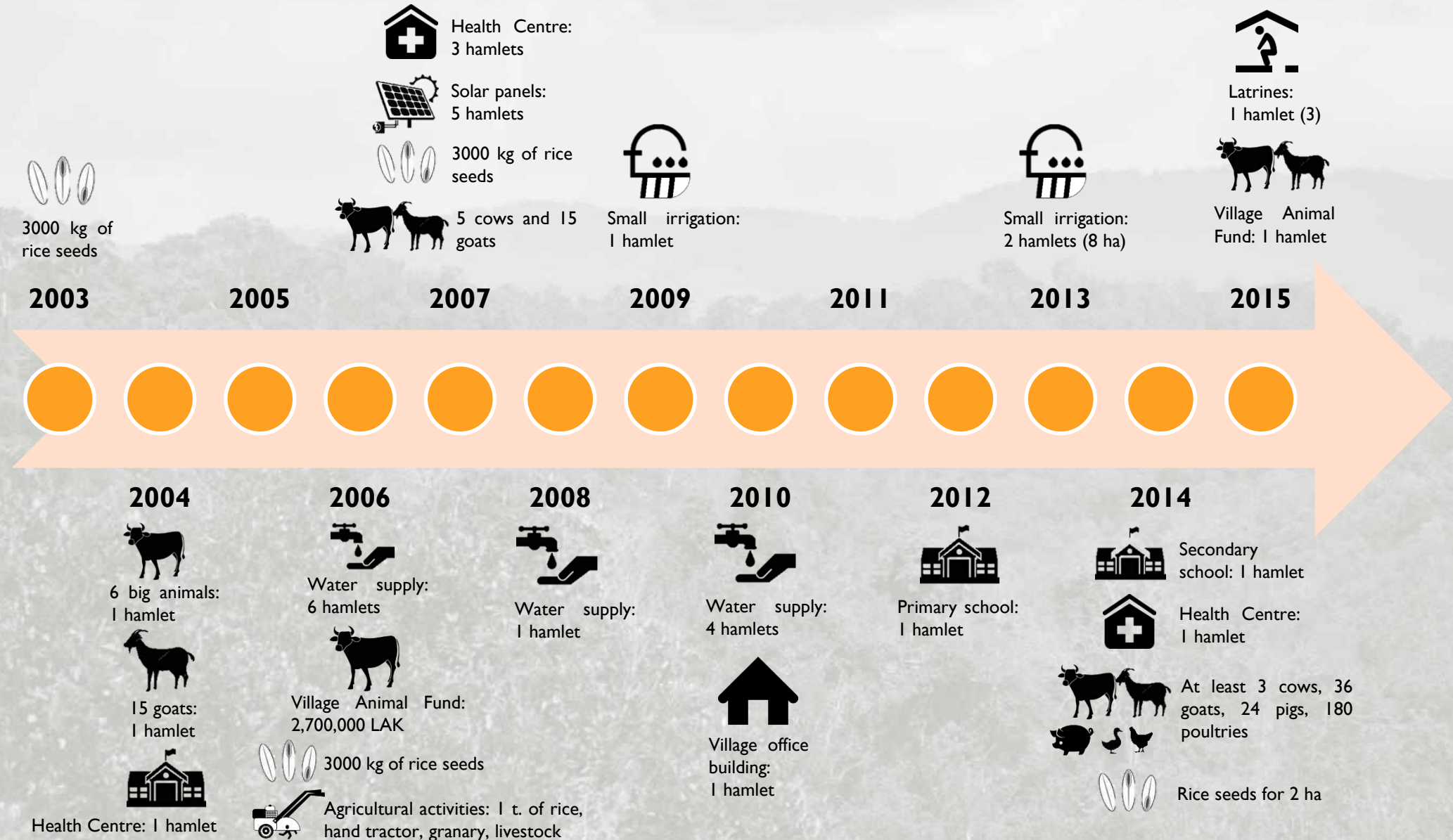


Water supply system on Korbong hamlet

PAST DEVELOPMENT ACTIONS

WMPA involvement over the years

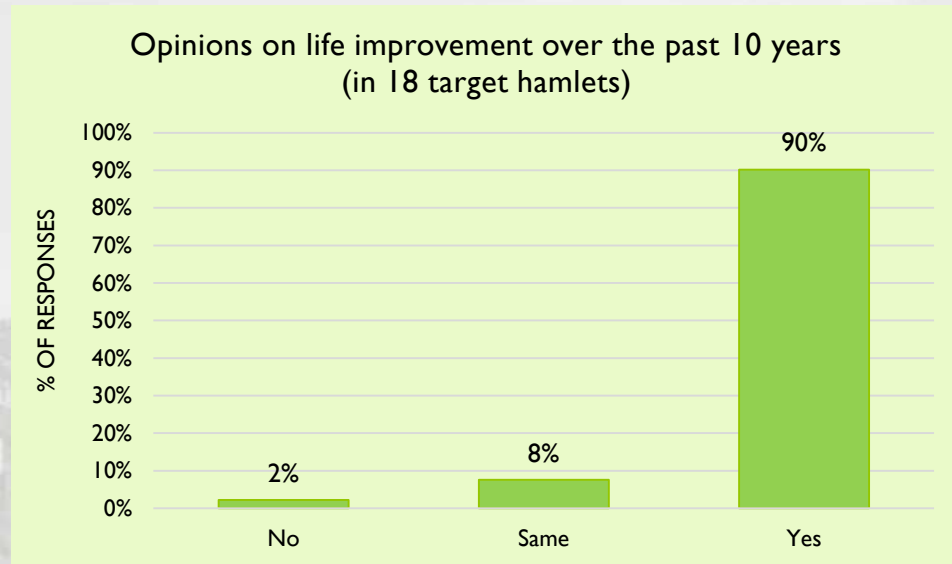
Over the past 15 years, WMPA has achieved various activities in the selected target villages, especially in health, sanitation and agricultural activities. However, considering the large budget allocated each year, the lack of efficiency in the use of funds is obvious. Some villages, especially the more accessible in Navang Cluster, have benefited from more support than others. However, as only the activities done in the survey target hamlets are listed here, it doesn't make for an exhaustive list of WMPA's work over the years.



PAST DEVELOPMENT ACTIONS

Households' satisfaction regarding WMPA past actions

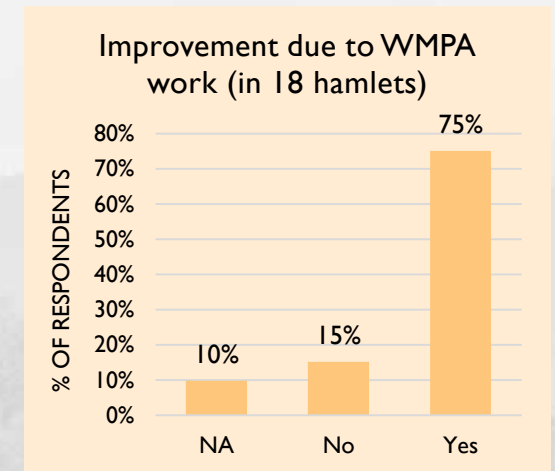
During the socio-economic survey, questions were asked during the family profile data collection by questionnaire about their views on their livelihood