Ministry of Agriculture and Forestry
Department of Forestry

Ministry of Natural Resources and Environment
Department of Forest Resources and Management

LIVELIHOOD ASSESSMENT REPORT

LAO PDR

Lowering Emissions in Asia's Forests (LEAF)

Cooperative Agreement Number: AID-486-A-11-00005

LIVELIHOOD ASSESSMENT REPORT

LAO PDR

Submitted to (if to be submitted leave this here)
United States Agency for International Development
Regional Development Mission for Asia (RDMA), Bangkok, Thailand

Submitted by
SNV Lao PDR

Submitted on
2 September 2014

The Lowering Emissions in Asia's Forests (LEAF) Program, a five-year cooperative agreement, is funded by the United States Agency for International Development's (USAID) Regional Development Mission for Asia (RDMA). LEAF is being implemented by Winrock International (Winrock), in partnership with SNV – Netherlands Development Organization, Climate Focus and The Center for People and Forests (RECOFTC). The LEAF program began in 2011 and will continue until 2016.

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List of acronyms

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AP	Attapeu Province
BCC	Biodiversity Conservation Corridor project (funded by ADB)
BDS	Benefit Distribution System
CBB	Coffee Berry Borer
CIAT	*Centro Internacional de Agricultura Tropical* (International Center for Tropical Agriculture)
CIRAD	*Centre de Coopération Internationale en Recherche Agronomique pour le Développement* (French Agricultural Research Centre for International Development)
CSF	Classical Swine fever
DAEC	Department of Agriculture and Extension Centre
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FLSP	Forage and Livestock System Project
GCCAP	Global Climate Change Alliance Programme
GHG	Greenhouse gas
GIZ	*Gesellschaft für Internationale Zusammenarbeit* – German International Cooperation
Hh	Household
HP	Houaphan Province
IIED	International Institute for Environment and Development
IITA	International Institute in Tropical Agriculture
INGO	International Non-Governmental Organizations
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
LAK	Lao Kip (currency of the Lao PDR)
LEAF	Lowering Emission in Asia's Forest
MAF	Ministry of Agriculture and Forestry
PAFO	Provincial Agriculture and Forestry Office
PRA	Participatory Rural Appraisal
REDD+	Reducing Emission from Deforestation and Forest Degradation
SAN	Sanamxay District
SEBLS	Socio-Economic Baseline Survey
SRI	System of Rice Intensification
SWOT	Strength, Weakness, Opportunity, Threat
USAID	United States Agency for International Development
USD	United States Dollars (currency of the USA)
VGX	Viengxay District
VVW	Village Veterinary Worker
XAM	Xamtai District

Exchange rate at bcel.com on 07th of February 2014
1 USD = 8,024 LAK

Disclaimer

The views, opinions and interpretations expressed in this report are those of the author at the time of research and writing. They should not be interpreted as representing official or unofficial views or positions of the SNV Development Organization and its officers and representatives, or any other involved government or non-government organizations.

This study was funded by the United States Agency for International Development Lowering Emissions in Asia's Forests (USAID-LEAF) program

Introduction

Background

In recent times, climate change has received the highest level of political and media attention, however little has been achieved to arrest the increasing carbon emissions that are responsible for global warming. Sudden shocks and extreme weather conditions, such as cyclones, floods, and droughts, are projected to increase in intensity and/or frequency. Agriculture, along with land use change, enjoys double distinction of being both a driver and a victim of climate change. On one hand, the carbon emissions related to each stage of the agricultural value chain – from seed to plate –contribute to climate change, while on the other hand, the negative impacts of climate change (e.g. growing frequency and intensity of rainfall, higher temperatures, shorter growing seasons, changing patterns of pests and diseases) may lead to crop damage, land degradation, and food insecurity. Hence, without appropriate response mechanisms, climate change could severely impede the ability of developing countries to feed themselves (IIED, 2011).

While agricultural expansion has been considered as the largest driver of tropical deforestation, global food production suffers from less than adequate corresponding growth to satisfy the expected demands for food, as a result of the world's population increase. This suggests that agricultural value chains are still inefficient in many regions and large sustainable intensification potential remain untapped (GIZ, 2013). The potential role of forests in reducing of global greenhouse gas emissions has attracted significant interest from the international community. In this purpose, the 2008 Bali Action Plan agreed at the UNFCCC 13th Conference of Parties 'establishment' the Reducing Emission from Deforestation and Forest Degradation (REDD+) mechanism to create a financial incentive for the conservation and sustainable management of forests and enhancement of forest carbon stocks.

Moreover, in the objective of maximizing global agricultural productivity, increasing resilience of agricultural systems in the face of climate change and mitigating greenhouse gas (GHG) emissions from agriculture, the term *climate-smart agriculture* was first used in 2009. Presented at the First Global Conference on Agriculture, Food Security and Climate Change at The Hague in 2010, it is defined as "sustainably increases productivity, enhances resilience, reduces/removes greenhouse gas emissions, and enhances achievement of national food security and development goals". This definition represented an attempt to set a global agenda for investments in agricultural research and innovation, joining the agriculture, development and climate change communities under a common brand (Agriculture and Food Security, 2013). This concept has been taken up by intergovernmental organizations and national governments as a way forward for making landscapes more resilient to climate change and increase the adaptive capacity of agricultural communities (FAO, 2010).

In Lao PDR, climate change manifestations mainly include an increase in temperatures and changes in rainfall patterns which are likely to be accentuated in the coming decades, according to climate model projections (GCCAP, 2012). This phenomenon arises from the production of two greenhouse gases coming from the farming sector namely methane – as a result of livestock digestion processes and stored animal manure, and nitrous oxide - from organic and mineral nitrogen fertilizers. This trend is intensified by commercial concessions, large mining and energy projects as well as rapid deforestation driven by legal and illegal logging, combined with forest degradation linked to slash-and-burn cultivation (GCCAP, 2012). Agriculture, forestry, and natural resources are of critical importance to the Lao PDR, both at the level of the whole country and for local communities, especially for vulnerable farming households. Consequently, the potential effects of climate change need to be assessed carefully and possible adaptation and mitigation strategies developed.

Under the United States Agency for International Development Lowering Emission in Asia's Forest (USAID-LEAF) program, the objective of this report is to assess and recommend potential livelihood improvement activities/interventions within the context of REDD+ compatible ('climate smart') agricultural opportunities within LEAF targeted villages. This report compile information gathered during the fieldwork conducted in February and March 2014 in the project villages located in the target

districts of Sanamxay (SAN) district of Attapeu province and Viengxay (VGX) and Xamtai (XAM) districts of Houaphan province.

Methodology & PRA tools employed

Participatory rural appraisal (PRA) is an approach to incorporate the knowledge and opinions of rural people in the planning and management of development projects and programs. It requires field workers to act as facilitators to help local people in collecting and analyzing the information, practicing critical self-awareness, taking responsibility and sharing their knowledge of life and conditions to plan and to act. In other words, the basic concept of PRA is to learn from rural people. It closely involves villagers and local officials in the process.

The district authorities recommended 11 pilot villages for carrying out the LEAF livelihood improvement activities, of which seven villages are based in Sanamxay district Attapeu Province and four villages are located in Viengxay and Xamtai districts in Houaphan Province. All the project villages located in Sanamxay District were selected as pilot sites as LEAF will implement its activity in close collaboration with the Biodiversity Conservation Corridor (BCC) project funded by the Asian Development Bank (ADB). Out of the 33 Focus Group Discussions (FGDs) planned to be implemented, a total of 31 FGDs were carried out during field work. Two FGDs were not conducted as the number of participants for the men's group was found too low and was therefore merged with the village authorities' group.

The survey team was composed of nine people, the majority of them coming from the governmental agencies involved with the LEAF program. It was found necessary to gather the same team members that implemented the socio-economic baseline survey (SEBLS) in 2013 due to their previous working experience in the project area. In each group, three people, one PRA facilitator and two PRA note takers, were responsible for collecting the qualitative information.

Approximately 30 people from each village participated in the PRA exercises, with villages exceeding this number as a result of high number of farmers willing to be involved. Three groups were organized, namely village leaders as well as women's and men's groups. The reason for separating the leaders from other men and women is to reduce the risk that the leaders will be too dominating in the men's and women's group.

The following PRA exercises were selected during field work: i) village resource map; ii) seasonal calendars; iii) SWOT analysis; iv) problem-cause-effect-solution trees; v) matrix scoring and ranking. The village resource map was used to facilitate an understanding and discussion on local farming systems, physical resources/features and infrastructure considered important by the participants. The seasonal calendar on various crop productions was organized to display months where farmers carry out activities such as ploughing, sowing, harvesting or weeding. SWOT analysis was used to determine and to understand the status of the village or community in terms of their strengths, weaknesses, opportunities and threats. Problem-Cause-Effect-Solution Trees highlights the causes and effects of the main problem faced by the participants and propose activities to overcome it. Finally matrix scoring and ranking allows the participants to identify the most preferred activity aiming at improving their livelihoods. Training on PRA was undertaken before implementation with the team members and included facilitation skills, conducting different exercises and analysing results. The PRA did last to one or two days for each pilot sites. The exercise introduction was organized in plenary session, with all the PRA participants gathered in one place. Then the groups split into three, and each went off to its own working area. Information on population of the study sites are presented in table 1.

Table 1: Population in the study sites

Province	District	Village name	Population	Household	Total no. of PRA participants
HP	VGX	Naheua	240	45	28
		Naman	387	67	33
	XAM	Sobpeng	375	62	30
		Tinphou	204	39	29
AP	SAN	Hat-Oudomxay	537	94	28
		Sompoy	1,187	219	27
		Tagao	327	62	33
		Nonghin	380	91	40
		Xaydonekhong	536	107	29
		Mathka	534	115	88
		Nongmouang	535	117	39

Source: PRA field work

Before the implementation of PRA, a socio-economic baseline survey (SEBLS) was carried out in 2013 in the LEAF project villages for determining benchmarks where changes and progress of achievements can be measured and evaluated using socio-economic indicators. Information from the SEBLS is also used in this report to document the PRA findings. The following chapters will present and describe the local livelihoods observed in the pilot's area.

1. Major agricultural farming systems

This chapter provides information on four major crop production systems that have been observed in the eleven LEAF pilot sites namely upland rice, paddy rice, maize and coffee. Upland and paddy rice are mainly produced for home consumption while maize and coffee represent the main annual revenue for subsistence farmers as a result of the growing international demand.

1.1. Upland Rice

Upland rice is practiced in all surveyed villages, except for the three villages located in the Sompoy village cluster in Attapeu Province where paddy is the main cultivated system. Practiced on slopes, upland rice is usually grown in slash-and-burn production systems where rice is grown for one year, with the field then being allowed to return to a natural fallow. In the project area, the annual upland rice production cycle starts in March or April, when farmers meet together to discuss and identify the areas to be cleared and cropped. In April, the vegetation is slashed and allowed to dry before being burned a few days later. Depending on the location, sowing usually takes place in April or May by dibble planting. This method requires making a hole in the soil about 5-10 cm deep on average with a dibble stick and then putting the rice seed. Holes are usually spaced at a dimension of 20 cm (width) by 25 cm (length), with 5–15 seeds being planted in each hole. Several secondary crops are planted aside rice grain such as pumpkin, taro, peanut, chilli, cucumber as well as sugarcane or cassava essentially for the purpose of home consumption.

Most traditional upland rice varieties belong to the tropical *japonica* variety group (Roder et al 1996). Upland farmers clearly differentiate between early, medium, and later maturing varieties and most households will plant varieties from each group. This allows them to harvest rice for consumption as early as possible, distribute labor requirements for harvest, and spread risk (Roder et al 1996). No improved rice varieties were planted at times of data collection. Most upland farmers cultivate glutinous rice and grow two to five varieties. A small quantity of seeds (25-30 kgs) is kept for the next planting's season.

Table 2: Information on upland rice production in 2012

Province	District	Village name	Average area per household in ha	Productivity per t/ha	Annual cash income per hh (in USD)
HP	VGX	Naheua	0.58	1.79	3.5
		Naman	0.38	1.23	-
	XAM	Sobpeng	0.83	2.5	4.4
		Tinphou	0.74	2.0	7.2
AP	SAN	Hat-Oudomxay	-	-	-
		Sompoy	-	-	-
		Nonghin	0.58	1.6	24.5
		Xaydonekhong	0.85	0.6	-
		Mathka	0.50	1.9	2.1
		Nongmouang	0.45	0.9	-

Source: PRA and data extracted from SEBLS

Weed control is the major labour input since it is carried out from one to three times starting from June to September, depending on the availability of labor force and the length of the previous fallow. During this time, fences are also built around the field to provide protection from grazing animals (both wild and domesticated). Upland rice is harvested during September or October depending on the maturity time of a variety. Rice is stored unmilled, as rice quality is better maintained when the rice is left inside the husk until required for consumption. Rice is stored sometimes in the house and mainly in a separate store. These are mainly made of wooden wall and zinc or straw roof with a dimension of 2m by 3m. In some villages, rice storages are built on stilts with aluminium or smooth bamboo around the stilt poles to deter the entry of rodents. When rice is needed for consumption, farmers will usually mill enough to

meet family consumption requirements for 1 or 2 weeks. Farmers usually take their rice to a village miller. Usually, the cost of milling amounts to LAK 5,000-7,000 per kg (USD 0.6-0.9). An alternative mode of payment is organized through the provision of the bran from the rice, which the miller subsequently sells as a livestock feed (IRRI, 2006).

Due to the low production level encountered in the project villages, rice is mainly devoted to consumption while a minority of households manages to sell their rice surpluses to local traders. More often and when possible, rice is sold within the village at an affordable price for households experiencing annual rice shortage. Main upland rice production constraints that were raised during the PRA exercise are weed control followed by rodents, insects and wild animals, mostly wild boars. Drought has also been mentioned as a major issue due to erratic rainfall. Others problems were also pointed out such as land availability, labor shortage, soil fertility, and soil erosion. The combination of these events causes rice crop losses, ranging from 10% to 50% of the total production. Shifting cultivation is considered by the farmers themselves as a major cause of deforestation and forest degradation. Some project villages reported to expand the upland rice area from 2ha to 5ha per year since new households are established in the village. This practice has become increasingly unsustainable because of the shortening fallowing periods with an average ranging from 3 to 5 years in the project area as a result of the increasing population pressure and land-use restrictions.

1.2. Paddy

Rain-fed paddy production typically begins in May or early June at the start of the monsoon rains with the planting of the rice nursery. Some farmers pre-soak seeds for a day or two before sowing. Rice is sown by broadcasting the seeds immediately after puddling. Nurseries occupy a small area (5–10% of the total area to be planted) and are usually fenced to protect them from livestock. Seedlings grow for about 30 days in the nursery, although farmers may transplant at any time from 25 to 40 days or longer depending on rainfall. Sufficient rainfall is required to plow the main field and prepare for transplanting. Farmers usually transplant using about 3-6 seedlings per hill. Fertilizer and pesticide are not applied due to limited financial means. Weeding is done manually once or twice during a season and is not perceived as a major production constraint as compared to upland rice production. Rice usually starts to mature in October, and continues through November depending on location, variety, and time of planting (IRRI, 2006).

Table 3: Information on paddy production in 2012

Province	District	Village name	Average area per household in ha	Productivity per t/ha	Average cash income perceived per hh (in USD)	Use of improved rice varieties
HP	VGX	Naheua	0.5	2.2	23.5	No
		Naman	0.9	1.6	53.1	No
	XAM	Sobpeng	0.2	3.1	4.9	No
		Tinphou	-	-	-	No
AP	SAN	Hat-Oudomxay	1.3	1.2	-	Yes
		Sompoy	1.2	1.2	17.8	Yes
		Tagao	-	-	-	No
		Nonghin	-	0.5		No
		Xaydonekhong	0.2	0.7	-	Yes
		Mathka	0.5	1.4	-	No
		Nongmouang	0.6	1.3	-	No

Source: Data extracted from SEBLS and PRA

Low rice yields is quite common at the LEAF pilot sites since the production range from 0.5 to 3.1 ton/ha only as a result of the small cultivated area (see table 2 overleaf). Harvesting is done manually during October and November and the harvest is left in the field for a few days to dry. The remaining

straw is most commonly grazed by livestock during the dry season, but it may also be burned. No effort is made to collect and use the straw as a potential manure or mulch. The main production constraints identified by most of the project lowland farmers are drought followed by insect pests. The intensity of climate change events such as flash flood is found to be more pronounced in the three villages located in Sompoy village cluster as Hat-Oudomxay, Sompoy and Tagao are all located along riverbanks. Paddy rice is not considered by the farmers themselves as having a major impact on deforestation and forest degradation since the paddy land is not significantly expanded year by year. When upland and lowland rice system are both practiced in a given village, a rotation system for using the paddy fields is sometimes established for a period of 5 years.

1.3. Maize

Maize is one of the major agricultural commodities exported in Laos as a consequence of the high demand from the neighbouring countries, namely Thailand and Vietnam (Lestrelin, 2009). Maize is cultivated in the northern part of the LEAF program and is the prominent cash crop for the target smallholders. Methods of cultivation do not differ significantly from upland rice. Slashing occurs at the end of March while sowing is done with a stick without rows in April. Hybrid varieties such as LVN 10 (imported from Vietnam) and DK 888 (imported from Thailand) are mainly planted due to their better drought resistance and higher weight/yield. Holes are mainly separated by 50 x 50 cm, 60 x 70 cm or 80 cm x100 cm, depending on the pilot sites. Farmers generally weed once or twice in June and July and no herbicides or chemical fertilizers are used in the production.

Harvesting takes place in September and October. Farmers still shelled their crop by hand or used simple tools. The crop is generally dried on sheets in front of their homes and no improved drying facilities were reported in the four northern project villages, thus resulting in low additional value on crop. In addition, large volumes are unable to be processed quickly and slow processing time risk mould growth. When maize production is being sold, the cash crop is directly bought at the village level at a price ranging from LAK 900 (USD 0.11) to LAK 1,300 (USD 0.16) per kg, depending on seed varieties. The whole cash crop production is mostly sold at Nameo village in Vietnam since local trader offer higher prices, around LAK 1,500 (USD 0.18) per kg, as compared to those located in district or provincial market places.

Table 4: Information on maize production in 2012

Province	District	Village name	Average area per household in ha in 2012	Productivity range per t/ha in 2012	Annual cash income per hh in 2012 (in USD)
HP	VGX	Naheua	0.7	4.6	323
		Naman	1.0	3.2	322
	XAM	Sobpeng	0.3	-	-
		Tinphou	0.6	2.7	137

Source: Data extracted from SEBLS

In the selected pilot sites, contract farming have been established between investors and interested farmers. The main feature of the contract is the "seeds for harvest" mechanism. The investor sells seeds to farmers in the beginning of the planting season at a price varying from LAK 12,000 (USD 1.49) to LAK 25,000 (USD 3.11), depending on the seed variety. These seeds are hybrid and annual types and cannot be reproduced by the farmers themselves which means that the farmers need to buy seeds every year anew. As the farmers do not have enough money to pay fully for the purchased seeds in the beginning of the planting season, they take on debts with the investor. Consequently, the farmers are bound to this investor as they are obliged to sell their harvest to him in order to settle their debts. This creates a state of dependence for the farmers and limits their room for maneuver (Willi, 2011).

Additionally, and contrary to the prices for seeds, the price for the harvested maize is usually not fixed at the beginning of the planting season. The farmers have no option but to sell their harvest to a single

investor for a price only agreed on after harvest. Due to the investor's superior position, he has more power to fix prices than the farmers. In general, farmers do not exert a strong bargaining power in transactions due to local market distortions since inadequate information are often received by villagers (Gebert, 2006). Moreover it has been found during fieldwork that the contracting companies breached the signed agreement in 2012 since they did not purchase the expected maize production, thus increasing farmers' vulnerability to external shocks.

The maize boom has had very important consequences for land cover, land use and smallholder agriculture. Over the past decade, it has led to agricultural expansion (forest and fallow conversion), a generalization of ploughing practices and an increased use of pesticides. With the transition from shifting cultivation to intensive hybrid maize monoculture, agricultural productivity has increased considerably while rural poverty has receded. However, a growing number of farmers are now confronted with land degradation issues such as soil erosion, i.e. weed pressure and chemical pollution, excessive production costs and indebtedness (Lestrelin, 2009).

1.4. Coffee

Introduced by the French a century ago, coffee is one of Laos' top-five export earners and agricultural largest export commodity despite the international coffee price crash observed in the early 2000s. Coffee is cultivated almost exclusively on the Bolaven Plateau, Champasak Province in the southern part of Laos as the plateau offers high altitudes, moderate temperatures and fertile soils (Philaphone, 2011). Robusta variety (*Coffea canephora*) has continued to dominate the coffee farms in Laos, because of its disease-resistant and resilient qualities. Arabica variety *(Coffea Arabica*) is semi-abandoned and this cropping system is progressively dismantled due to the spread of cryptogamic disease (coffee leaf rust due to Hemileia vastratix) (Galindo, 2007). However, according to the coffee experts, Robusta is in general considered to be of lower quality due to its higher level of acidity, thus commanding a lower price (Southichack, 2009). Concurrently, national authorities through the support of development projects started to promote Arabica production by introducing the high-productive dwarf variety Catimor (Galindo, 2007)

Robusta is only produced in the southern Sanamxay District due its favourable climatic condition. Coffee production starts with land clearing and preparation that occurs in January and February. In March remaining weed is burned while digging hole is carried out in April. Finally coffee trees are planted in June or July during the wet season and are purchased mainly at Paksong District in Champasak Province. Weed control is implemented three times a year using simple agricultural tools. Robusta is the main coffee variety grown in the project villages while some smallholders in Nonghin village reported to cultivate *Catimor* variety. The *C.canephora* cropping system is a low intensive system without chemical input, adapted to divagation system of cattle. It is also an economically non risky system as it uses very low level of inputs of workforce and capital. The duration of the plantations last from to 10 to 50 years. The density plantation is considered as low from 900 to 2,000 trees where the 3x3m spacing is the most frequent density observed (1,111 trees per ha) and yields is estimated from 0.1 to 0.6 tonnes per ha, following the altitude and the year (Galindo, 2007). Secondary crops are also cultivated aside from coffee trees such as mango, jack fruit, lemon or papaya.

Almost all robusta coffee is processed through the dry method where in many cases cherries are dried on the bare ground where they are in contact with animals or excrements. A complete absence of quality standards makes the farmers take little care during harvest and at all stages of coffee processing. One of the causes is the absence of a real quality remuneration system as farmers get the same price whatever the quality of their coffee is, except penalties for very bad coffees (Galindo & al., 2007).

Coffee is the main cash crop for smallholders in Sanamxay District with an observed average income of 393 USD per household. Productivity differs significantly from one village to the next since farmers living in Mathka village experienced a two times higher production than those based at the village of Nongmouang. Coffee grains are stored with rice grains in the same storage structure or in the house if no space. Many small farms enter into a verbal contract agreement with the processor/trader that

guarantees the sale of farm output. Many other farmers remain independent and bring their harvest to Paksong District Capital in Champasak Province where they can sell their unprocessed grain to any buyer of their choice. This situation is explained by the significant difference in the coffee price (ranging from 20 to 50%) that collectors are able to pay at the village level and in the urban area. The latter processes the grains and sell it afterwards to exporters, mainly to Dao Heuang company which dominates the coffee export market in Laos.

Table 5: Information on coffee production in 2012

Province	District	Village name	Average area per household in ha	Productivity per t/ha	Annual cash income per hh (in USD)
		Hat-Oudomxay	-	-	-
		Tagao	-	-	-
		Sompoy	-	-	-
AP	SAN	Nonghin	2.4	0.37	532
		Xaydonekhong	2.1	0.34	542
		Mathka	1.2	0.63	203
		Nongmouang	1.0	0.31	296

Source: Data extracted from SEBLS

Little has been done to improve the quality and international image of Lao Robusta coffee over the past 10 years. It is produced as a "Natural" coffee and the industry is based on traders, processors and exporters who buy the product and sell it up the market chain for a margin, adding little value for farmers. At present there is no price incentive for Lao farmers to produce better quality Robusta. A range of strategies is required to address the production / processing / marketing chain to help farmers to value-add and to develop the image and direction of the industry by better processing and targeting new markets, which could lead to better price of Lao Robusta coffee. In addition to these problems, Robusta exports from Lao have declined severely in the last two years (Marsh, 2006). Other limiting factors to coffee production refer to pest control (especially Coffee Berry Borer), fertility and plantations' management. Extended period of drought plays also a significant role in limiting productivity since overexposure to sun and high temperatures cause yellowing and death of leaves, tree overbearing and/or dieback in older tree (FAO, 2005).

2. Main livestock production systems

This chapter summarizes information collected on the three main livestock production systems encountered in the pilot sites, namely cattle and buffalos, pigs and poultry. In Laos livestock is principally regarded as a form of saving or capital accumulation to be sold only when needed.

2.1. Cattle and buffalo

The main cattle breed found in the Lao PDR is closely related to the Chinese Yellow cattle. The breed is well adapted to the environment and conditions encountered on smallholder farms. They are agile and hardy, and have a good reproductive rate and few calving problems. They have a small body size with a body weight of up to 350 kg for males and 250 kg for females. Growth rates are low with animals taking 4-6 years to reach mature weights under the current extensive feeding system. Farmers report that females usually produce their first calf at an age of 3 years. Ideally, they will produce a calf every year but in reality miss a breeding season once every 2-4 years. Calving tends to occur in the early part of the dry season (November to February). Breeding is not controlled and is based on opportunity, usually during periods of communal herding (Stür & al., 2002).

The small bodyweight of the local breed is a major advantage in extensive management systems since the amount of feed needed to maintain condition is relatively small and cattle can spend a lot of time looking for better-quality feed. Farmers sell more adult male than females or young animals, leaving a

herd structure with a predominance of females aged 2 years or older for reproduction. Adult males are slaughtered for domestic consumption or exported (Gibson, 1997).

Table 6: Information on cattle and buffalo production in 2012

Province	District	Village name	Average number of cattle per hh	Average number of buffalo per hh	Average cash income per hh (in USD)
HP	VGX	Naheua	1.0	2.1	944
		Naman	1.2	1.2	1,093
	XAM	Sobpeng	2.7	2.3	913
		Tinphou	1.9	1.0	440
AP	SAN	Hat-Oudomxay	0.3	1.7	446
		Sompoy	4.5	1.2	597
		Nonghin	0.5	-	255
		Xaydonekhong	-	0.3	425
		Mathka	0.2	-	95
		Nongmouang	0.6	0.3	-

Source: Data extracted from SEBLS

The buffalo is larger than cattle with males reaching up to 450kg and females up to 350kg of bodyweight. Females tend to have their first calf at age 4-5 years and calving intervals are lower than for cattle since the annual calving rate at less than 50% (MAF, 2001). The herd structures, management, calving and joining periods are similar to cattle. The table 5 above indicates that the number of cattle per household is more pronounced in the southern village of Sompoy (4.5) while population located in Xaydonekhong village do not raise cows at all due to limited grazing area. Buffalos are more observed in the northern part of the project, especially at the village of Sobpeng (2.3) and Tinphou (2.1). The average cash income perceived per household varies significantly from one project village to another since households based in Naman village sold their large ruminants at higher prices as a result of superior body weight.

In the project area, cattle and buffalo are grazed on the vacant cropping area for most of the year, utilizing rice straw, grasses and weeds growing in and around fields. The management system tends to be extensive, with animals being allowed to graze and mix freely in large herds. In some areas, owners only check their animals occasionally, maybe twice a week, while others return their cattle to an enclosure or pen every night. Providing salt is commonly used to entice animals back to the pens, which are usually located near the rice fields. The amount of available grazing and other non-cropping areas are critical for animal production since there are no other feed resources during this time of year. Management inputs are minimal with animals grazing in small groups. Often, herding or close supervision is required at this time of year to avoid crop damage for which the owner would have to pay compensation.

Some local traders come directly to the village once or twice a year and look for any purchase opportunity especially during the wet season. Farmers usually bargain and sometimes refuse to sell their animals if the offered price is considered too low. After agreement, traders move animals by trekking over small roads and tracks to the nearest urban market. In Houaphan Province, most of the cattle and buffalo meat is exported to Vietnam since the retail price is higher, thus resulting sometimes in meat shortage for the Lao residents. Diseases and parasites in mature bovine animals constitute the major problem. Foot and mouth is the main disease reported by the participants and cause heavy economic loss while *Haemorrhagic Septicaemia* and Blackblood are also a problem. Internal parasites do not cause sudden death in ruminants but they could affect growing ability of the animals. Vaccination against certain diseases and deworming is always advantageous but often ignored by smallholders, while government services are also not readily available (Vongsamphanh, 2003).

2.2. Pig

Four native breeds are recognized in Laos including 'Moo Chid', 'Moo Laat', 'Moo Daeng' and 'Moo Nonghaet' (Vongthilath and Blacksell, 1999). Most local pigs are high fat, black, swaybacked Asian breeds, and can reach a mature weight of 60-100kg. Growth rates tend to be slow in extensive management systems and animals may take 15 months to reach a weight of 40-50kg (Kennard, 1996). Many sows only have 1 or 2 litter per year with 6-8 piglets per litter (FLSP, 2002). Pigs usually roam freely and scavenge feed around houses and are mainly the task of women in all areas (ADB, 2001). Penning is rarely practiced in the project villages. Despite free roaming, pig production is very labor-intensive with supplementary cooked feed being provided. Farmers spend nearly 3 hours per day to collect green leaves and starchy roots from fallow fields and forest margins to feed to pigs in combination with rice bran and cassava roots (Phengsavanh, 2010). Pigs tend to be under-fed as farmers raise more pigs than they can easily feed. This is explained by the fact that farmers can sell small animals at any time to cover unforeseen expenses such as medicines at times of illness or food at times of insufficient harvests.

Marketing pigs is more difficult for population based in the northern part of the programme as travel to market to sell pigs may be expensive or impossible, due to poor or impassable roads. In this case, a middle-man trader visits the village and offer sub-standard prices, further compounding the marketing problems for small-scale pig producers. Local or native pig breeds are not genetically improved and therefore do not provide as good a feed-conversion ratio as imported breeds. Pig disease is the major problem as Classical swine fever (CSF) and many other viral diseases account for a large number of pig deaths. The lack of quality vaccine, vaccine cold chains and veterinary staff to apply the vaccines is also a problem as well as the delivery and processing of quality feeds. Improved feeds such as cassava, corn and rice bran are used by target farmers but availability, expense of production and processing time are still an issue.

Table 7: Information on pig production system

Province	District	Village name	Average number of pigs per hh in 2012	Total number of pigs death per hh in 2011	Average cash income per hh in 2012 (in USD)
HP	VGX	Naheua	5.6	3.3	67
		Naman	2.3	1.1	33
	XAM	Sobpeng	3.6	0.8	64
		Tinphou	1.6	1.8	30
AP	SAN	Hat-Oudomxay	1.3	0.1	53
		Sompoy	1.0	0.1	77
		Nonghin	1.6	0.4	44
		Xaydonekhong	0.5	0.3	32
		Mathka	1.5	0.2	9
		Nongmouang	0.3	0.0	19

Source: Data extracted from SEBLS

It can be seen from the table above that population based in Naheua village own the highest number of pigs in the project area (5.6) while rural households in Nongmouang displays the lowest rate (0.3). Pig mortality is predominantly found in Naheua and Tinphou villages due to spread of specific diseases that occurred in 2011.

2.3. Poultry

The poultry production system observed in the LEAF pilot sites refer to the traditional, small-scale and extensive backyard. These free-range birds scavenge for food in backyards, gardens, orchards and vacant lots during the day and sometimes penned at night to protect them against predators and thieves. Given the minimal cost this implies, they are widely kept in the project villages. The recourse to vaccines,

animal health products, feed additives or veterinary advice in this production system is low (Burgos, 2009). Most farmers provide rice bran or broken rice twice per day as a supplementary feed to chickens. Growth rates are low under these management conditions and hens produce few eggs (maybe 30-50) per year (Stür, 2002). Many households also raise a small number of other poultry such as ducks and turkeys. Raising poultry usually is the task of women in the household.

Table 8: Information on poultry production system

Province	District	Village name	Average number of poultry per hh in 2012	Total number of poultry death per hh in 2011	Average cash income per hh in 2012 (in USD)
HP	VGX	Naheua	32	14	39
		Naman	25	7	0
	XAM	Sobpeng	44	8	31
		Tinphou	27	12	14
AP	SAN	Hat-Oudomxay	4	1	6
		Sompoy	8	7	2
		Nonghin	8	5	7
		Xaydonekhong	2	4	
		Mathka	12	7	18
		Nongmouang	5	2	1

Source: Data extracted from SEBLS

Almost exclusively of local breeds, these birds are raised for meat and eggs (mostly consumed by the household) or sold locally for cash income. The cash raised from sales is used for medicines, education, garments and purchases of food items at shops and markets. Newcastle Disease and Ascaris are the main disease observed in the project village causing important chicken and duck losses.

3. Climate change impacts and local adaptation practices

Awareness and observed events

During field work farmers were asking about their understanding of the term “climate change”. In general villagers often attribute climate change to their agricultural calendar and the natural resources their livelihood depends on. In general the participants were aware that negative changes are induced by human activities. It appears that deforestation was the main cause mentioned by the participants while of a few of them referred to major environmental polluters such as western countries, industrial plantation concessionaires or mines. The major climate change events that regularly occur in both target provinces are found to be drought as this weather pattern has been mostly mentioned by the participants. Drought conditions are characterized by higher and irregular increases in temperature, have become more and more serious in the project area and do not currently follow the usual patterns as in the past, often begin earlier and last for a longer period of time, with the peak experienced in March and April.

Occurring between May and September, flash floods are also considered as another major issue in LEAF pilot sites and happen more suddenly and over a shorter amount of time as illustrated by the Ketsana typhoon in 2009. Unusual rainfall characterized by greater variability in the amount and distribution is another issue that farmers raised since precipitations happen later on average as compared to 15 years ago. Finally low temperatures have also been presented as an unusual weather pattern since farmers experienced unexpected cold meteorological conditions. To a lesser extent, the target population located in the southern province experienced as well as strong wind that occur mainly in November and December.

Table 9: Major climate change events in LEAF pilot sites

Province	District	Village name	Flash floods	Drought	Unusual rainfall	Strong wind	Low temperature
HP	VGX	**Total HP**	**2**	**4**	-	-	-
		Naheua	Yes	Yes	-	-	-
		Naman	Yes	Yes	-	-	-
	XAM	Sobpeng	-	Yes	-	-	-
		Tinphou	-	Yes	-	-	-
AP	SAN	**Total AP**	**5**	**6**	**3**	**2**	**5**
		Hat-Oudomxay	Yes	-	-	Yes	Yes
		Sompoy	Yes	Yes	-	-	-
		Tagao	Yes	Yes	Yes	-	-
		Nonghin	Yes	Yes	-	Yes	Yes
		Xaydonekhong	-	Yes	Yes	Yes	Yes
		Mathka	Yes	Yes	-	-	Yes
		Nongmouang	-	Yes	Yes	-	Yes
		Overall total	**7**	**10**	**3**	**2**	**5**

Source: PRA

Impact on livelihoods and local adaptation practices

The participants were also asked about the impact of each of the climate change-related symptoms on their local livelihoods and the corresponding local adaptation practices. The table 9 overleaf shows that many aspects are affected by the increased and changing weather pattern. Flash flooding cause severe impact on many food sources as well as village infrastructures such as roads, primary schools and health centers. Depending on the flash flood severity, paddy rice in the southern pilot sites is partially or completely lost which could lead to increased food insecurity with a change in food consumption towards less nutritious foods. Health services have to deal with a range of disease outbreaks and public health concerns, especially when clean water supplies are not made available as a matter of urgency. In addition, damage to village infrastructure has made local communities more vulnerable.

Drought mainly affects rice cultivation as the current rice production systems rely on an ample water supply and is becoming an increasingly severe problem. Drought stress is severely damaging during reproductive stages of the rice crop, especially during flowering, although drought in other stages can also lead to significant yield reductions (Liu et al., 2006). Drought also adversely affects livestock, leading to shortages of fodder and water, which in turn lead to stressed animals that lose weight and are more prone to disease and possible death. The cost of droughts to animal husbandry is quite important as it is considered as a valuable source of income and also imposes a variety of social costs on affected peoples, including food and water shortages, increased susceptibility to disease, and additional hardships (Helmers et al., 2004). A shortage of water for latrines and washing purposes, coupled with a decline in the availability, quality and safety of water supplies, often leads to an increase in diarrhoea and other gastro-intestinal diseases during drought periods. Household members, often women and children, have to spend a considerable time each day collecting water for domestic use and providing water and fodder for livestock. This can and does interfere with children's schooling (Joy, 2013). All of these social costs help sustain poverty, especially in subsistence households.

The PRA participants did demonstrate some capacities to adapt to climate change challenges where their approaches mainly consist of their own resourcefulness but are also supported with some external assistance. Here local adaptation practices refer to current adjustments encountered in the pilot sites for each of the observed climate change event. Examples displayed in table 9 include improved water management by the construction of small scale reservoirs, moving the crop growing period, the cultivation of secondary crops or close weather monitoring conditions with village radio. However, the current adaptation methods are not adequate to support sustainable livelihoods in the long-term since

many of them have disadvantages including the fact that they are costly, labour intensive and/or ineffective. That is the reason why the target farmers also expressed their need for financial, community support as well as skills and knowledge enhancement to cope with climate-related events.

Intervention and support from the local authorities mainly consist in responding to climate change impact by the provision of rice bags in after flash floods and also by mitigating its impact through the construction of small scale reservoirs for providing water for crop cultivation. In the next years climate change is expected to change the frequency, intensity and locations of existing climate hazards and to challenge the existing coping mechanisms of the population located in rural and remote places.

Table 10: Impact on livelihoods and local adaptation practices

Observed climate change event	Impact	Local adaptation practices
Flash flood	- High number of animal husbandry death - Crop losses - Damage to houses and property - Human disease - Soil erosion - Village infrastructures - Road degradation	- Animal quarantine - Collective action in the community to repair damaged houses - Close weather monitoring conditions with village radio - Construction of dikes to prevent soil erosion - Transplantation of new seedlings as well as additional ploughing - Tree planting with external assistance.
Drought	- Reduced crop productivity - Water shortage for crop cultivation and domestic use - Grass shortage for large ruminants - Dry soil - Human disease such as fever and diarrhoea - High incidence of animal husbandry disease and death - Disturbance in crop growing phase - Low water level of the river nearby - Crop losses - Low quality coffee grains due to insect pest	- Digging water wells - Moving the crop growing period - Praying for rain - Constructing small scale irrigation system with external assistance - Going to health center - Reducing deforestation - Establishment of dikes for water retention - Reduction in logging trees - Plantation of secondary crops on a short term basis such as fruits, eggplant or vegetables.
Low temperature	- Lower coffee berries quality due to mist - High number of chicken death - Human disease - Animal disease	- Plant fruit trees for providing shadow to coffee trees. - Purchase of medicine to overcome human disease. - Treatment at health center of provincial hospital.
Strong wind	- House degradation - Damage on crops - Fruit and coffee trees are uprooted	- Reinforcing and protecting their houses against typhoon - Labour contribution with those cultivating dry season rice.
Unusual rainfall	- Damage and loss of crops - Landslides - Soil depletion - Poor quality of rice harvested - Limited seeds grains for the next cropping season - Poor soil fertility - Grass shortage for large ruminants - Scarcity in forest product and NTFPs	- Farmers bring their cattle to another grazing area belonging to neighbouring villages. - Additional rice planting

Source: PRA

4. Prioritization of livelihood activities

The PRA participants were asked to rank the principal constraint encountered by the villagers in improving their local livelihood. In the northern part of the program the high number of animal husbandry death is perceived as the main problem followed by the limited space for crop cultivation especially for paddy as a result of the mountainous area surrounding the pilot sites. In the southern Sanamxay District annual rice shortage, limited technical capacities in crop cultivation and livestock raising and to lesser extent limited access to health services are the main difficulties observed.

Table 11: Main constraints for livelihood improvement by PRA group

Province	District	Village name	Village authorities	Men	Women
HP	VGX	Naheua	Limited space for cultivation	High number of animal husbandry death	Poor road condition leading to maize fields
		Naman	Limited financial means	High number of animal husbandry death	High number in animal husbandry death
	XAM	Sobpeng	Limited financial means in livestock raising	Limited financial means	High number of animal husbandry death
		Tinphou	No area for paddy cultivation	High number of animal husbandry death	High number of animal husbandry death
AP	SAN	Hat-Oudomxay	Limited technical capacities in crop cultivation	No health center	Annual rice shortage and no health center
		Sompoy	No irrigation system	Annual rice shortage	Annual rice shortage
		Tagao	High number of animal husbandry death	-	Annual rice shortage
		Nonghin	Limited technical capacities in crop and livestock.	Annual rice shortage	Difficulty in pest management
		Xaydonekhong	Annual rice shortage	Insufficient availability of water supply	Annual rice shortage
		Mathka	Limited technical capacities in crop cultivation and livestock raising	Limited technical capacities in crop cultivation and livestock raising	Difficulty in pest management
		Nongmouang	Annual rice shortage	Annual rice shortage	Limited access to health services

Source: PRA

Following the identification of the principal constraint in improving local livelihoods, identification of possible interventions was carried out. It can be seen from the table above that enhancing rice and coffee productivity as well as improving livestock raising technique are the three main priorities raised by the participants. In the northern part of the pilot sites, farmers aim to improve livestock raising technique to generate sustainable cash income as a result of limited surface area for crop cultivation and due to the fact that the contract farming for maize was not respected by the local companies. In the southern part of the programme, enhancing paddy and coffee growing practices are the principal activities as a consequence of the high lowland area and the suitable climatic condition for cultivating their main cash crop. To a lesser extent, planting fruit trees (mainly bananas and jackfruit) was mentioned in two villages due to the rising demand from the district capital.

Table 12: Identification of livelihood improvement activities

Province	District	Village name	Rice	Coffee	Livestock	Fruit trees
HP		**Total HP**	**1**	**-**	**4**	**-**
	VGX	Naheua	Yes	-	Yes	-
		Naman	-	-	Yes	-
	XAM	Sobpeng	-	-	Yes	-
		Tinphou	-	-	Yes	-
AP	SAN	**Total AP**	**5**	**5**	**2**	**2**
		Hat-Oudomxay	Yes	-	-	-
		Sompoy	Yes	-	Yes	-
		Tagao	-	Yes	Yes	
		Nonghin	-	Yes	-	Yes
		Xaydonekhong	Yes	Yes	-	Yes
		Mathka	Yes	Yes	-	-
		Nongmouang	Yes	Yes	-	-
		Overall Total	**6**	**5**	**6**	**2**

Source: PRA

5. REDD+ livelihood options

REDD+ is a financial instrument to incentivize conservation and sustainable management of forest and thereby reducing GHG emissions from deforestation and forest degradation. It aims at compensating the forest owners in developing countries for conserving the forests by putting a value on the forest carbon stocks. Development of technologies that facilitate intensification and consequently alleviate yield risk for smallholders may also help to reduce deforestation by small scale farmers, given their use of natural resources as a form of insurance against these risks (Angelsen and Kaimowitz 2001). However this approach is not sufficient to prevent deforestation in the absence of specific policies to do this (Thomson et al. 2010). Through the LEAF program local communities will be encouraged to voluntarily protect their forests by the provision of livelihood action plans that improve the farmers' economic situation. The following section focuses on the possible activities that intensify the existing crops and livestock production systems observed in the pilot sites and aiming at adapting and/or reducing the impact of climate change on the target livelihoods or in a way that is "climate-smart". These proposed lower emission intensification technologies shall be discussed and approved by the relevant local and national authorities as well as involved development organisations.

Improving rice production system

Rice cultivation is both an important sequester of carbon dioxide from the atmosphere and an important source of methane and nitrite oxide. Flooded rice fields principally emit methane (or CH4), which is second in importance to CO2 as a greenhouse gas (Moller, 2007). Adaptation to climate change involves adjustments to decrease the vulnerability of rice production to climate changes, while mitigation focuses on reducing the emission of greenhouse gases from rice production and minimizing deforestation resulting from upland rice cultivation under slash-and-burn shifting cultivation. There are a range of technological options that are presently available or which can potentially be developed in the near future for enhancing the rice production systems' ability to adapt to and mitigate the effects of global climate changes (Nguyen, 2007).

- Selection of appropriate planting date

Given that germination and emergence of rice seedlings are more likely to be limited by low than by high temperatures, any temperature increase under global climate changes would not significantly affect the selection of the appropriate date for establishing the rice crop in tropical regions. As temperature

varies from month to month, it is possible to select the right date for crop establishment in such a way that the reproductive and grain filling phases of rice fall into those months with a relatively low temperature. This would minimize the negative effect of temperature increase on rice yield as reported by Peng et al. (2004). Efforts to collect and disseminate the information on month-to-month variation in temperature regimes in major rice-producing tropical areas, therefore, are essential for helping rice production to adapt to climate changes.

- Selection and development of appropriate rice varieties

The selection of appropriate rice varieties is another technical option for adaptation to global climate changes since modern rice varieties have now different abilities to tolerate high temperature, salinity, drought and floods and own high-yielding potential. The most promising varieties under Lao environmental conditions are TDK 1, TDK 1/1, TDK 8 and TDK 11, among others. In LEAF pilot sites, farmers sometimes prefer planting traditional varieties of rice when new, more productive varieties were available. Some farmers were reluctant to use the new varieties because of uncertainties about their performance under local growing conditions. In other cases, farmers were interested in the new varieties but could not get access to the modern seeds. However, most farmers obtained improved seed through rice swaps, i.e. exchange of rice with other village members. Access to the new varieties depends on the availability of seed in the village and willingness for swaps.

- System of Rice Intensification

The "System of Rice Intensification" (SRI) is a set of agronomic practices developed in the 1980s in Madagascar to help smallholder farmers grow more rice in a sustainable way, using less water, seeds and chemical fertilizers. SRI has been demonstrated in more than 45 countries and key practices include alternate wetting and drying (AWD) of the soil during grain filling rather than continuous flooding, and application of organic fertilisers, such as manure, rather than synthetic fertilisers. AWD reduce methane emissions from rice paddies by up to 90% and decreases the amount of water farmers have to apply to their fields by up to 40%. However, AWD may increase production of nitrous oxide, so careful fertiliser management is needed to reduce excess nitrogen in the soil and thus reduce nitrous oxide emissions. Changes in the way the crop is planted and managed—with seedlings more widely spaced in a grid pattern—allows the plants to make best use of the light, water and nutrients available to them and ensures good yields. Integrated pest management completes an environmentally friendly package.

On average, farmers using SRI in Cambodia since 1999 have increased their yields by 9–15% and used 70–75% less seed, 20–25% less nitrogen fertiliser and 33% less water than farmers following conventional practices. This has boosted their income by US$95–US$260 per hectare in each cropping season. Farmers have also reported positive changes to the environment and their health as a result of using fewer pesticides, herbicides and synthetic fertilisers (Neate, 2013). An Indian farmer even harvested nearly 24 tonnes of paddy rice per hectare (Vidal, 2014). This show that SRI brings immediate benefits to smallholder farmers in terms of increased yields, reduction of the amount of required water and enhancement of long-term soil fertility. This helps to mitigate climate change by reducing emissions of greenhouse gases and sequestering carbon in the soil (Neate, 2013).

According to the SRI International Network and Resources Center at Cornell University in the US, the method has been adopted by at least 9.5 million farmers in Cambodia, China, India, Indonesia, Vietnam and the main rice-growing countries. One million farmers in other countries in Asia, Africa and the Middle East are also thought to be using it. In Laos research organizations, national extension services and INGO carried out SRI trial activities such as the Lao- IRRI project, the National Rice Research Program (NRRP) or Oxfam International. Consultation with these relevant structures shall be organized for the possible SRI replication in the LEAF pilot sites.

Improving coffee production system

- Coffee- Banana intercropping

In general coffee intercropping systems offer more agronomic benefits to smallholder farmers than coffee mono-cropping systems, with an increase in organic matter/nutrient recycling, soil conservation, productivity life cycle of coffee plants and higher biodiversity values (Miguel & Toledo, 1999). Shade provided by banana trees can help coffee to cope with the warmer climate and with drought shocks. Research has shown that shade can reduce the temperature in the understory plants by up to 2º C or more. Past research by the International Institute in Tropical Agriculture (IITA) in Uganda also showed that growing coffee and banana together increased the farmers' income – the coffee yield remained the same despite creating room for the banana and the farmer gained additional income from selling the banana (increase revenue of banana-coffee intercropped fields by 50-60% compared to mono-cropped coffee fields). This study strengthens the case for growing coffee and banana together as it provides both short- and long- term benefits to farmers. The farmers had also observed that pests and diseases such as leaf miners, coffee berry borers, mealy bugs, and leaf rust were on the rise. However, the study found that leaf rust incidences were 50% lower in coffee that was shaded by banana compared to the unshaded plants (Van Asten, 2011).

The only drawback to adding shade to coffee is that it demands more nutrients and farmers will have to invest in maintaining soil fertility. Adding shade to a coffee system increases competition among the different plants for water, nutrients, and light. This competition needs to be managed by using good agronomic practices such as integrating fertilizers and organic nutrient inputs, appropriate plant density and canopy management, as well as good soil and water conservation practices to adapt successfully to climate change (Van Asten, 2011).

- Coffee farmers association

Small-scale coffee farmers and farm workers remain extremely vulnerable to the coffee market's price swings and the disproportionate market power of local buyers, international traders, and multinational coffee companies. Despite the recent increase in the international price of coffee, an adequate, sustainable, and stable price of coffee is a priority concern for small-scale farmers. Farmers' core demand is a coffee price that covers the costs of production and some level of investment and savings. However high transaction costs, such as taxes, technical assistance fees and certification, can make a farm or organization unprofitable when combined with low prices.

Improving livestock management

- Development of forage systems

Forages are **grasses, herbaceous legumes and shrub/tree legumes** that can be used for feeding large ruminants as well as monogastric animals such as pigs and poultry (but in a small amount and associated with other high-energy feeds). In Laos, researchers at the International Center for Tropical Agriculture (CIAT), in partnership with Lao's National Agriculture and Forestry Research Institute (NAFRI) and the Ministry of Agriculture and Forestry have developed improved forage varieties. The most promising species are *Brachiaria brizantha 'Marandu', Brachiaria hybrid'Mulato', Panicum maximum'Simuang', Pennisetum purpureum and Stylosanthes guianensis'CIAT 184'*. Grown close to home, the improved varieties deliver double or even triple weight gain in animals, especially when combined with better animal-keeping practices – keeping animals in a pen rather than leaving them to roam and graze for meager feed around the village; ensuring well-stocked troughs throughout the day; providing adequate water and mineral licks (Smith, 2014). This approach has successfully been implemented in San Dong village, Nonghet District, Xieng Khouang province.

Forages can also improve the management of natural resources on farms by: i) reducing soil erosion; ii) improving soil fertility, and iii) controlling weeds. Reduction of soil erosion is achieved when forages are grown in hedgerows, as ground covers and as cover crops. For instance when forages provide 80% ground cover of a given plot, the erosion is reduced by 5% and water runoff is greatly reduced, thus increasing the availability of soil moisture for crops. Improvement of soil fertility is achieved when farmers plant their forage near their houses so they can keep their animals closer to home and collect the corresponding manure more easily to improve the yield of vegetables, food crops, fruit trees and forages. Finally weed control is organized when forage legumes are grown as fallows and cover crops in cropping areas and under tree crops (Stür, 1999).

- Establishment of Village Veterinary Worker (VVW)

Since large-scale vaccination is not routinely practised, the livestock population remains largely susceptible to infection as Laos is a major thoroughfare for trans-boundary animal movements and regular disease outbreaks, thus causing economic hardship for farmers and their families (Khounsy and al., 2008). Two VVWs will be selected in each pilot sites where improving livestock management is a priority. The corresponding training could be conducted by the PAFO or DAEC (Department of Agriculture and Extension Centre) in Vientiane. A financial contribution will be required to use the VVW services (such as vaccination), thus making the system sustainable. Women will be encouraged to become a village veterinary worker since they are the main responsible for pig and poultry raising.

6. Integrating gender into climate smart practices

There is a growing acknowledgement that based on their different knowledge and roles related to agriculture development, men and women are affected differently by climate change. Understanding men and women's vulnerability and adaptation responses is important in order to design and implement effective climate-smart agriculture strategies. Their different roles, responsibilities and capacity in adapting to climate change and maintaining food security need to be well understood to ensure both men and women benefit from climate-smart agriculture practices and approaches2

Researches shows that women in many places are more vulnerable to climate impacts than men, for many reasons, including their greater dependence on natural resources for livelihoods; responsibility for securing food, fetching water for their households; more limited assets, and social, cultural barriers that restrict their decision-making power, access to information, and even mobility (UN WomenWatch, 2009). At the same time, as food producers and stewards of natural resources in their households and communities, women are well positioned to be effective agents of change for both mitigation and adaptation, if they are given the opportunity to do so (UN Commission on the Status of Women, 2008). As anywhere else in the world, there is no simple tool to integrate gender considerations across the country, but the project will orient activities in a way that promotes gender equity while acknowledging and respecting the cultural and ethnic roles of gender.

Conclusion

Three main activities were selected by the participants during the PRA exercise, namely paddy rice, coffee and livestock management. This report proposed corresponding climate smart practices that offer opportunities to tackle food security and climate adaptation objective. The next step will focus on the design and the establishment of specific livelihood action plans for each of the three selected activities, in close consultation with the national research centres and international development organisations involved in reducing greenhouse gas emissions from the agricultural sector. These actions plans shall be provided at the end of this year or before the beginning of the planting season.

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Annex 1: Seasonal calendar on crops

Typical seasonal calendar for **upland rice** production

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Identification												
2	Slash												
3	Burn												
4	Sowing												
5	Fencing												
6	First weeding												
7	Second weeding												
8	Third weeding												
9	Harvest												
10	Threshing												
11	Storage												

Source: PRA

Typical seasonal calendar for **paddy** production

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Clean water channel												
2	Irrigation												
3	Nursery preparation												
4	Soaking												
5	Sowing												
7	Plowing												
8	Diking												
9	Harrowing												
10	Levelling												
11	Transplanting												
12	Harvesting												
13	Storage												

Source: PRA

Typical seasonal calendar for **maize** production

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Slash												
2	Soil preparation												
3	Sowing												
4	First weeding												
5	Second weeding												
6	Harvest												

Source: PRA

Typical seasonal calendar for **coffee** production

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Land clearing												
2	Burning												
3	Hole digging												
4	Planting												
5	First weeding												
6	Second weeding												
7	Third weeding												

Source: PRA

Annex 2: Village profile

Annex 1.1: Naheua village profile

1. General information

Demography	
District name Village cluster name **Village name** Year of establishment	Viengxay Nam Nga **Naheua** 1850
Total number of PRA participants - from village authorities group - from men's group - from women's group	**28** 10 8 10
No. of households Household size **Population** - of which female	**45** 5.3 **240** 121
Ethnic minority	Thaideng
Agriculture and NTFPs	
Subsistence crops	Upland rice, paddy, cassava, cabbage, eggplant, chilli, banana, peanuts, sugarcane.
Commercial crops	Maize, ginger, kind of pumpkin.
NTFPs	Bamboo shoots.
Type and total number of animal husbandry registered	
No. of buffalos No. of cows No. of pigs No. of goats No. of poultry	108 23 500 5 250

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	4 – 5 years
Hole dimension	3 - 5 cm
Hole spacing	25 cm x 25 cm; 20 cm x 25 cm; 30 cm x 40 cm
No. of seeds in each hole	5-15 seeds
No. of rice varieties registered	8
Use of improved rice varieties	No
Fertilizer application	Yes (but only on vegetable garden with animal manure)
Use of straw as potential manure of mulch	No
Use of rice husks as organic fertilizer	No
Weeding	4 times per year
Estimated productivity in 2012	1.8 tons per ha

Upland rice production system	
No. of rice mills	45
Milling speed	100 kg per hour
Milling price	LAK 5,000 (USD 0.62) per 30 kgs bag
Main constraints for upland rice production	Rodents, birds, drought, heavy rainfall and poor soil fertility. That events cause loss of 30-40% of total production.
Impact on forest decline and forest degradation	Limited due to low population pressure.
Paddy production system	
No. of rice varieties	2
Name of rice varieties	Small red rice chicken and small yellow rice chicken.
Use of improved varieties	Yes
No. of weeks before transplanting	8
Sandy soil when transplanting	No
No. of seedlings per hill	2-5
Application of fertilizer	No
Quantity of rice grain preserved for seeds	5-15 kgs.
Weeding	2 times per year.
Estimated productivity	4.4 tons per ha.
Main constraints for paddy cultivation	Rodents, birds cause 20-30% loss of total production.
Impact on forest decline	Limited as no land extension is carried out.
Value chain	
Seeds purchase	No
Processing	Traditional alcohol sold at LAK 10,000 per bottle (USD 1.25).
Buyers	Rice is sold to villagers only with little quantity purchased by local traders.
Farmgate price	Unhusked rice sold at LAK 3,500/ kg (USD 0.44/kg)
Destination of rice sold	Nameo village in Vietnam. Distance of 19 km from Naheua village.
Farmers' bargaining power	Yes

2.2. Maize

Maize production system	
No. of maize varieties	1
Name of maize variety	Red maize (variant 888,999 & 10)
Price of maize variety	888 & 999: LAK 23,000 per kg (USD 2.87) 10: LAK 20,000 per kg (USD 2.49)
Origin of maize seeds	Provided by Vongthon company
Hole spacing	70 x 70 cm; 80 x 100 cm; 50 x50 cm
No. of grains per hole	1-2
Weeding	Two times per year

Maize production system	
Estimated productivity in 2012	4.6 tons per ha.
Use of drying sheds	No
Storage location	House and small hut near the house
Buyers	Maize crop bought by Vongthon company at a price of LAK 1,100 per kg (USD 1.14).
Destination	Vongthon company sold the maize production at Nameo market in Vietnam at LAK 1,500 per kg (USD 0.19).
Relation with traders	Contract agreement between villagers and the Vongthon company. However, in 2011 and 2012, the company did not buy the production as expected which make farmers more vulnerable.
Main constraints for maize cultivation	Local rodents, grain eaten by ruminants during growing phase, rotten maize due to company's withdrawal.
Main local adaptation practice	Cats and traps for catching rodents.

2.3. Animal husbandry

Type	Cattle and buffalos
Penning system	No / Free grazing
Main disease	Foot and mouth in September and October Black Blood in February and March
Local solution	Animal disposal or quarantine and vaccination after disease revealed supported by DAFO.
Information on market prices	Village level only
Origin and price of livestock bought in 2012	Mostly with relatives or from villages located nearby Cattle: n.a Buffalos: LAK 5,000,000 (USD 623)
Destination and price of livestock sold	Viengxay D.C. and Nameo village in Vietnam. Animal sold at LAK 50,000 per kilo (USD 6.23).
Other problems	Limited space for proper cattle and buffalos raising Men group indicate that animal disease is mainly due to use of herbicide.
Impact on forest decline and forest degradation	None according to various focus groups.
Type	Pigs
Penning system	Yes / 42 pens registered in the village. Each of them lasting for approx. 2-3 years.
Feeding	Rice bran, cassava and banana leaves.
Main disease	Classical swine fever in March and April.
Local solution	None.
Number of local traders	5 people from Viengxay District.
Farmgate price	Between 1-14 kgs, LAK 30,000 per kilo (USD 3.74) Between 15-20 kgs, LAK 20,000 per kilo (USD 2.49) Between 21-100 kgs, LAK 18,000 per kilo (USD 2.2)
Destination of livestock sold	Viengxay D.C. and Nameo village in Vietnam.

Farmers' bargaining power with local traders	Yes
Impact on forest decline	Limited as timber is used for pens construction only.

3. Others livelihood aspects

Water supply	
No. of irrigation system	1 / System of rotation that lasts for 5 years.
Condition	Good
No. of beneficiaries	16 for men's group and 34 for women's group
Other available systems	Gravity-fed system
Maintenance	By villagers themselves. Financial contribution of LAK 20,000 per family/per year (USD 2.49).
Water shortage	Dried source for gravity-fed system in June and July.
Sanitation	
Latrine coverage (in percent of total families)	90% (or 33 latrines registered).
Domestic waste	Burned and no compost.
Education and health	
No. of illiterates	45 people of which 30 women.
Adult literacy class	None.
Main health disease	Fever, cold, arthritis, stomach ache, tuberculosis.
Local groups and external assistance	
Total number of local group	1
Type	Rice bank
External assistance	- **ADB**: Renovation of primary school in 2012. - **AusAid**: Construction of gravity-fed system and establishment of the rice bank in 2002. - **PRF**: Construction of small scale irrigation structure in 2013 and gravity fed system in 2001.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Flash Floods	- Crop losses - Human disease - Soil erosion	- Recourse to health services available at the village level - Reduce deforestation
2. Drought	- Delay in crop cultivation - Water shortage	- Construction of dug well

5. SWOT analysis

A. Strength	B. Weakness
- Capacities in rice and maize cultivation as well as weaving, drying bamboo shoots and livestock raising - No annual rice shortage - Hard working population	- Poor road condition leading to maize fields - High number of animal husbandry death - Weed in shifting cultivation - Limited labour force - Lack of health services - Limited space for crop cultivation - Limited infrastructures such as electricity and telecommunication coverage. - Soil erosion
C. Opportunities	**D. Threats**
- High demand for livestock and cash crop	- Price variability in commodities - Decrease of forest cover area resulting in climate change

6. Main problem raised by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited space for cultivation	High number of animal husbandry death	Poor road condition leading to maize fields
2	High number of animal husbandry death	Limited labour force	High number of animal husbandry death
3	Lack of health services	Lack of health services	-
4	No electricity	-	-
5	No telecommunications	-	-

Annex 1.2: Naman village profile

1. General information

Demography	
District name Village cluster name **Village name** Year of establishment	Viengxay Nam Nga **Naman** n.a
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**33** 14 9 10
No. of households Household size **Population** - of which female	**67** 5.8 **387** 196
Ethnic minority	Thaideng
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy, upland rice, cabbage, cassava, banana, taro, ginger, pumpkin, cucumber and other vegetables.
Commercial crops cultivated	Red maize, paddy.
NTFPs	Broom grass, bamboo shoots, cardamom, wild potato, *gnameuak*, *makka*, *mak tien*, *gna lai*
Type and total number of animal husbandry registered	
No. of buffalos No. of cows No. of pigs No. of goats No. of poultry	36 100 150 0 170

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	From 3 to 6 years
Hole dimension	From 2 to 5 cm
Hole spacing	20 x 20 cm, 25 x 25 cm; 20 x 30 cm
No. of seeds in each hole	Between 5 – 10 seeds
No. of rice varieties registered	4
Use of improved rice varieties	No
Fertilizer application	No
Use of straw as potential manure of mulch	No
Use of rice husks as organic fertilizer	No
Weeding	3 times per year.
Estimated productivity	1.2 tons per ha

Upland rice production system	
No. of rice mills	n.a
Milling speed	200 kg per hour
Milling price	LAK 5,000 per 30 kg (USD 0.62).
Main constraints for upland rice production	Caterpillar, slug, rodents, wild pigs and birds. Estimated loss of 3% of the total production.
Impact on forest decline and forest degradation	Important due to high population pressure.
Paddy production system	
No. of rice varieties	2
Name of rice varieties	Small yellow rice chicken and *khao EU*
Use of improved varieties	Yes
No. of weeks before transplanting	3
Sandy soil when transplanting	No
No. of seedlings per hill	2-3 & 4-5
Application of fertilizer	No
Quantity of rice grain preserved for seeds	10-40 kgs
Weeding	2 times per year
Estimated productivity	1.8 ton per ha
Main constraints for paddy cultivation	Caterpillar, birds and rodents. Estimated loss of 10% of the total production.
Impact on forest decline	Limited as no land extension is carried out.
Rice value chain	
Seeds purchase	No
Processing	Traditional alcohol is produced and sold at LAK 10,000 per bottle (USD 1.25).
Buyers	Rice is sold to villagers only
Destination of rice sold	n.a
Farmers' bargaining power	Yes

2.2. Maize

Maize production system	
No. of maize varieties	1
Name of maize variety	Red maize (variant 888,999 & 10)
Hole spacing	50 x50 cm; 60 x 60 cm 70 x 80 cm.
No. of grains per hole	1-2
Weeding	Two times per year
Use of drying sheds	No
Storage location	House and small hut near the house
Estimated productivity in 2012	3.2 tons per ha.
Main constraints	Poor soil quality, water shortage, local rodents, wild pigs and birds. Estimated loss of 40-50% of total production. Rotten maize as the company delayed its purchase in 2013.

Maize production system	
Main local adaptation practices	Traps for catching rodents.
Impact on forest decline and forest degradation	High as a result of shifting cultivation system
Maize value chain	
Contract farming	Yes
Origin of seeds	Sold by Vongthon company
Seeds price	"888" variety at LAK 22,000 per kilo (USD 2.74) "10" variety at LAK 15,000 per kilo (USD 1.87)
Buyers	Vongthon Company
Farmgate price	LAK 1,100 – 1,200 per kilo (USD 0.14 – 0.15)
Destination of maize sold	Nameo village in Vietnam.
Farmers' bargaining power with local traders	Limited due to contract farming. In 2011 and 2012 the company did not buy the expected production.

2.3. Animal husbandry

Type	Cattle
Penning system	No / Free grazing
Main disease	Black Blood in August and September
Local solution	Animal disposal or quarantine.
Information on market prices	Through local traders only.
Origin and price and livestock bought in 2012	Provided within the village itself Cattle: LAK 680,000 (USD 85) Buffalo: LAK 4,000,000 (USD 498)
Destination and price of livestock sold	Animals sent at Nameo village in Vietnam. Cattle: LAK 4,700,000 (USD 586) Buffalo: LAK 4,075,000 (USD 508)
Other problems	Limited space for proper cattle and buffalos raising
Impact on forest decline and forest degradation	None according to various focus groups.
Type	Pigs
Penning system	Yes / 10 pens registered in the village. According to village authorities group, a fine of LAK 50,000 per animal (USD 6.23) is applied in case of pigs are not penned at night.
Feeding	Rice bran, cassava, banana leaves, taro
Main disease	Classical swine fever.
Local solution	Animal quarantine
Other constraint	No proper animal feeding.
Impact on forest decline and forest degradation	Medium as timber is used for pen construction only.
Breed purchase / location	LAK 30,000 (USD 3.74) / Purchased at Naheua and Hindam villages.
Number of local traders	4-5 from Viengxay D.C.
Farmgate price	Between 1-19 kgs, LAK 30,000 per kilo (USD 3.74) Between 20-100 kgs, LAK 18,000 per kilo (USD 2.2)
Destination of livestock sold	n.a

Farmers' bargaining power with local traders	Yes

3. Others livelihood aspects

Water supply	
No. of irrigation system	10
Condition	Good except one which does not function
No. of beneficiaries	n.a
Other available systems	Gravity fed system and river nearby the village.
Maintenance	Financial contribution of LAK 5,000 per family/per year (USD 0.62) with involvement of villagers' labor force on average once a year).
Water shortage	No
Sanitation	
Latrine coverage	67 families
Domestic waste	1 specific location for village waste.
Education and health	
No. of illiterates	20 people of which 10 women.
Adult literacy class	Already implemented. Duration of 3 hours per day for a period of 3 months. 33 people participated of which 12 women.
Main health disease	Fever (March/April), stomach ache (May/June) and diarrhoea (All year round).
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	**PRF**: Training on paddy, fish ponds and vegetables cultivation in 2012. Training in water system use and latrine construction in 2011. **AusAid**: Extension of primary school in 2007. Not identified: Construction of irrigation system in 2011. **Oxfam Hong Kong**: Training on veterinary capacities as well as training on crop cultivation, livestock raising and vegetables (year unknown). **ADB**: Construction of primary school in 2002. **DHO:** Construction of gravity-fed systems in 2011.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Flash Floods	- Crop losses - Animal disease - Soil erosion	- Water level monitoring and construction of dikes to prevent soil erosion
2. Drought	- Reduce agricultural productivity - High number of animal husbandry death - Water shortage for crop cultivation and domestic use	- Rain praying - Establishment of dikes for water retention

5. SWOT analysis

A. Strength	B. Weakness
- Capacities in rice, maize cultivation and large ruminants. - Hard working population and solidarity - Fertile soil - Full course of primary school - Availability of clean water supply - Sufficient labour force	- Limited financial means to purchase rice seeds - Difficulty in pest management - Mountainous area - Limited area for paddy cultivation - High number of animal husbandry death - Limited access to health services - Long distance from secondary schools - Restricted telecommunications coverage - Lack of technical capacities in crop cultivation and livestock raising
C. Opportunities	**D. Threats**
- High demand for industrial tree plantation	- Unsuitable weather conditions such as drought - High population pressure - High level of deforestation - Instability of crop prices

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited financial means	High number of animal husbandry death	High number of animal husbandry death
2	Difficulty in pest management	Limited access to health services	Limited area for paddy cultivation
3	-	Long distance from secondary schools	Difficulty in pest management
4	-	Restricted telecommunications coverage	Lack of technical capacities in crop cultivation and livestock raising

Annex 1.3: Sobpeng village profile

1. General information

Demography	
District name Village cluster name **Village name** Year of establishment	Xamtai Long Kaem **Sobpeng** n.a
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**30** 10 10 10
No. of households	**62**
Household size	6.0
Population - of which female	**375** 184
Ethnic minority	Thaideng
Agriculture and NTFPs	
Subsistence crops cultivated	Upland rice, paddy, vegetables, fruits, cassava, cucumber, beans, chili, sponge gourd, pumpkin, eggplant, yam bean.
Commercial crops cultivated	Red maize and paddy.
NTFPs	Bamboo shoots, broom grass, *nangheuan, samhang, maksamsip, peuak meauk.*
Type and total number of animal husbandry registered	
No. of buffalos No. of cows No. of pigs No. of goats No. of poultry	120 150 180 3 170

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	10 years
Hole dimension	2-4 cm
Hole spacing	30 x 40 cm; 20 x 30 cm; 30 x 30 cm
No. of seeds in each hole	10 - 30
No. of rice varieties registered	4
Use of improved rice varieties	No
Fertilizer application	Use of animal manure on vegetable gardens only.
Use of straw as potential manure of mulch	No
Use of rice husks as organic fertilizer	No
Weeding	Three times per year.

Upland rice production system	
Estimated productivity in 2012	2.5 tons per ha.
No. of rice mills	n.a
Milling speed	200 – 400 kg/hour
Milling price	LAK 5,000 per 30 kg/bag (USD 0.62).
Main constraints for upland rice production	Wild pigs, weeds, insects, birds, local rodents and domestic cows and buffalos. Estimated total loss of **20-40%** of total production.
Impact on forest decline and forest degradation	High as availability of paddy land is low and also as a result of population pressure.
Paddy	
No. of rice varieties	3
Name of rice varieties	Small chicken rice, EU rice and Agricultural rice
Use of improved varieties	Yes
No. of weeks before transplanting	5-8
Sandy soil when transplanting	Yes
No. of seedlings per hill	2-5
Application of fertilizer	No.
Quantity of rice grain preserved for seeds	30 - 50 kgs
Estimated productivity in 2012	3.2 tons per ha.
Weeding	2-3 times per year
Main constraints for paddy cultivation	Local rodents and birds, heavy rainfall leading to flash floods. Estimated loss of **30-40%** of total production
Impact on forest decline	Use of timber for the construction of wooden dikes.
Rice value chain	
Seeds purchase	Some farmers bought the EU rice at LAK 15,000 per kilo (USD 1.87) with DAFO.
Processing	Traditional Lao alcohol
Buyers	Local traders from Xamtai District Center
Farmgate price	LAK 2,500 – 2,800 per kilo for small rice chicken (USD 0.31 – 0.35). LAK 2,000 for other rice varieties (USD 0.25). Bartering is also practiced in the village. However the village authorities' group mentioned that the received products were of bad quality and rather expensive.
Farmers' bargaining power	No.
Destination	Xamtai District Center and Vietnam

2.2. Maize

Maize production system	
No. of maize varieties	2
Name of maize variety	Red maize and white maize
Hole spacing	60 x 70 cm, 80 x 80 cm
No. of grains per hole	1-2

Maize production system	
Weeding	1-2 times per year
Use of drying sheds	No
Storage location	House and small hut near the house
Main constraints	Local rodents and insects, wild pigs. Estimated loss of 30-50% of the total production.
Estimated productivity in 2012	3.6 tons per ha.
Main local adaptation practice	Human control against wild pigs and traps for rodents.
Impact on forest decline and forest degradation	Yes
Maize value chain	
Contract farming	Yes
Origin of seeds	Provided by Daothong company.
Seeds price	LAK 12,000 – 15,000 per kilo (USD 1.49 – 1.87).
Buyers	Purchased by Daothong company.
Farmgate price	LAK 800 – 1,000 per kilo (USD 0.1 – 0.13)
Destination of maize sold	Nameo village in Vietnam.
Farmers' bargaining power with local traders	No.

2.3. Animal husbandry

Type	Cattle and buffalos
Penning system	Free grazing during the day and penned at night. 30 pens systems are registered in the village.
Main disease	Black Blood, Foot and Mouth and abdominal distension.
Local solution	Vaccination when disease outbreak at LAK 25,000 per vaccine (USD 3.12) or animal disposal.
Other problems	Limited grazing area. Rice and maize grains eaten by cattle and buffalos during the crops growing phase.
Information on market prices	Through local traders.
Origin and price of livestock bought in 2012	Provided by relatives or purchased at a price between LAK 2-3 million per animal (USD 249 – 374)
Destination and price of livestock sold in 2012	Cattle: LAK 3,3000,000 (USD 411 – 498) Buffalos: LAK 4,000,000 (USD 498) Large ruminants brought to Viengxay and Xamtai District Centers as well as Nameo village in Vietnam.
Impact on forest decline and forest degradation	Decrease of collectable bamboo shoots as result of free grazing system
Farmers' bargaining power with local traders	Yes

3. Others livelihood aspects

Water supply	
No. of irrigation system	8
Condition	Small scale systems
No. of beneficiaries	-
Other available systems	Gravity-fed system and river nearby the village.
Maintenance	Financial contribution of LAK 800 per person/year (USD 0.1)
Water shortage	Depending on the season, water shortage in May and June for crop cultivation.
Sanitation	
Latrine coverage	53 households constructed their own latrines (85% coverage)
Domestic waste	One specific location for waste management (hole in the ground). When required, waste is afterwards burned.
Education and health	
No. of literates	382 people of which 173 women
Adult literacy class	Already implemented. 18 people were involved of which 4 women.
Main health disease	Stomach ache in May and June Cold in November and December Diarrhoea in May and June
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	**DAFO**: Livestock vaccination campaign in 2013. **DHO**: Construction of gravity-fed system and primary school in 2004. **WHO**: Provision of 8 tons of rice in 2004. **PRF**: Renovation of gravity-fed system in 2007. **UNICEF**: Support in latrine construction in 2004.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Soil erosion - Crop losses - Grass shortage for large ruminants - Human disease	- Reduction in cutting trees
2. Unusual rainfall	- Soil degradation - Perturbation in the crop growing phase - Animal disease - Grass shortage for large ruminants	- Farmers bring their cattle to another grazing area belonging to neighbouring villages.

5. SWOT analysis

A. Strength	B. Weakness
- Capacities in rice cultivation, livestock raising and weaving - Solidarity between villagers - All year round water supply - Dispensary with adequate medicines - Availability of electricity - Short distance to health center	- Limited area for crop cultivation - Long distance to secondary schools - High number of animal husbandry death - Inadequate irrigation scheme - Limited financial means in livestock raising and weaving - Limited technical capacities in crop cultivation and livestock raising - No full course of primary school - Dry season road only - Annual rice shortage - Difficulty in pest management
C. Opportunities	**D. Threats**
- High demand for livestock.	- High population pressure

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited financial means in livestock raising	Limited financial means	High number of animal husbandry death
2	No full course of primary school	Difficulty in pest management	No full course of primary school
3	Inadequate irrigation scheme	-	Limited area for crop cultivation
4	Limited area for crop cultivation	-	Long distance to secondary schools
5	Limited technical capacities in crop cultivation and livestock raising	-	-
6	Limited financial means in weaving	-	-
7	Dry season road only	-	-

Annex 1.4: Tinphou village profile

1. General information

Demography	
District name Village cluster name **Village name** Year of establishment	Xamtai Long Kaem **Tinphou** 1920
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**29** 10 9 10
No. of households	**39**
Household size	5.2
Population	**204**
- of which female	103
Ethnic minority	Thaideng & Laophoud
Agriculture and NTFPs	
Subsistence crops cultivated	Upland rice, cassava, chilli, eggplant, type of gourd; cucumber, pumpkin, beans, sugarcane
Commercial crops cultivated	Upland Rice, maize
NTFPs	Bamboo shoot, tree bark, broom grass, *maksamhang*, *maksamsip*.
Type and total number of animal husbandry registered	
No. of buffalos No. of cows No. of pigs No. of goats No. of poultry	78 108 63 94 n.a

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	3 – 6 years
Hole dimension	2 – 5 cm
Hole spacing	25 x 25 cm; 30 x 30 Cm
No. of seeds in each hole	10 – 15
No. of rice varieties registered	7
Name of rice varieties	*Khao khai, khao xang, khao samdeuan, khao leuang, khao tjer, khao pee, khao dor, khao kang*
Use of improved rice varieties	No
Fertilizer application	No due to limited financial means
Use of straw as potential manure of mulch	No
Use of rice husks as organic fertilizer	No

Upland rice production system	
Weeding	Three times per year
Estimated productivity in 2012	2 tons per ha.
No. of rice mills	5
Milling speed	100-150 kg per hour
Milling price	LAK 5,000 per 30kg/bag (USD 0.62)
Main constraints for upland rice production	Poor soil fertility, period of drought, local rodents, *nokpeed* birds and wild pigs. Estimated loss of 40% of the total production.
Local solution practices	Trap barriers and weeding White paper placed at the edge of the rice field against birds and human supervision at night.
Impact on forest decline and forest degradation	Reduction in forest cover due to expansion of the shifting cultivation area.
Rice value chain	
Seeds purchase	No as grains come from the previous rice harvest.
Processing	Traditional alcohol
Buyers	Local traders from Sam Neua and Xamtai District Centers.
Farmgate price	LAK 2,500 – 2,700 per kilo (USD 0.31 – 0.34)
Farmers's bargaining power	Limited
Destination	n.a

2.2. Maize

Maize production system	
No. of maize varieties	1
Name of maize variety	Red maize
Hole spacing	50 x 50 cm; 100 x 100 cm
No. of grains per hole	2
Weeding	Two times per year in May and June.
Use of drying sheds	No
Storage location	House and small hut near the house
Main constraints	Poor soil fertility, weed invasion, local rodents, wild pigs and *nokpeed* birds. Estimated loss of 40% of the total production.
Estimated productivity in 2012	2.7 tons per ha
Main local adaptation practice	Similar to upland rice cultivation.
Impact on forest decline and forest degradation	Similar to upland rice cultivation.
Maize value chain	
Contract farming	Yes
Origin of seeds	Sold by Bounthieng company
Seeds price	LAK 12,000 – 20,000 per kilo (USD 1.49 – 2.49)

Buyers	Bought by Bounthieng company
Farmgate price	LAK 800 – 1,000 per kilo (USD 0.1 – 0.12)
Destination of maize sold	Vietnam
Farmers' bargaining power with local traders	No

2.3. Animal husbandry

Type	Cattle and buffalos
Penning system	No/ Free grazing
Main disease	Black blood & Foot and mouth disease from May to August.
Local solution	First vaccination provided free of charge by DAFO. Next ones are supplied for LAK 25,000 – 60,000 (USD 3.11 – 7.47) while it can be purchased directly at the district level for LAK 25,000 only (USD 3.11).
Other problems	Grass shortage and prolonged period of drought
Information on market prices	Provided by local traders only who come mostly from Vietnam.
Origin and price of livestock bought in 2012	From surrounding villages. Cattle: LAK 3,400,000 (USD 424) Buffalo: LAK 4,800,000 (USD 599)
Destination and price of livestock sold in 2012	Mostly to Nameo village in Vietnam. Cattle: LAK 3,500,0000 (USD 436) Buffalo: n.a
Impact on forest decline and forest degradation	Cattle and buffalos graze sometimes tree leaves which can slow down tree growing phase.
Farmers' bargaining power with local traders	Yes

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Gravity-fed system and river nearby the village.
Maintenance	Financial contribution of LAK 3,000 per family/time (USD 0.37)
Water shortage	No
Sanitation	
Latrine coverage	10 families did not dispose of latrines.
Domestic waste	One specific location for waste management (hole in the ground). When required, waste is afterwards burned.
Education and health	
No. of literates	90% of the population

Adult literacy class	Implemented in 2008-09. Evening classes of 2 hours per day for duration of 3 months. 23 people were involved of which 15 were women.
Main health disease	Diarrhoea from April to August Cold in October
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	**DAFO**: Promotion of goat and chicken production system and forage cultivation as well as vaccination campaign. This was financially supported by the Agricultural Promotion Bank and the *Nayobai* Bank. **PRF**: Construction of road tracks in 2005 and gravity-fed system in 2007. **ADB**: Renovation of primary school in 2009.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Human disease - Grass shortage for large ruminants - Dried soil - Disturbance in crop growing phase - Low water level of the river nearby - Water shortage for crop cultivation - Crop losses - Soil erosion	- none
2. Unusual rainfall	- Disturbance in crop growing phase - Poor quality of rice harvested - Animal disease - Limited seeds grains for the next cropping season - Poor soil fertility	- none

5. SWOT analysis

A. Strength	B. Weakness
- Capacities in upland rice cultivation, livestock raising and weaving. - Solidarity between farmers - Availability of primary school, electricity, water supply and latrines - Improves road access	- No area for paddy cultivation - No pathway leading to agricultural lands - Limited area for land cultivation - Restricted financial means for livestock production - High number of animal husbandry death
C. Opportunities	**D. Threats**
- High demand for livestock product	- Village located close to the forest conservation area - Prolonged period of drought - Price volatility on crops

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	No area for paddy cultivation	High number of animal husbandry death	High number of animal husbandry death
2	No pathway leading to agricultural lands	Restricted financial means for livestock production	-

Annex 1.5: Hat-Oudomxay village profile

1. General information

Demography	
District name Village cluster name **Village name**	Sanamxay Sompoy **Hat-Oudomxay**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**28** 6 10 12
No. of households Household size **Population** - of which female	**94** 5.7 **537** 295
Ethnic minority	Sou
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy, maize, watermelon and vegetables.
Commercial crops cultivated	Paddy, maize and coffee.
NTFPs	Mushrooms.

2. Main crop cultivated and livestock raising

2.1 Rice

Paddy production system	
No. of rice varieties	8
Name of rice varieties	*Khao eetiou, khao korkho 6, khao korkho 8, khao dokkham, khao hommalee, khao dordang, khao eekhao, khao pongseng.*
Use of improved varieties	Yes
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	n.a
Application of fertilizer	Only rice husk is used for vegetable garden.
Quantity of rice grain preserved for seeds	90 kgs
Estimated productivity in 2012	1.2 tons per ha.
Weeding	Two times per year in November and December
Main constraints for paddy cultivation	Changing rainfall, prolonged period of drought and flash floods.
Impact on forest decline and forest degradation	Limited as area for paddy cultivation does not increase.
Rice value chain	
Seeds purchase	No as it is provided free of charge by a development project.
Processing	Traditional alcohol and rice noodle are produced.
Buyers	No rice surpluses are released.

Destination	-
Farmers' bargaining power	-

2.3. Animal husbandry

Type	Cattle and buffalos
Penning system	No / Free grazing area in specific location during the day and penned at night only.
Main disease	Foot and mouth disease in June and July.
Local solution	Vaccination supported by DAFO.
Other problems	None.
Information on market prices	With local traders.
Origin and price of livestock bought in 2012	Mainly provided free of charge by relatives. In case of livestock purchase, this price is set approx. at LAK 2,000,000 (USD 249).
Destination and price of livestock sold in 2012	Sent to Attapeu provincial capital Cattle: n.a Buffalo: LAK 3,600,000 (USD 449)
Farmers' bargaining power with local traders	Yes.
Impact on forest decline and forest degradation	No impact according to PRA participants.

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Gravity-fed system and river nearby the village.
Maintenance	No financial contribution
Water shortage	None
Sanitation	
Latrine coverage	n.a
Domestic waste	n.a
Education and health	
No. of literates	n.a
Adult literacy class	Already implemented. Evening classes carried three times per week for duration of 4 months.
Main health disease	Malaria in September and October
Local groups and external assistance	
Total number of local group	4
Type	- 8 households in weaving group and 12 households in chicken raising group supported by BCC. - 10 households in cattle raising group supported by the *Nayobai* bank.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Flash floods	- Animal husbandry death - Loss of rice production - Human disease - Poor road condition - Deterioration of housing condition	- Close weather monitoring conditions - After flooding, transplantation of new seedlings as well as additional ploughing.
2. Strong wind	- Degradation of house - Damage on crops	- House degradation - Labour contribution with those cultivating dry season rice.
3. Low temperatures	- Human disease - Animal disease - Loss of crops due to mist	- Human and animal vaccination

5. SWOT analysis

A. Strength - Adequate surface area for crop cultivation - Appropriate socio-economic infrastructure - Abundance of natural resources - Satisfactory area for livestock grazing	**B. Weakness** - No health center - No irrigation system - Limited technical capacities in crop cultivation - Restricted area for paddy - Annual rice shortage - Difficult access to district market
C. Opportunities - High demand for livestock and vegetables	**D. Threats** - Recurrence of flash floods - Extended period of drought

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited technical capacities in crop cultivation.	No health center.	Annual rice shortage and limited access to health center.
2	No health center.	Annual rice shortage.	Limited technical capacities in crop cultivation.
3	No irrigation system.	-	Difficult access to district market.

Annex 1.6: Sompoy village profile

1. General information

Demography	
District name Village cluster name **Village name**	Sanamxay Sompoy **Sompoy**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**27** 8 10 9
No. of households in 2012 Household size **Population in 2012** - of which female	**219** 5.4 **1,187** 607
Ethnic minority	Lao Phoud, Sou and Talieng.
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy, maize, cassava, chili and vegetables.
Commercial crops cultivated	Paddy, maize, beans and cilantro.
NTFPs	Mushrooms, malva nuts and bamboo shoots.

2. Main crop cultivated and livestock raising

2.1 Rice

Paddy production system	
No. of rice varieties	7
Name of rice varieties	*Khao Damdangkhao, khao malphai, khao makmouay, khao dorlay, khao thadokkham 11, khao korkho 9*
Use of improved varieties	Yes
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	4-5
Application of fertilizer	Use of animal manure at the nursery.
Quantity of rice grain preserved for seeds	20% of the total production.
Weeding	None as not much weed observed during rice growing phase.
Estimated productivity in 2012	1.2 tons per ha.
Main constraints for paddy cultivation	n.a
Impact on forest decline and forest degradation	Limited as the surface area for paddy is not expanded year by year. Timber is collected for fence construction only.
Rice value chain	
Seeds purchase	No purchase as seeds provided free of charge by the government for the improved rice varieties. For the traditional one, seeds are kept from the previous rice harvest.

Processing	Grains are mostly processed with millers located at the village at a cost of LAK 6,000 per bag for electric mills (USD 0.75) and LAK 7,000 per bag for mill using fuel (USD 0.87).
Buyers	Local traders from Sanamxay D.C.
Destination	n.a
Farmers' bargaining power	n.a

2.2. Maize

Maize production system	
No. of maize varieties	2
Name of maize variety	*Salee Fakgnai and salee gnieo*
Hole spacing	40 x 40 cm.
No. of grains per hole	1
Weeding	Three times per year.
Use of drying sheds	No
Storage location	House and small hut near the house
Main constraints	Birds and local rodents
Estimated productivity in 2012	0.13 ton per ha
Main local adaptation practice	None.
Impact on forest decline and forest degradation	Limited.
Maize value chain	
Contract farming	No
Origin of seeds	Provided by governmental agencies
Seeds price	LAK 3,000 per kg (USD 0.38)
Buyers	Local traders from Sanamxay D.C.
Destination of maize sold	Sanamxay D.C.
Farmers' bargaining power with local traders	n.a

2.3. Animal husbandry

Type	Cattle and buffalos
Penning system	Free grazing during the day and evening. Penned during the wet season.
Main disease	Foot and mouth disease and abdominal distension.
Local solution	Vaccination or animal quarantine and disposal.
Other problems	Large ruminants destroy paddy fields by consuming rice grain during the growing phase as a result of free grazing system.
Information on market prices	With local traders only.
Origin and price of livestock bought in 2012	Mostly from relatives, development projects or through loans from the *Nayobai* Bank.

Destination and price of livestock sold in 2012	To Sanamxay D.C. and Champasak Province. Sold on average at LAK 2,035,000/cow (or USD 254) and LAK 2,760,000/buffalo (or USD 344).
Farmers' bargaining power with local traders	Yes
Impact on forest decline and forest degradation	Yes as intensive free grazing system prevent the regeneration of the forest as tree leaves, grasses and NTFPs are mostly consumed by cattle and buffalos.

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Borehole and river nearby the village.
Maintenance	No financial contribution when required.
Water shortage	No
Sanitation	
Latrine coverage	50 % of the total families registered.
Domestic waste	One specific location for waste management (hole in the ground). When required, waste is burned.
Education and health	
No. of literates	Village classified as "free illiteracy".
Adult literacy class	n.a
Main health disease	Malaria and cold occurring all-year round, diarrhoea in June.
Local groups and external assistance	
Total number of local group	5
Type	- 8 households listed in weaving group - 67 households listed in cattle raising group - 9 households listed in hand tractor group - 2 households listed in quail raising group - 1 nutrition group
External assistance	BCC project and Lao Red Cross

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Limited animal growth as a result of grass shortage for large ruminants - Reduction in crop yields	- None
2. Flash floods	- Animal husbandry death - Loss of rice production - Human disease - Poor road condition - Deterioration of housing condition	- Close weather monitoring conditions - After flooding, transplantation of new seedlings as well as additional ploughing.

Events	Impact on livelihoods	Local adaptation practices
3. Cold weather	- Human disease especially affecting children.	- Treatment at health center of provincial hospital.

5. SWOT analysis

A. Strength	**B. Weakness**
- Area for livestock grazing - Abundance of NTFPs - Area for paddy - Important forest cover area - Connection to electricity grid, - Availability of clean water supply - Good road access - Primary school - Proximity to river - Capacities in weaving activities	- No irrigation system - No paved road condition - No permanent market place - No village meeting facility - No permanent health center - Village speaker in poor condition - Limited qualified staff for health center - Annual rice shortage - Insufficient range of medicines available at health center. - High number of animal husbandry death
C. Opportunities	**D. Threats**
- High demand for livestock - Short distance and good road condition leading to Sanamxay D.C.	- Recurrence of flash floods - Extended period of drought

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	No irrigation system.	Annual rice shortage.	Annual rice shortage.
2	No improved road condition.	Limited qualified staff for health center.	Limited qualified staff for health center
3	Limited qualified staff for health center.	Insufficient range of medicines available at health center.	High number of animal husbandry death
4	No permanent market place.	No paved road condition.	No irrigation system
5	No village meeting facility.	No permanent market place.	-
6	Village speaker in poor condition.	-	-

Annex 1.7:Tagao village profile

1. General information

Demography	
District name Village cluster name **Village name**	Sanamxay Sompoy **Tagao**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**33** 12 Not implemented due to lack of participants 21
No. of households Household size **Population** - of which female	**62** 5.3 **327** 166
Ethnic minority	n.a
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy, pepper and maize.
Commercial crops cultivated	n.a
NTFPs	Mushrooms and *makseng*

2. Main crop cultivated and livestock raising

2.1 Rice

Paddy production system	
No. of rice varieties	5
Name of rice varieties	*Khao damdang, khao eetom, khao eekhao, khao pongseng and khao dor 3 deuan.*
Use of improved varieties	No.
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	3-4.
Hole spacing	20 x 20 cm.
Application of fertilizer	Animal manure for seedlings at nursery only.
Use of straw as potential manure of mulch	Yes.
Quantity of rice grain preserved for seeds	Approx. 7% of the total production.
Weeding	One time per year in September/October.
Post harvest storage	30-35 rice stores. Estimated loss of 2-3 rice bags per year due to local rodent infestation.
Local adaptation practices to post harvest issue	Use of rodent traps and cats as well as covering metal on grain store supporting legs.
Main constraints for paddy cultivation	n.a
Impact on forest decline and forest degradation	Limited as annual paddy extension is not carried out on a big scale.

Rice value chain	
Seeds purchase	Rice seeds collected from the previous harvest.
Processing	LAK 6,000 per 30 kg bag for electric rice mill (USD 0.75) LAK 8,000 per 30 kg bag for rice using petrol (USD 0.9)
Buyers	Local traders from Sanamxay D.C.
Destination	n.a
Farmers' bargaining power	n.a

2.2. Animal husbandry

Type	Cattle and buffalos
Penning system	Free grazing during the day and evening from December to May. Penned at night from June to November during crop cultivation period.
Main disease	Foot and mouth disease and abdominal distension from June to August.
Local solution	Animal vaccination organized by VVWs. Villagers have to pay the required medicines.
Other problems	Animal theft and area for livestock grazing not completely fenced.
Information on market prices	Only through local traders who come directly at the village.
Origin and price of livestock bought in 2012	From relatives living in the village. Prices are not available as the village was not covered in 2012 by the SEBLS.
Destination and price of livestock sold in 2012	Sanamxay D.C. and Attapeu provincial capital. Prices are not available as the village was not covered in 2012 by the SEBLS.
Farmers' bargaining power with local traders	Yes
Impact on forest decline and forest degradation	None.

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Borehole and river nearby the village.
Maintenance	No financial contribution.
Water shortage	None.
Sanitation	
Latrine coverage	n.a
Domestic waste	n.a
Education and health	
No. of literates	n.a

Adult literacy class	n.a
Main health disease	Malaria and cold all year round. Diarrhoea in May and June.
Local groups and external assistance	
Total number of local group	2
Type	3 households in chicken raising group 10 households in duck raising group
External assistance	**DAFO**: Provision of rice bags after Ketsana storm in 2009.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Grass shortage for large ruminants - Delay in paddy cultivation	- Plantation of secondary crops on a short term basis such as fruits, eggplant or vegetables.
2. Flash floods	- Human disease (malaria) - High number of animal husbandry death - Loss of crop cultivated	- Close weather monitoring conditions with village radio
3. Unusual rainfall	- Less grasses during livestock free grazing system - Scarcity in forest product collection	- None

5. SWOT analysis

A. Strength - Area for livestock grazing. - Area for paddy cultivation. - Proximity with stream and natural ponds. - Availability of electricity. - Good road condition. - Abundance of natural resources. - Solidarity between farmers.	**B. Weakness** - Limited financial means in livestock raising. - Some households do not have access to paddy. - No irrigation system. - No area for fish ponds raising. - Low motivation in improving local livelihoods. - High number of animal husbandry death. - Limited technical capacities in crop cultivation and livestock raising. - Annual rice shortage. - Insufficient access to agricultural inputs.
C. Opportunities - High demand for livestock.	**D. Threats** - Extended period of drought - Vulnerability to flash floods - Reduction in forest cover area

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	High number of animal husbandry death.		Annual rice shortage
2	No irrigation system.		Insufficient access to agricultural inputs.
3	No area for fish ponds raising.		No irrigation system.
4	Some households do not have access to paddy.		Limited technical capacities in crop cultivation and livestock raising.
5	Limited financial means in livestock raising.		-

Annex 1.8: Nonghin village profile

1. General information

Demography	
District name Village cluster **Village name**	Sanamxay Nonghin **Nonghin**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**40** 12 8 20
No. of households in 2012 Household size **Population in 2012** - of which female	**91** 4.2 **380** 192
Ethnic minority	Lao Phoud and Laven.
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy and upland rice, pumpkin, pepper, eggplant, tobacco.
Commercial crops cultivated	Coffee and cardamom.
NTFPs	Malva nuts, resin, vine (plant type)

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	2-3 years or 6-7 years
Hole dimension	4-5 cm
Hole spacing	25 x 30 cm
No. of seeds in each hole	5-10
No. of rice varieties registered	9
Name of rice varieties	*Khao nieo, khao xangkhao, khao xanglay, khao makkheua, khao tiae, khao gneek, khao kam, khao hangkater, khao dokkham*
Use of improved rice varieties	Yes
Fertilizer application	No
Use of straw as potential manure of mulch	No. But straw is burned for using it as organic fertilizer in vegetable garden.
Use of rice husks as organic fertilizer	No
Weeding	Two times per year from June to October.
Estimated productivity in 2012	1.6 tons per ha.
No. of rice mills Milling speed Milling price	19 60 kg per hour LAK 7,000 per rice bag (USD 0.87)
Main constraints for upland rice production	Wild pigs, birds, worms, insects and local rodents. Estimated total loss of 80% of the total production.

Upland rice production system	
Local solution practices	Use of taut cord or wire and trap barriers.
Impact on forest decline and forest degradation	Surface area for shifting cultivation is not yearly expanded
Paddy production system	
No. of rice varieties	5
Name of rice varieties	*Khao nieo, khao samsee, khao damdang, khao deng, khao maling*
Use of improved varieties	No
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	3-5
Hole spacing	n.a
Application of fertilizer	Use of animal manure in small vegetable garden
Use of straw as potential manure of mulch	No
Quantity of rice grain preserved for seeds	n.a
Weeding	No
Post harvest storage	90 rice stores registered. Estimated loss of 2-3 rice bags per year as a result of birds and local rodent infestations.
Local adaptation practices to post harvest issue	Farmers cover the supporting legs of the grain store with metal.
Main constraints for paddy cultivation	Similar reasons to upland rice cultivation.
Impact on forest decline and forest degradation	Limited as paddy surface area is not yearly extended.
Rice value chain	
Seeds purchase	No purchase since rice seeds are kept from the previous harvest.
Processing	Apart from using rice mills, small quantity of traditional alcohol is produced.
Buyers	Local traders from Sanamxay D.C.
Destination of rice sold	n.a
Farmers' bargaining power	n.a

2.2. Coffee

Coffee production system	
Name of coffee variety grown	Robusta
Tree spacing	2 x 2.5 m and 3 x 3 m.
Other crops cultivated	Jackfruit and mango.
Weeding	Two times per year from July to October.
Harvest	From 3 to 5 years after tree planting.
Estimated productivity in 2012	0.37 tons per ha.
Harvesting method	Manually.
Quality of coffee grains collected	90% mature and 10% not mature.

Coffee production system	
No. of days during coffee drying	From 15 to 30 days.
Main constraints in coffee production	Over exposure to sun, extended period of drought, low level of rainfall, insect pests and beans robbery.
Local solution practices	Replacement of coffee trees that are affected by diseases.
Impact on forest decline and forest degradation	High as coffee surface area has been expanded.
Coffee value chain	
Origin of seeds	Provided free of charge by relatives or collected from the previous harvest.
Seeds price	No purchase.
Buyers	Two to three middlemen come annually at the village.
Farmgate price in 2012	LAK 11,340 per kilo (USD 1.41).
Destination of coffee sold	Mostly sold to trading companies located in Champasak Province.
Farmers' bargaining power with local traders	Yes by using the weighing scale of both farmer and traders.

2.2. Animal husbandry

Type	Cattle and buffalos
Penning system	Free grazing during the day and evening. No pens listed in the village.
Main disease	Black blood in March and April.
Local solution	None
Other problems	None
Information on market prices	Through local traders from Pathoumphone District in Champasack Province.
Origin and price of livestock bought in 2012	Purchased at Paksong District in Champasak Province. Cattle: n.a Buffalo: n.a
Destination and price of livestock sold in 2012	Brought to Champasack Province. Cattle: n.a Buffalo: n.a
Farmers' bargaining power with local traders	Yes
Impact on forest decline and forest degradation	No impact according to PRA participants.

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Borehole and river nearby the village.

Water supply	
Maintenance	No financial contribution from villagers when required maintenance.
Water shortage	No
Sanitation	
Latrine coverage	See GITEC data
Domestic waste	No specific location for waste management. Each household use to burn their waste.
Education and health	
No. of illiterates	40 people (10% of the population)
Adult literacy class	Already implemented. Morning and evening classes during the week end only for duration of 2 hours.
Main health disease	Malaria and stomach ache (all year-round) Diarrhoea (from June to August) Cold (from October to November)
Local groups and external assistance	
Total number of local group	1
Type	23 families in paddy cultivation
External assistance	**BCC**: Unknown **SUFORD**: Capacity building in paddy cultivation **DAFO**: Provision of 30 kgs of rice per person.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Human disease - High incidence of animal disease - Loss of crops cultivated	- None
2. Flash floods	- Human disease - Loss of crops cultivated	- Tree plantation through external assistance.
3. Low temperatures	- Human disease	- Visit to village health volunteer and health facilities.
4. Strong wind	- Degradation of house - Damage on crops	- House degradation - Labour contribution with those cultivating dry season rice.

5. SWOT analysis

A. Strength	B. Weakness
- Good road condition - Primary school - Abundance of forest products and NTFPs - Clean water supply - Large amount of arable land - Adequate area for livestock grazing	- Limited technical capacities in crop cultivation and livestock raising - Low crop productivity - Annual rice shortage - No health center - No electricity - Dry road season only - Long distance to permanent market place - Difficulty in pest management - High walking distance to water supply
C. Opportunities	**D. Threats**
- High demand for coffee and cardamom	- Extended period of drought - Changing rainfall - Population pressure

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited technical capacities in crop cultivation and livestock raising.	Annual rice shortage.	Difficulty in pest management.
2	Annual rice shortage.	No health center.	Dry road season only.
3	Low crop productivity.	Limited technical capacities in crop cultivation and livestock raising.	No electricity.
4	-	No electricity.	High walking distance to water supply.

Annex 1.9: Xaydonekhong village profile

1. General information

Demography	
District name Village cluster name **Village name**	Sanamxay Nonghin **Xaydonekhong**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**29** 6 12 11
No. of households Household size **Population** - of which female	**107** 5.0 **536** 282
Ethnic minority	Lao Phoud, Laven and Talieng.
Agriculture and NTFPs	
Subsistence crops cultivated	Upland rice, paddy, chili, gourd, pumpkin and vegetables
Commercial crops cultivated	Coffee and cardamom.
NTFPs	Rattan, malva nuts, resin

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	5 years
Hole dimension	3-5 cm
Hole spacing	40 x 40 cm
No. of seeds in each hole	9-10
No. of rice varieties registered	1
Name of rice varieties	*Khao gasang*
Use of improved rice varieties	No
Fertilizer application	Use of animal manure on vegetable gardens only.
Use of straw as potential manure of mulch	No
Use of rice husks as organic fertilizer	No
Weeding	Three times per year from July to October.
Estimated productivity in 2012	0.6 tons per ha.
Post harvest storage	112 rice stores registered. Estimated loss of 1-2 rice bags per year as a result of birds, rodent and insect infestation.
No. of rice mills Milling speed Milling price	n.a n.a n.a

Upland rice production system	
Main constraints for upland rice production	Wild pigs, birds, insects and rodent infestation.
Local solution practices	n.a
Impact on forest decline and forest degradation	High as surface area for upland rice is annually expanded.
Paddy production system	
No. of rice varieties	2
Name of rice varieties	*Khao dokkham 3 and khao dokkham 10*
Use of improved varieties	Yes
No. of weeks before transplanting	
Sandy soil when transplanting	No
No. of seedlings per hill	3-4
Hole spacing	20 x 20 cm
Application of fertilizer	Use of chemical fertilizer and insecticide.
Use of straw as potential manure of mulch	No.
Quantity of rice grain preserved for seeds	10% of the total production
Weeding	Once per year
Estimated productivity in 2012	0.7 ton per ha.
Post harvest storage	Paddy rice bags stored in the same upland rice store.
Local adaptation practices to post harvest issue	Similar to upland rice.
Main constraints for paddy cultivation	Poor soil fertility.
Impact on forest decline and forest degradation	High as village authorities plan to expand the paddy surface area due to the current poor soil fertility.
Rice value chain	
Seeds purchase	Provided free of charge by district authorities.
Processing	None
Buyers	Local traders from Attapeu and Champasak Province.
Destination of rice sold	Attapeu and Champasak Provinces
Farmers' bargaining power	Yes

2.2. Coffee

Coffee production system	
Name of coffee variety grown	Robusta
Tree spacing	3 x 3 m or 1,110 trees per ha
Other crops cultivated	Jack fruit, lemon and papaya
Weeding	Three times per year from July to November.
Harvest	4-5 years after tree plantation
Estimated productivity in 2012	0.4 tons per ha.
Harvesting method	Manually
Quality of coffee grains collected	n.a

Coffee production system	
No. of days when coffee drying	15
Main constraints in coffee production	Insect pest and diseases as a result of over exposure to sun;
Local solution practices	None
Impact on forest decline and forest degradation	n.a
Coffee value chain	
Origin of seeds	Purchased at Paksong District, Champasak Province
Seeds price	n.a
Buyers	Middlemen and local traders mostly from Dao Heuang company as well as related branches.
Farmgate price in 2012	LAK 10,900 per kilo (USD 1.36)
Destination of coffee sold	Mostly sold to trading companies located in Champasak Province.
Farmers' bargaining power with local traders	Yes

2.2. Animal husbandry

Type	Cattle and buffalos
Penning system	Data not collected.
Main disease	
Local solution	
Other problems	
Information on market prices	
Origin and price of livestock bought in 2012	
Destination and price of livestock sold in 2012	
Farmers' bargaining power with local traders	
Impact on forest decline and forest degradation	

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	Gravity-fed system and stream nearby the village.
Maintenance	No financial contribution when maintenance is required.
Water shortage	During fieldwork, gravity-fed system needed reparation as it was not functioning at all.
Sanitation	
Latrine coverage	93 latrines were registered (100% coverage)

Domestic waste	n.a
Education and health	
No. of illiterates	50% of the population is illiterate according to village authorities.
Adult literacy class	Not implemented as the village do not own financial resources to pay teachers.
Main health disease	Malaria in June Diarrhoea in May and June
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	Only LEAF activities.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Low temperatures	- Human disease - Animal disease - Loss of crops due to mist	- Human and animal vaccination
2. Drought	- Grass shortage for large ruminants - Water shortage - Human and animal disease	- Fruit tree plantation for the provision of shadow to coffee trees.
3. Unusual rainfall	- Poor road condition - Human disease	- None
4. Storm	- Fruit and coffee trees are uprooted - Degradation of house	- None

5. SWOT analysis

A. Strength - Clean water supply - Abundance of forest products and NTFPs - Adequate area for livestock grazing - Health center and primary school - Good road condition - Large amount of arable land - Availability of village meeting office - Improved sanitation structures - Solidarity within farmers	**B. Weakness** - Limited financial means for managing the health center - Insufficient availability of water supply - Insufficient availability of electricity - Limited technical capacity in coffee cultivation - Restricted number of animal husbandry per household - Annual rice shortage - High incidence of animal disease - Limited labour force - Difficulty in pest management - Dry season road only - Health problems - Limited access to agricultural inputs
C. Opportunities - Extension of arable land for coffee.	**D. Threats** - Reduction in forest cover area - Period of drought and flash floods

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Annual rice shortage.	Insufficient availability of water supply.	Annual rice shortage.
2	Limited financial means for managing the health center.	Annual rice shortage.	Insufficient availability of water supply.
3	Insufficient availability of water supply.	Dry season road only.	Health problems.
4	Insufficient availability of electricity.	Insufficient availability of electricity.	Limited access to agricultural inputs.
5	Limited technical capacity in coffee cultivation.	-	Difficulty in pest management.
6	Restricted number of animal husbandry per household.	-	Limited labour force.
7	-	-	High incidence of animal disease.

Annex 1.10: Mathka village profile

1. Demography

Demography	
District name Village cluster name **Village name**	Sanamxay Nonghin **Mathka**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**88** 16 22 50
No. of households Household size **Population** - of which female	**115** 4.6 **534** 248
Ethnic minority	Lao Phoud, Sou and Laven.
Agriculture and NTFPs	
Subsistence crops cultivated	Paddy, upland rice, tobacco, pepper, eggplant, cucumber, *phak eekhou.*
Commercial crops cultivated	Coffee and cardamom.
NTFPs	Malva nuts and cardamom.

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	n.a
Hole dimension	n.a
Hole spacing	25 x 25 cm
No. of seeds in each hole	10 – 15 cm
No. of rice varieties registered	4
Name of rice varieties	*Khao khang,khao xang lai, khao gaxangkhao, khao kam*
Use of improved rice varieties	No.
Fertilizer application	Use of animal manure only on vegetable gardens.
Use of straw as potential manure of mulch	No.
Use of rice husks as organic fertilizer	No.
Weeding	Two times per year from June to August.
Estimated productivity in 2012	1.9 tons per ha.
Post harvest storage	Estimated loss of 2-3 rice bags per 100 rice bags as a result of birds and rodents infestation. Raising cats and covering metal on the rice store's supporting legs are the main local adaptation practices.
No. of rice mills Milling speed Milling price	n.a 100 kgs per hour LAK 5,000 per 30 kg/bag (USD 0.62)

Upland rice production system	
Main constraints for upland rice production	Weeding, wild pigs and insects, health problems and limited technical capacities.
Local solution practices	n.a
Impact on forest decline and forest degradation	High
Paddy production system	
No. of rice varieties	4
Name of rice varieties	*Khao hingtiae, khao eedeng, khao eepouak, khao damdang*
Use of improved varieties	No
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	3-5
Hole spacing	n.a
Application of fertilizer	No
Use of straw as potential manure of mulch	No
Quantity of rice grain preserved for seeds	30 kgs
Weeding	No
Estimated productivity in 2012	1.4 tons per ha.
Post harvest storage	n.a
Local adaptation practices to post harvest issue	n.a
Main constraints for paddy cultivation	Extended period of drought, flash floods and insect pests.
Impact on forest decline and forest degradation	High as paddy surface area has been extended by 5 ha in 2012.
Rice value chain	
Seeds purchase	No purchase as the rice seeds are collected from the previous harvest.
Processing	Traditional alcohol is produced.
Buyers	n.a
Destination of rice sold	n.a
Farmers' bargaining power	Yes

2.2. Coffee

Coffee production system	
Name of coffee variety grown	Robusta
Tree spacing	2.5 x 2.5 m
Other crops cultivated	Jack fruit and mango
Weeding	Two times per year
Harvest	3-4 years after plantation
Estimated productivity in 2012	0.6 tons per ha.
Harvesting method	Manually

Coffee production system	
Quality of coffee grains collected	90% mature and 10% not mature.
No. of days during coffee sun drying	From 20 to 30 days
Main constraints in coffee production	Weeding, over exposure to sun, low level of rainfall,
Local solution practices	Fruit tree plantation for providing shadow to coffee trees.
Impact on forest decline and forest degradation	High as the coffee surface area has been extended by 5 ha in 2012.
Coffee value chain	
Origin of seeds	From Paksong District at Champasak Province and also provided from relatives with free of charge.
Seeds price	n.a
Buyers	Two or three local traders from Champasak Province who usually come in February and March and buy coffee at a price of LAK 10,000 per kilo (USD 1.25). Farmers also transport themselves their production to Champasak to get a better price of LAK 15,000 per kilo (USD 1.87), mainly to Oudomsap company.
Farmgate price in 2012	LAK 17,000 per kilo (USD 2.12)
Destination of coffee sold	Sold to trading companies.
Farmers' bargaining power with local traders	Yes

2.2. Animal husbandry

Type	Pigs
Penning system	No as many households practice free grazing system.
Main disease	Unknown diseases by the participants but mainly occurring from March to June.
Local solution	Vaccination when pig disease observed. No regular vaccination is organized.
Other problems	No proper animal feeding.
Information on market prices	Through local traders only.
Origin and price of livestock bought in 2012	Mainly bought from farmers in the same village. Pig: LAK 140,000 (USD 17.4)
Destination and price of livestock sold in 2012	Mainly sold to farmers in the same village Pig: LAK 350,000 (USD 44)
Farmers' bargaining power with local traders	Yes
Impact on forest decline and forest degradation	None

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-

Water supply	
No. of beneficiaries	-
Other available systems	Borehole, water wells and river nearby the village.
Maintenance	No financial contribution is carried out when reparation is required.
Water shortage	No.
Sanitation	
Latrine coverage	No latrines have been constructed.
Domestic waste	No specific location for waste management. Each household use to burn their waste.
Education and health	
No. of illiterates	234 people (44% of the population)
Adult literacy class	Currently implemented on Saturday and Sunday for duration of 3 hours per day.
Main health disease	Diarrhoea in June and July. Cold in January. Conjunctivitis in April and May. Stomach ache all year round.
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	**PRF**: Renovation of primary school and construction of borehole system (year unknown). **BCC**: activities unknown **DAFO**: Provision of 30 kg rice bag person after Ketsana storm in 2009.

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Drought	- Low quality coffee grains due to insect pest - High loss of rice production - Human disease such as diarrhoea and malaria - High incidence of animal husbandry disease	- Provision of paracetamol and ampicilin to animal husbandry. - Visit to provincial hospital in Paksé, Champasak Province. - Tree planting
2. Flash floods	- Loss of crop production - Human and health disease - Road degradation	- None
3. Low temperature	- Human and animal husbandry disease - Loss of crop production - High number of chicken death	- None

5. SWOT analysis

A. Strength	B. Weakness
- Adequate natural resources - Large surface area for crop cultivation - Area for livestock grazing - All year-round water supply - Good road condition - River nearby	- Dry season road only - No electricity - Long distance to health centers - Primary school courses from grade 1 to grade 3 only. - Difficulty in pest management - High incidence of animal disease - Low paddy surface area - Annual rice shortage - Limited financial means - Limited technical capacities in crop cultivation and animal husbandry raising technique.
C. Opportunities	**D. Threats**
- Development and improvement of socio-economic infrastructure by GoL (electricity, water supply and road)	- High population pressure - Unfavorable climate change events.

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Limited technical capacities in crop cultivation and livestock raising.	Limited technical capacities in crop cultivation and animal husbandry raising technique.	Difficulty in pest management.
2	Annual rice shortage.	Low paddy surface area.	Limited technical capacities in crop cultivation and animal husbandry raising technique.
3	Limited financial means.	Annual rice shortage.	Long distance to health centers.
4	Difficulty in pest management.	Dry season road only.	High incidence of animal disease.
5	-	No health center.	No electricity.
6	-	Primary school courses from grade 1 to grade 3 only.	-

Annex 1.11: Nongmouang village profile

Demography	
District name Village cluster name **Village name**	Sanamxay Nonghin **Nongmouang**
Total number of PRA participants - from village authorities' group - from men's group - from women's group	**39** 14 7 18
No. of households in 2012 Household size **Population in 2012** - of which female	**117** 4.6 **535** 239
Ethnic minority	Lao Phoud and Laven
Agriculture and NTFPs	
Subsistence crops cultivated	Upland rice and paddy, pumpkin, cucumber, chili.
Commercial crops cultivated	Coffee and cardamom.
NTFPs	Malva nuts, cardamom

2. Main crop cultivated and livestock raising

2.1 Rice

Upland rice production system	
Average land fallow	n.a
Hole dimension	3-5 cm
Hole spacing	25 x 25 cm
No. of seeds in each hole	10-15
No. of rice varieties registered	4
Name of rice varieties	*Khao hingtiae, khao eedeng, khao eepouak, khao damdang*
Use of improved rice varieties	No
Fertilizer application	Use of animal manure on vegetable gardens.
Use of straw as potential manure of mulch	No.
Use of rice husks as organic fertilizer	No.
Weeding	Two times per year.
Estimated productivity in 2012	0.9 tons per ha.
Post harvest storage	n.a
No. of rice mills Milling speed Milling price	n.a n.a n.a
Main constraints for upland rice production	Weeding, wild pigs, birds and local rodents
Local solution practices	n.a
Impact on forest decline and forest degradation	High as forest clearing is previously organized before upland rice cultivation.

Paddy production system	
No. of rice varieties	4
Name of rice varieties	*Khao hingtiae, khao eedeng, khao eepouak, khao damdang*
Use of improved varieties	No
No. of weeks before transplanting	n.a
Sandy soil when transplanting	No
No. of seedlings per hill	2-4
Hole spacing	20 cm x 20 cm
Application of fertilizer	No.
Use of straw as potential manure of mulch	No.
Quantity of rice grain preserved for seeds	25 kgs
Weeding	No.
Estimated productivity in 2012	1.3 tons per ha.
Post harvest storage	n.a
Local adaptation practices to post harvest issue	n.a
Main constraints for paddy cultivation	n.a
Impact on forest decline and forest degradation	Limited as paddy surface area has not been extended.
Rice value chain	
Seeds purchase	No purchase as rice seeds are collected from the previous harvest.
Processing	Traditional alcohol is organized.
Buyers	Local traders from Champasak Province.
Destination of rice sold	Mainly to Champasak Province.
Farmers' bargaining power	Yes.

2.2. Coffee

Coffee production system	
Name of coffee variety grown	Robusta
Tree spacing	2.5 x 2.5 m
Other crops cultivated	Jack fruit and mango
Weeding	Two times per year
Harvest	3-4 years after plantation
Estimated productivity	0.3 tons per ha.
Harvesting method	Manually
Quality of coffee grains collected	90% mature and 10% not mature.
No. of days when coffee drying	15-30 days.
Main constraints in coffee production	Insect pests, over exposure to sun and low level of rainfall.
Local solution practices	Fruit tree planting to provide shadow to coffee trees.
Impact on forest decline and forest degradation	No as coffee surface area is not extended.

Coffee value chain	
Origin of seeds	From Paksong District in Champasak Province.
Seeds price	n.a
Buyers	Sold at the village level directly or farmers bring the production themselves directly to Champasak Province.
Farmgate price in 2012	LAK 15,900 per kilo (USD 1.98)
Destination of coffee sold	Sold to trading companies located in Champasak Province.
Farmers' bargaining power with local traders	Yes

2.2. Animal husbandry

Type	Cattle and buffalos
Penning system	No as farmers practiced free grazing system.
Main disease	Black blood disease and foot and mouth disease.
Local solution	Vaccination after disease observed.
Other problems	n.a
Information on market prices	Through local traders only.
Origin and price of livestock bought in 2012	Provided by relatives Cattle: n.a Buffalo: n.a
Destination and price of livestock sold in 2012	Sold to local traders from Champasak Province. Cattle: n.a Buffalo: n.a
Farmers' bargaining power with local traders	Yes
Impact on forest decline and forest degradation	Limited.

3. Others livelihood aspects

Water supply	
No. of irrigation system	0
Condition	-
No. of beneficiaries	-
Other available systems	River nearby the village.
Maintenance	-
Water shortage	No
Sanitation	
Latrine coverage	No latrines have been constructed in the village.
Domestic waste	-
Education and health	
No. of illiterates	n.a
Adult literacy class	n.a

Main health disease	n.a
Local groups and external assistance	
Total number of local group	0
Type	-
External assistance	n.a

4. Climate change

Events	Impact on livelihoods	Local adaptation practices
1. Low temperature	- Human disease (diarrhoea and cough)	- Medicine purchase at the village dispensary.
2. Drought	- Human disease - Low level of coffee and rice production - High number of animal husbandry death	- Visit to hospital at Paksé city in Champasak Province
3. Unusual rainfall	- Road degradation - Low level of rice production	- Additional rice planting

5. SWOT analysis

A. Strength

- Adequate natural resources
- Appropriate surface area for agricultural production
- Enthusiastic people
- All year round water supply
- Good road condition
- Availability of primary school
- Capacities in weaving
- Area for livestock raising
- Availability of natural fish ponds

B. Weakness

- Insufficient quantity of water supply
- Dry season road only
- Limited access to health services
- High incidence of animal disease
- Difficulty in pest management
- Insufficient availability of electricity
- Annual rice shortage

C. Opportunities

- Possibility in coffee and cardamom cultivation area.

D. Threats

- High population pressure
- Inadequate level of rainfall for crop production

6. Main problem identified by the PRA participants (in order of importance)

	Village authorities	Men	Women
1	Annual rice shortage	Annual rice shortage	Limited access to health services.
2	High incidence of animal disease	Limited access to health services	High incidence of animal disease.
3	Difficulty in pest management	Dry season road only	Dry season road only.
4	-	-	Difficulty in pest management.
5		-	Insufficient availability of electricity.