conditions and if rather or not it has been improved over the past 10 years. And then, opinions of the families were asked regarding the actions of WMPA in their hamlet over the past 15 years.



In general, 90% of the families interviewed (593 households) considered that their life has improved over the past 10 years. Only 2% considered that it is worse than before and 8% about the same.

Regarding the fact that this improvement is due to the past actions of WMPA, 75% of the respondents have responded positively, while 10% did not answer and 15% considered that it was not the consequence of WMPA works, in the 18 target hamlets.

In the 2 PIZ villages, 88% of the respondents considered that their life has been improved over the past 10 years. However, 82% of the respondents considered that this improvement had nothing to do with WMPA work.



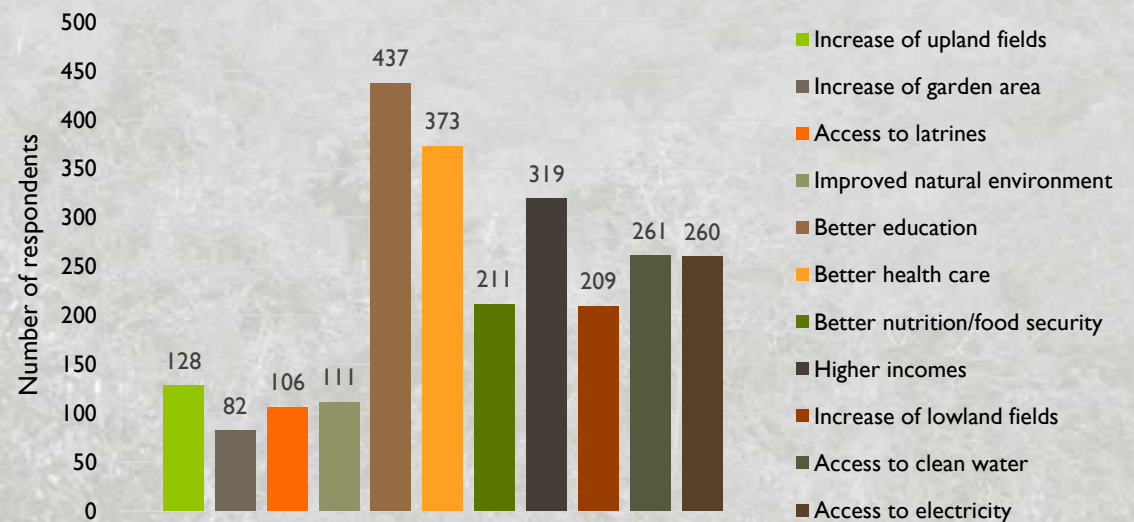
Areas that have been improved the most over the past 10 years, according to the families, are:

- ✓ Education → 74% of the respondents
- ✓ Health care → 63% of the respondents
- ✓ Incomes → 54% of the respondents
- ✓ Access to clean water → 44% of the respondents
- ✓ Access to electricity → 44% of the respondents

These answers are not surprising in light of the activities undergone by WMPA over the past 15 years. Investments were made in school, water supply system and health clinic infrastructures. School infrastructures and equipment were provided, as well as grants for education and health care takers. Solar panels were also proposed to families in many hamlets.

However, the increase in household income is difficult to relate directly to the work done by the WMPA with regard to the actions carried out in recent years. Apart from the distribution of few livestock animals, rice seeds and small irrigation structures, it does not seem that sustainable income-generating activities were undergone in the past.

Areas improved these past 10 years (in 18 target villages)



CONCLUSION

The purpose of this assessment was to assess improvements in the quality of life for the enclave and PIZ villages since 2005, including possible increases in incomes, better access to basic services, and whether or not people are actively involved in conservation. This assessment was able to provide information on livelihood improvement only through the testimonies of the NPA and PIZ villagers. Activity reports from WMPA since 2003 were not provided for this study. Unfortunately, it seems that many documents have not been recorded properly and not shared widely so they would have been accessible for research.

However, the COTE Livelihood team is confident that it was able to fill the aim to establish the current level of income/ expenditure/ food intake/diversity, current access to natural resources, sources of income and other relevant socioeconomic characteristics in the NPA and PIZ villages. Qualitative questions were able to assess the perception of target population about the changes in their livelihood status, their access to natural resources and their priorities for livelihoods and living standards investment. Questions about the approach used by the WMPA to consult with them on decisions and actions, and their participation in local development planning processes, have not been asked directly. However, the village chief testimonies on WMPA activities done in their hamlet and the discussions with relevant District offices (DAFO, DONRE, DOH, DOES, LWU...) are showing that the participatory process was not effective. In villages, only PLUPs have been completed. Within the 18 hamlets interviewed, only 7 have declared having a Village Development Committee (VDC). Most of the VDCs, except for Thongkong PIZ village, are composed only of men and are mono-ethnic. The ethnic group in numeric majority represents 100% of committee members. Government offices reported having been left out in the decision process regarding the implementation of livelihood activities. PIZ villages did not received the same level of support from WMPA than the NPA villages. In terms of involvement of the communities in wildlife and biodiversity conservation, the COTE Livelihood team has found no trace of a previous community conservation agreement (CCA) in any of the survey hamlet. It doesn't mean that it was not done, but data could not be found and villagers did not mentioned it. This shows that the involvement of the local people was not very active in the sector of conservation. This hypothesis is also reinforced by the data on the forest products used by the villagers where many of the wildlife hunted belong to protected categories.

As for the improvement in the quality of life of the enclave and PIZ villages since 2005, some conclusions could be drawn thanks to the previous studies undergone in the area. In the socio-economic assessment done by Chamberlain and al. in 1996 (CARE International), valuable information was retrieved for comparative purpose. Some quantitative data such as yearly incomes by ethnic group for each production system could not be compared due to high money devaluation since 1996 (one USD represented 927 LAK in 1996 and 8,455 LAK in 2018). But qualitative data were proven useful to see the changes observed over the last 20 years. In 1996, according to Chamberlain, in the NPA villages, the gathering and sale of NTFP is the most important activity generating cash incomes (47%). In 2018, only 9% of the families have declared that NTFP collection is their main source of incomes, while casual labour is declared as the main income-generating activity for 34% of the families interviewed in the NPA villages. In 1996 and 1997 reports, no mention is done of casual labour being practiced as source of incomes within the NPA. Households who chiefly rely on swidden cultivation tend to become poorer as a result of the decline in hay productivity: those who have access to lowlands now focus on paddies; others make a living from casual work and livestock sales. Most households in the NNT NPA face at least 2-3 months food gap every year, which is partly covered by maize/cassava consumption and in-kind wages (casual labour). NPA villagers have limited cash incomes. A good share of their income is still in the form of an exchange of labour services and the bartering of commodities such as fish in exchange for rice. There are no credit systems but some rice loans from relatives/friends (often paid back with labour or in kind after harvest, without interest).

In 1996, in his report, Chamberlain has already observed that there was a decline in carrying capacity of local resources, especially land. He said that if this trend were to continue, it will have "a deleterious affect on the lives and livelihoods of the NBCA residents". Today, with 42% of families classified as poor in the NPA and the testimonies on the natural resource depletion, it seems that this point is in pass to be reached.

While recommendations were made, in 1996 and 1997, to support the creation of develop plans focusing on sustainable production systems, the actions taken so far by WMPA regarding livelihood have fallen short. Apart from the dotation of animal and rice banks, and the construction of few irrigation systems for lowland paddy fields, there was no development planning implemented by WMPA for food security and sustainable agriculture practices. In this report, the COTE team has identified community priorities for livelihoods and living standards investment that can be included in community action plans.

Asian Development Bank. 2004. Summary environmental and social impact assessment. Nam Theun 2 hydroelectric project in the Lao People's Democratic Republic.

Chamberlain J.R, Alton C., Silavong L., Philavong B. 1996. Socio-Economic and Cultural survey. CARE International. 66 p.

Chamberlain J.R. 2004. Assessing Quality of the Local Consultations, Interim draft report. 26 p.

FAO. 1999. Guidelines for agrarian systems diagnosis. Rome: FAO.

IRAM. 2004. Assessment of the conditions of sustainability of the resettlement program of the populations of Nakai plateau. Assessment of the productive livelihood options of the resettlement action plan.

IUCN. 1997. Environmental and Social Action Plan for Nakai-Nam Theun Catchment and Corridor Areas" (revised May 1998). 253 p.

Kottelat M. 2015. The fishes of the Nam Theun and Xe Bangfai drainages, Laos. 51 p.

Melki S. & Kibler J.F. 2017. Support to community forest products value chain organization. Vientiane: GRET.

Nam Theun 2 Project. 2005. Social Development Plan. Volume 2 – Chapter 3: Ethnic Groups on the Nakai Plateau.

National Assembly Lao PDR. 2009. Wildlife and Aquatics law. 30 p.

Olivier Ducourtieux, Jean-Richard Laffort and Silinthone Sacklokham. 2005. Land Policy and Farming Practices in Laos. 28 p.

Pasquet J. 2018. Rapid agrarian diagnosis in Nakai Nam Theun National Protected Area, Laos. Agrisud/E-Sud. 55 p.

Robichaud, W.G. 2005. Testing assumptions: the recent history of forest cover in Nakai-Nam Theun National Protected Area, Laos. The University of British Columbia.

Sparkes, S. 2004. Cumulative impact analysis and Nam Theun 2 contributions. Annex 8: Ethnic minorities. Vientiane: Government of Lao PDR & Asian Development Bank.

Timmins, R.J. & T.D. Evans. 1996. A Wildlife and Habitat Survey of Nakai-Nam Theun National Biodiversity Conservation Area, Khammouan and Bolikhamxai Provinces, Lao PDR. Vientiane: Wildlife Conservation Society.

United States Department of Agriculture (USDA) / Foreign Agricultural Service. 2011. Commodity Intelligence Report. Laos: Sustainability of Future Rice Production Growth and Food Security Uncertain. December 13, 2011. Link accessed on 10/03/2018.

World Food Programme (WFP). 2009. Food consumption score – kit Laos. How to apply the FCS in the Lao context. 22 p.

WMPA. 2004. Social and Environmental Management Framework and 1st Operational Plan. Vientiane: Nam Theun 2 Watershed Management and Protection Authority

WMPA. 2013. A socio-economic baseline survey report for Nahao village in the Nam Theun 2 Watershed Area

WMPA. 2014. SEMFOP 2. NT2.

WMPA. 2017. The Environmental and Social Management Plan for Subproject: Strengthening the Capacity of WMPA to Effectively Manage the Nakai Nam Theun National Protected Area and NT2 Watershed.

WMPA. 2018. Wildlife poaching summary report. SMART database January to August 2018.

World Bank. 2018. Nam Theun 2 Social and Environment Project (P049290). Implementation Status & Results Report. January 2018.



To quote this study: The Socio-Economic Assessment of the Nakai-Nam Theun National Protected Area and Its Peripheral Impact Zone

Contributors: Souklaty Sysaneth (Socio-Economic Consultant), Claire Kieffer (Livelihood Advisor – AGRISUD International), Dr. Khammone Luangsackda (Livelihood Manager), Phouvang Xaiyalin (Health and Education Consultant), Khampasit Sengsouvan (Livelihood Improvement Consultant), Phianxay Xongyiadang (Natural Resources & Environment Consultant), Johan Pasquet (Agrarian Diagnosis Consultant).

Support to the realization: Direction of Operations Agrisud International

Photos: COTE team

Last editing: November 2018

With the financial support of:

