

Household and Community Level Practices towards Attaining Food Security in Long District, Luang Namtha, Lao PDR

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INTRODUCTION

The people in the uplands in Lao PDR, particularly those living in the villages of Chamai, Houadoy, Chommok, Chagnee, Langphamai, and Pakha, in Long District, Luang Namtha Province, have been practicing poppy and slash-and-burn cultivation as main sources of income. However, the Lao government, in its effort to decrease poverty as outlined in the National Growth and Poverty Eradication Strategy (FBIS 1999), eradicated these agricultural practices by resettling these people to the lowlands and along the road where public services and potential for wetland rice cultivation are available. Adversely, resettlement brought about even more problems for the food security of these people as cultivation was restricted, rotation period was shortened, yields decreased, rice shortage was experienced, and alternative income-generating programs were not provided. The resettlement program has increased vulnerability to food security (Bechstedt *et al.* 2007). Thus, food security situation before the policy implementation was relatively better than the present (Boyce 2003).

This study is a pioneering investigation into food security as affected by policy changes and focuses on household and community level practices for the attainment of food security based on its three pillars, namely food availability, accessibility and utilization. It is hinged upon the fact that food security is the condition characterized by the sufficiency of available, adequate, accessible, affordable, safe and nutritious food that satisfies dietary needs and food preferences of all people at all times for an active and healthy life (FAO 1996). Furthermore, in terms of access and availability, Amartya Sen's Entitlement Theory of Famine (Sen 1981) states that famine occurs not because there is not enough food, but because people do not have access to enough food. This study is pioneering in the sense there have been no studies conducted yet in Long District particularly pertaining to food security among the local people who have been affected by the changes in government policies.

ABSTRACT

This study, which determined the farming practices of the households and the communities in attaining food security, was conducted in six villages in Long District, Luang Namtha, Lao PDR. The issue of food security is very relevant among the local people in the villages who have been affected by changes in government policies on shifting cultivation and poppy cultivation. Descriptive and inferential statistics were used to analyze the data obtained from 122 farmers as survey respondents and 30 farmers (five farmers per village) as focus group discussion (FGD) participants. Correlation analysis was done to determine the relationship between socio-demographic and economic characteristics of respondents and their household and community practices on food security, and household and community level farming practices and food security. Key informant interviews were conducted with six village and two district officials. To attain food security at the household level, the respondents plant upland rice using native varieties and use manual tools, raise swine and poultry in the traditional way, decline taking out loans, and practice equal sharing of farming and household tasks between husband and wife. At the community level, they availed of food distribution and livelihood programs in the past, both of which are scarce at present. Correlation analysis shows that household level farming practices on food security are positively related to educational attainment, total household income and length of stay in the area. Farmers who have higher educational attainment, higher total household income, and have stayed longer in the village resort to household level practices such as planting a variety of wetland rice, use higher seeding rate, raise livestock, and avail of credit. Community level practices are likewise positively correlated with the respondents' age, length of stay in the area, and household size. Older farmers who have bigger household size and have stayed longer in the village access food and livelihood programs for food security.

Key words: community level practices, food security, household level practices, Lao PDR

Food security indicators include food availability, food access, and food utilization (Figure 1 from Webb, Richardson & von Braun 1993 as cited by MajdaBneSaad 1999). Food availability includes the availability of resources and production. Resources include physical, natural, and human resources.

Both non-farm and farm productions form part of the production. Natural resources include rainfall levels, ecological stability, soil quality, water availability, forest resource access, and fish and seafood access. The physical resources are livestock ownership, infrastructure access, farm implement ownership, security of tenure/access and control, and other physical assets. For the human resources, these include gender of household head, dependency ratio, education, literacy levels, household size, and ages of household head and members.

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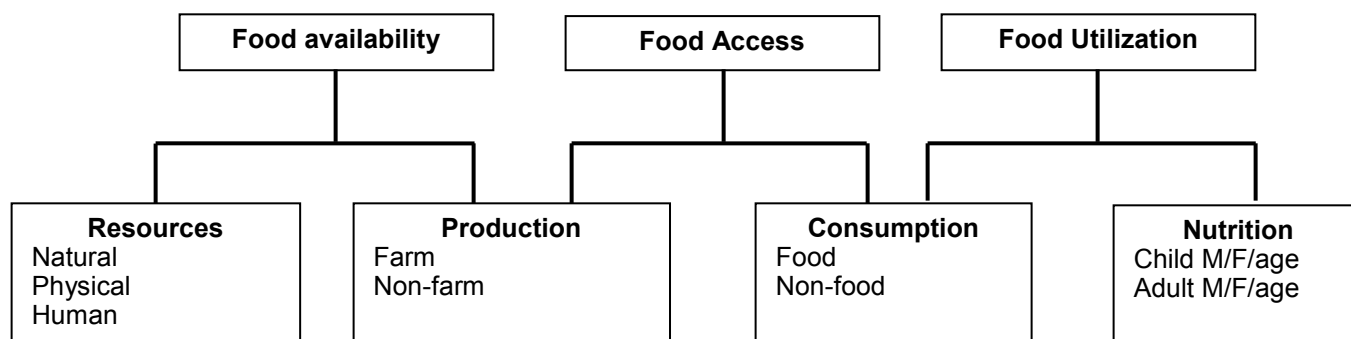


Figure 1. Food security indicators (Source: Webb, Richardson & von Braun 1993 as cited by MajdaBneSaad 1999)

<u>Resources</u>	<u>Production</u>	<u>Income</u>	<u>Consumption</u>
Natural • Rainfall levels, stability • Soil quality • Water availability • Forest resource • access • Fish and seafood Physical • Livestock ownership • Infrastructure access • Farm implement ownership • Land ownership or security of tenure/access and control • Other physical assets Human • Gender of household head • Dependency ratio • Education, literacy levels • Household size • Ages of H/H head and members	• Total area cultivated • Irrigated area • Area in fallow • Access to and use of inputs • Number of cropping seasons • Crop diversity • Crop yield • Food production • Cash crop production • Number of sources of non-farm income • Cottage industry production • Gender division of labor	• Total income • Crop income • Livestock income • Wage income • Self-employment • Migrant income • Producer prices • Market road access	• Total expenditure • Food prices • Non-food consumer prices • Dietary intake • Meal frequencies per/day/over 2-3 seasons • Composition of daily meals

The production aspect of food availability includes both farm and non-farm production. It is assessed using information focusing on the total area cultivated, irrigated area, area in fallow, access to and use of inputs, number of cropping seasons, crop diversity, crop yield, food production, cash crop production, number of sources of non-farm income, cottage industry production, and gender division of labor.

Food access cuts across income and consumption. The total income includes incomes from crops and livestock, wages, self-employment, and non-farm activities. On the other hand, consumption refers to food and non-food items which include total expenditure, food prices, non-food consumer prices, dietary intake, frequency of meals per day/over 2-3 seasons, and composition of daily meals.

Food utilization covers both consumption and nutrition. Nutrition information includes anthropometric data, serum micronutrient levels, morbidity rates, mortality rates, fertility rates, access to health services, access to potable water, and

access to adequate sanitation (Webb, Richardson & von Braun 1993 as cited by MajdaBneSaad 1999).

Thus, this study focused on exploring food security in Long District. Ethnic minorities living in the mountains of Long District have seen their livelihood threatened resulting to alarming food insecurity and high chronic malnutrition rates. This vulnerability is linked to structural context as well as natural and political events. Up to this date, the Long District still faces a problem of food insecurity. According to the District Agriculture and Forestry Office (DAFO Report 2010), the average per capita rice consumption is 275.85 kg. In comparison with the figure from the World Food Program (WFP 2012), 360 kg of paddy rice consumption per capita on the average implies that there is rice insufficiency. The study provides insights on the household and community practices to attain food security and hopes to add to the body of knowledge on food security in the district in particular and to the country in general.

Statement of the Problem

As a result of the eradication of poppy production, other activities have been implemented in some villages in Long District. Alternative livelihoods were introduced through the Chinese investors by planting rubber, tea, cassava, sugarcane, and banana. Aside from these, non-government organizations (NGOs) provided interventions focusing on food security, empowerment of ethnic minority groups, and poverty reduction. The Lao government also established a policy bank where the farmers can loan money for farming and livestock purposes and for hiring of tractors for their paddies. Despite the efforts from the Lao government, it seems that the communities still face difficulties in terms of food security. According to the Comprehensive Food Security and Vulnerability Analysis or CFSVA (2006), the ethnic groups in the highlands of Lao PDR are food insecure. Hence, this study envisioned to provide answers to the following questions to fill in some research gaps:

- Who are the people affected by changes in government policies which negatively affect food security in Long District?
- What are the available natural and physical resources in the affected villages?
- What are the current practices of households and communities in the affected villages to attain food security?
- What is the status of food security in the concerned villages in Long District?
- Is there a significant relationship between household and community practices and food security?
- What factors contribute to the food security of the local people in the concerned villages?

Objectives of the Study

The general objective of the study was to determine the practices of the households and communities in attaining food security in Long District, Luang Namtha Province, Lao PDR. Specifically, the study aimed to: (1) describe the social and economic characteristics of the respondents and the natural and physical resources in the community; (2) describe the household and community practices aimed at attaining food security; (3) determine the food security situation in the affected villages based on food availability, access, and utilization; (4) analyze the relationship between socio-demographic and economic characteristics and household and community practices for food security; and (5) analyze the relationship between household and community practices and food security.

METHODOLOGY

The six villages in Long District, Luang Namtha Province of Lao PDR (Figure 2) were chosen as study sites because the rice farmers in these areas are impoverished. As a result of the government's policy on banning of poppy and slash-and-burn cultivation, the government promoted cash crop cultivation which attracted Chinese businessmen to venture into agriculture in Long District. Thus, many of the agricultural farms in the area which were used to plant crops for the local people's staple food were converted to rubber, banana, cassava, sugarcane and tea plantations for export. This change in the agricultural sector has endangered the food security of the people in Long District which is one of the 47 poorest districts of Lao PDR (FBIS 1999).

The respondents for the study were chosen through random sampling and the sample size was determined using the following formula (Sevilla *et al.* 2000):

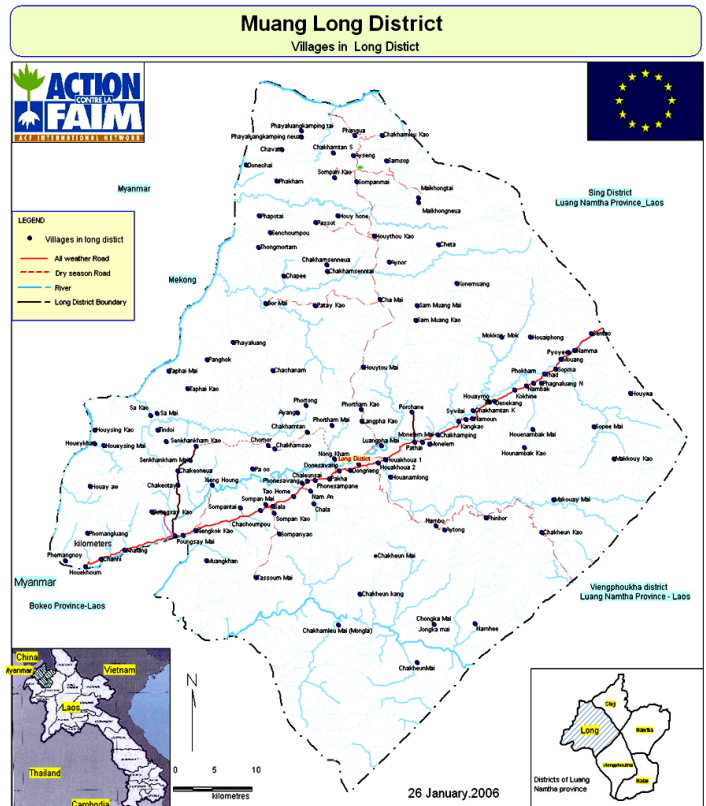


Figure 2. Map of Long District, Lao PDR reflecting the study sites (encircled ones) (Source: ACF 2006)

$$n = \frac{N}{1 + Ne^2}$$

Where:

n = sample size (122)

N= total households in the villages (185)

e = desired margin of error (5%)

To determine the sample respondents from each village, proportional allocation was used based on the number of households in each village. The respondents from each village were drawn through simple random sampling technique.

The research design adopted the social survey design and used data collection methods of interview using a structured questionnaire, key informant interviews (KIIs) and focus group discussions (FGDs) using guided questions, and desk review of relevant secondary documents from government organizations (GOs), NGOs, foreign investors, local authorities, internet materials, and others. The survey was designed to collect the relevant information such as respondents' profile, household and community resources, and practices to attain food security from the households. Meanwhile, the KIIs and FGDs were employed to enrich the data gathered from the household survey. The key informants included the village chiefs and the heads of the District Agriculture and Forestry Office and Planning and Investment Office. The village chief, other leaders and farmers in the communities served as FGD participants.

Results of the survey were analyzed with the use of descriptive and inferential statistics. Descriptive analysis included presentation and discussion of the frequency, percentage, mean, and range of data gathered. Inferential statistics used included Pearson Chi-square test of independence and Fisher’s exact test to analyze the correlation between the socio-demographic and economic characteristics with household and community level practices; and household and community level practices with food security.

Conceptual Framework of the Study

Figure 3 illustrates the interrelationship of household and community level practices in the attainment of food security based on its three guiding elements, namely food availability, accessibility and utilization in Long District.

It has to be understood that the socio-demographic characteristics such as age, gender, civil status, education, ethnic group, household size, income, and length of stay in the area influence and shape the household level practices. In this study, they serve as the baseline information among the farmer-respondents. The household and community practices to attain food security refer to the present farming system and other institutional arrangements in Long District. The practices of households and communities to attain food security need to be analyzed in order to look into possible gaps that may have been causative to their current food insecurity. The current institutional interventions need to be identified and analyzed as they play vital roles towards attaining food security in the light of the government’s

policy and social changes that occurred in the Long District as brought about by the Chinese investors (DAFO 2010).

Food security is an essential, universal dimension of household and personal well-being. Monitoring food security can help to identify and understand the basic aspect of well-being of the population and to identify population subgroups or regions with unusually severe conditions (USDA 2009).

Understanding the interplay among the household and community level practices, the socio-demographic and economic characteristics of the communities inherent to the study area, and the three pillars of food security, namely food availability, food access, and food utilization shall lead to alleviating food insecurity issues in Long District.

RESULTS AND DISCUSSION

Respondents’ Socio-economic Characteristics

Generally, all of the farmer-respondents are in the prime of life with a mean age of 40. A majority (93%) of the respondents are young adults (20-39 years old) and adults (40-59 years old), male (91%), married (91%), and had no formal education (80%). With the mean number of years in the area of 24 years, half of them had lived in the area for more than 20 years and most (69%) of them were migrants (resettled) to the area. More than half of them (57%) had 1-5 members in the household, and an average household annual income of ≤5,000,000 kip or USD 625.

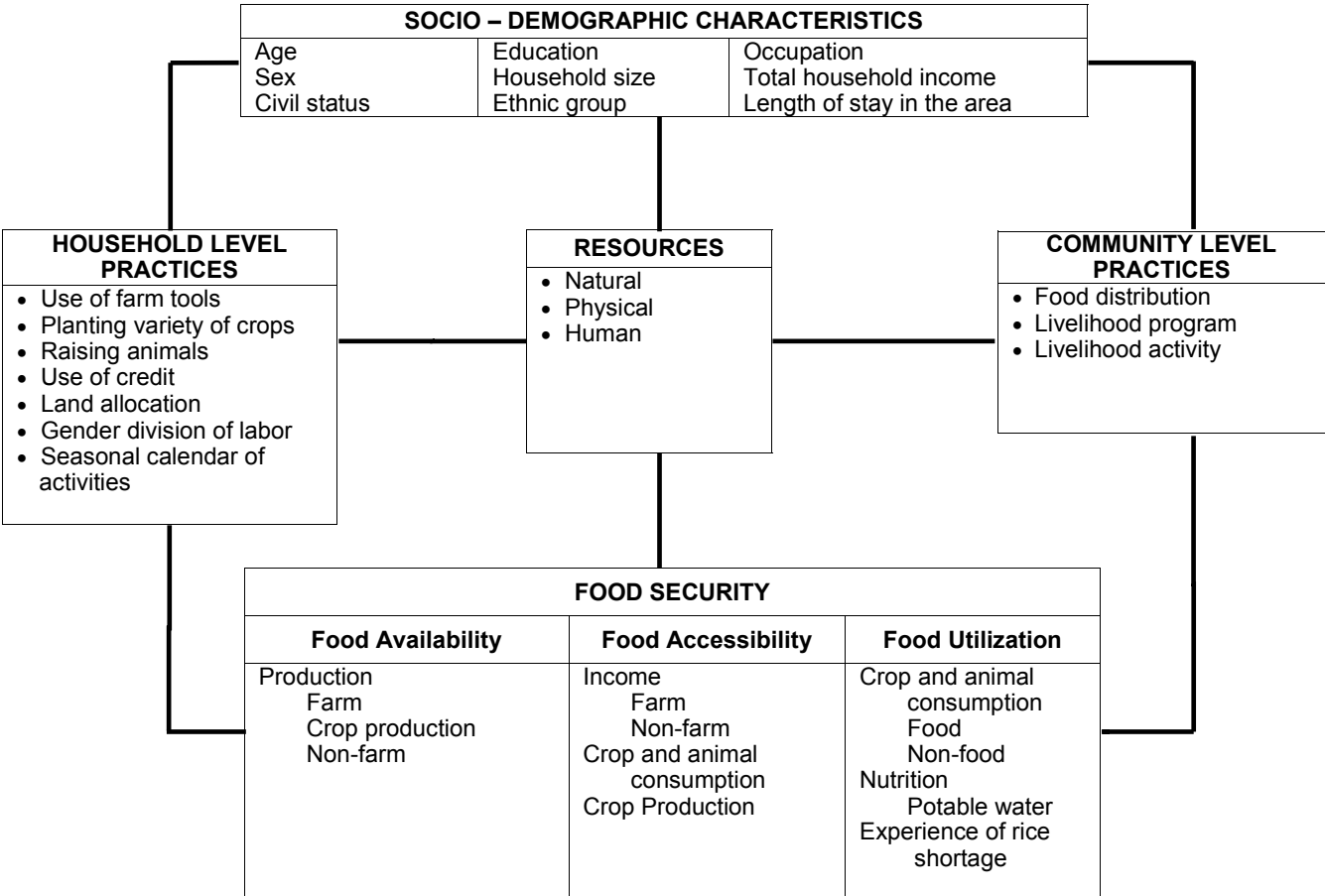


Figure 3. Conceptual framework of the study

In general, the respondents' spouses are likewise in the prime of their life, as most of the spouses (57%) are young adults (20-39 years old), while more than one-third are adults (40-59 years old). The spouses are comparatively younger than the respondents, with a mean age of 37. The youngest is 18 years old while the oldest is 68 years old. The majority are female (88%) and had no formal education (96%). They are all farmers like their spouses. Their offspring are mostly children aged 1-2 years old (57%), males (58%) and many had undergone primary schooling and are still studying (70%). Living together with the respondents are their relatives who are dominantly females, uneducated, and farmers.

With farming as their main occupation, all the respondents earn their living from crop production (mainly rice) and to some extent from livestock production. They view crop production income as enough but livestock production income as not enough to meet family needs. As regards the natural and physical resources, majority (70%) of the respondents declared that there was no irrigation system available in their area. Most of them (58%) get water from streams/rivers which are near their village and where fish are available to some extent. Most of the respondents (57%) replied that their villages have fertile black soil. Most of them (68%) have access to non-timber forest products which are primarily *khem* (broom grass or tiger grass) products collected 1-10 times a year.

Majority (96%) of the respondents' households raise livestock consisting mostly of pigs, cows and chickens. All of them have access to farm tools. The majority (96%) have 1-5 hoes, one shovel, and 1-5 jungle knives. They acquired these through purchasing or through NGO donations. Generally, they own the land that they till which do not have titles. In the past, they just planted in any area where they want to and that made them the owner of the land. A common village land certificate assures the legality of their use of the land. At present, the DAFO allocates the land area and titling of land for rubber tree plantations has started in 2012, while for wetland rice, housing, and other uses this has been done 10 years ago.

As regards facilities for basic needs, all of them have access to potable water during the rainy season which is taken from a water supply (ACF 2009). Water is available year-round in some areas like Langphamai, Pakha, Chamai and Chagnee, while water is scarce in Chommok and Huadoy during the dry season. Irrigation facilities are not available according to 70% of the respondents. Likewise, electricity is not available to most (61%) of them and public electricity is the chief source for half of the households who have access to electricity. Majority (94%) have access to cellular phones for communication and have motorcycles for transportation.

Practices to Attain Food Security

Almost all of the farmers use hoes, shovels, and jungle knives for farming, gardening, and slash-and-burn activities. Majority of the respondents (90%) plant upland rice using the native varieties. A majority (89%) do not plant vegetables. The few farmers who do so prefer the native varieties over the hybrids.

The farmer respondents plant an average of 88.4 kg ha⁻¹ of upland rice seeds, an average of 48.18 kg ha⁻¹ of wetland rice seeds, and an average of 2.5 kg of vegetable seeds.

Majority (75%) of them pen their pigs but unleash their chickens. Free-range chickens have also been observed by Chapman *et al.* (2007). The most common feed they give to pigs is rice or rice husk and most common feed given to poultry is milled rice. Pigs and poultry are not vaccinated in the selected study sites except in Chamai. In this village, pigs and poultry are given vaccinations four times a year. The Norwegian Church Aid (NCA) provides free and regular vaccinations to this village.

Majority (80%) of the respondents do not borrow money. Those who borrow money generally take loans from government banks and spend the money for farming purposes. Usually, the average loan is 3,745,000 kip (USD468).

Almost all of the respondents (99%) own the land that they farm. Among the various types of land that they own, the upland rice area has the largest mean size equivalent to 2.01ha. The mean sizes of the rubber plantation, the cash crop area, the wetland rice area, and the resettlement area are less compared to the upland rice area. In terms of access, most of the respondents have diminished access to upland rice (77%) and cash crop areas (43%) due to increasing population and limited land allocation by the DAFO. For the majority, access to wetland rice (67%) and resettlement areas (98%) remained the same. Almost all (99%) of them acquired their lands by inheritance and thereafter gained access by inhabiting them even without formal allocations given by the DAFO or the Land Allocation Office.

Husbands and wives share equal responsibilities in farming (both in upland rice production and in wetland rice production) and in livestock-raising. Also shared by both husbands and wives are household tasks that include cooking, taking care of children, and firewood gathering. However, the males still take charge of work that requires much physical strength. For most households, tasks are accomplished faster and on time because of husband and wife labor sharing.

The respondents perform the same farm routine over the course of the year. In upland rice production, February and March are devoted to selecting land. March and April are for tree felling/brushing, April and May are for burning, May, June, and July are for sowing, May until October is the period for maintaining the upland rice, October and November are for harvesting, and October to December is the period for threshing and hauling.

In wetland rice production, April and May are for clearing, May is for seedbed preparation, May and June are for land preparation, June and July are for transplanting, August to October is the period for maintaining the wetland rice paddies, and October, November, and December are for harvesting and hauling.

Gardening, constructing livestock enclosures, and festivals also have seasonal cycles. Gardening activities are also conducted sequentially from August to December. Activities for construction of livestock pens are done from January to March. New Year celebrations are in January, February, May, September, and December.

The respondents were able to avail themselves of food distribution programs provided by NGOs specifically the World Food Program (WFP) solicited by the government. Chamai village availed themselves of food for work in 2003 and 2009.

In this program, the villagers were given food that ranged from 15 to 400 kg with an average of 208.92 kg. From 2003 to 2011, all the six villages benefited from school food programs with a quantity of food ranging from 3 to 900 kg at the average of 209.62 kg.

The communities of Houadoy, Chagnee, and Pakha have been deprived of livelihood programs despite their requests. On the other hand, NGOs have provided livelihood programs to the people of Chamai, Chommok, and Langphamai villages. These programs included irrigation system construction, road construction and paddy rice expansion as the top three answers of the respondents. No livelihood strategies were observed in the six villages except in Chamai where there were weaving and sewing for the women.

Food Security Situation

The respondents' main sources of income are from crop and livestock production. The size of area planted determines the quantity of farm yield. For upland rice cultivation, the average area planted is 1.98 ha with an average production of 2,511.34 kg yearly. For wetland rice production, the average area planted is 0.52 ha with an average yield of 1,854.48 kg annually.

Most of the respondents (76%) declared that crop production is adequate for family's consumption. For the minority (24%) who viewed crop production as insufficient, their reasons are deficient rice harvest, large family size, and limited land for farming. For those who mentioned that crop production is sufficient, majority mentioned the level of sufficiency to be enough (65%), not enough (18%), sometimes enough (11%), and more than enough (6%). It can be deduced, therefore, that indeed crop production is for home consumption only. During the FGD, the participants mentioned that marketing their products is a problem.

The respondents also raise livestock, mostly pigs, chickens and cows. Households have an average of four pigs, 19 chickens, and three cows. They consume an average of one pig and six chickens annually. Aside from serving as food, their livestock are also used in some of their rituals, while the cows are used for animal labor. For the majority (60%) of the respondents, livestock production is insufficient because of the small number of animals raised, mortality due to disease outbreak, and lack of feed.

Generally, the respondents acknowledge their earnings' inability to respond to their family's basic needs. In terms of monthly expenses, primary on their list is food, with an average cost of 122,163.90 kip (USD 15.27) followed by medicine (100,577.60 kip or USD 12.57), clothing (87,290.60 kip or USD 10.91), education (55,325.58 kip or USD 6.92), and utilities (9,820.00 kip or USD 1.23).

Majority (75%) of the respondents consider the prevailing prices of food in the market to be high while others consider them as just enough. Condiments, fish, and meat are the top three commodities usually bought whereas processed foods, canned goods, and fruits are occasionally or not bought at all.

The respondents (99%) state that they still take meals three times a day. Majority (68%) mentioned that fish, meat, and vegetables are the common ingredients of their daily meal. Households consume an average of 4.05 kg of rice per day.

While a majority of the respondents (76%) assert that rice consumption in their household is sufficient, a significant percent (24%) affirmed otherwise. Those who considered rice as insufficient attribute the main reason for their poor harvest to flooding, limited land for farming, and large household size. Rice shortage is experienced by almost half of them, where most (45%) experienced shortages for more than three months. During this period, they buy rice from the market, borrow from their relatives, or exchange rice for labor.

Relationship between Socio-Demographic and Economic Characteristics and Household and Community Practices for Food Security

The correlation between the socio-economic characteristics and the household and community level practices is shown in Table 1. Among the socio-demographic characteristics, educational attainment is highly correlated with the quantity of upland rice planted (kg ha^{-1}) at the household level. Very notable are the findings that length of stay in the area is significantly correlated with availment of credit and household practices such as pig raising and planting of wetland rice variety. In addition, total household income is highly correlated with the quantity of upland rice seeds planted and significantly correlated with variety of wetland rice planted. These findings show that farmers who are well educated are, more often than not, the well-off ones and therefore could afford to buy upland rice seeds as planting materials. Secondly, farmers who have stayed long in the community are not afraid to avail of credits maybe because they have established their credibility through time. They are the same farmers who also venture into other income generating activities like pig raising and wetland rice cultivation most probably because they have the capital.

In terms of community level practices, age is highly correlated with access to livelihood programs while length of stay in the area is likewise highly correlated with access to food and livelihood programs. Meanwhile, household size is significantly correlated with access to food and livelihood programs. These findings imply older farmers who also have stayed for a long time in the village are given more access to food and livelihood programs.

Relationship between Household and Community Practices and Food Security

Table 2 shows the correlation between household and community level practices and food security. As shown in Table 2, planting of wetland rice variety is significantly correlated with sufficiency of rice consumption. This means that in addition to upland rice, wetland rice contributes to their rice consumption. Planting of wetland rice variety is highly correlated with experience of rice shortage. This means that if the farmers plant wetland rice in addition to upland rice, they will not experience rice shortage.

Another household practice variable found to be correlated with food security is the quantity of upland rice planted. Farmers, who are able to plant more in terms of the quantity of seeds used, have higher level of crop production sufficiency, more sufficient rice consumption, and do not experience rice shortage. In terms of livestock production, free range method of raising pigs and poultry is significantly correlated with level of sufficiency of crop production, sufficiency of animal consumption, sufficiency of income, and experience of rice

Table 1. Relationship between socio-economic characteristics and household and community level practices on food security.

SOCIO-ECONOMIC CHARACTERISTICS	HOUSEHOLD LEVEL PRACTICES									COMMUNITY LEVEL PRACTICES		
	UFT	VWR	VV	QCP			MRA		AC	FPA	LPA	LAA
				UR	WR	V	PR	POR				
Age	-	-	-	-	-	-	-	-	-	-	0.008*	-
Sex	-	-	-	-	-	-	-	-	-	-	-	-
Civil status	-	-	-	-	-	-	-	-	-	-	-	-
Educational	-	-	-	0.001**	-	-	-	-	-	-	-	-
Length of stay in the area	-	0.032*	-	-	-	-	0.025*	-	0.016*	0.001**	0.001*	-
Household size	-	-	-	-	-	-	-	-	-	0.041*	0.025*	-
Total household income	-	0.032*	-	0.008*	-	-	-	-	-	-	-	-
Occupation	-	-	-	-	-	-	-	-	-	-	-	-
Ethnic group	-	-	-	-	-	-	-	-	-	-	-	-

Note:

**Highly significant at $P < 0.001$

*Significant at $P < 0.05$

- Not significant (All variables that have p values above 0.05 are not significant, hence these were not included anymore).

Legend:

UFT: Use of farm tools
VWR: Variety of wetland rice planted
VV: Variety of vegetables planted
MRA: Method of raising animals
PR: Pig raising
POR: Poultry raising
QCP: Quantity of crops (seeds) planted
UR: Upland rice
WR: Wetland rice
V: Vegetables
AC: Availability of credit
FPA: Food programs access
LPA: Livelihood program access
LAA: Livelihood activity access

Table 2. Relationship between household and community level practices and food security.

HOUSEHOLD AND COMMUNITY LEVEL PRACTICES	FOOD SECURITY INDICATORS						
	SCP	LSC	SAC	LSA	SI	SRC	ES
Household level practices	-	-	-	-	-	-	-
Use of farm tools	-	-	-	-	-	-	-
Variety of upland rice planted	-	-	-	-	-	-	-
Variety of wetland rice planted	-	-	-	-	-	0.016*	0.001**
Variety of vegetable planted	-	-	-	-	-	-	-
Quantity of upland rice planted	-	0.008**	-	-	-	0.049*	0.001**
Quantity of wetland rice planted	-	-	-	-	-	-	-
Quantity of vegetable planted	-	-	-	-	-	-	-
Method of raising pig	-	0.001**	0.041*	-	0.001**	0.016*	-
Method of raising poultry	-	0.016*	0.049*	-	0.001**	-	-
Availability of credit	-	-	-	-	-	-	-
Community level practices							
Access to food program	-	-	-	-	-	-	-
Access to livelihood program	-	0.001**	-	-	0.001**	-	-
Livelihood activity	-	-	-	0.033*	-	-	-

Note:

*Significant at $p < 0.05$

** Highly significant at $p < 0.001$

Not significant (This means that all variables that have p values above 0.05 level are not significant; hence were not included).

Legend:

SCP: Sufficiency of crop production
LSC: Level of sufficiency of crop production
SAC: Sufficiency of animal for consumption
LSA: Level of sufficiency of animal consumption
SRC: Sufficiency of rice consumption
SI: Sufficiency of income
ES: Experience rice shortage

shortage. The method of raising livestock through free range is more cost effective since feeds for animals are not bought. Thus, the money that the farmers have is spent for other purposes as in buying rice.

There is a highly significant relationship between sufficiency of income and level of sufficiency of crop production and access to livelihood programs. This implies that households who have higher income and higher level of crop production have more access to the livelihood programs available in their community.

As shown in the conceptual framework of the study, food availability has two main variables, namely farm production and non-farm production. Farm production which was operationalized in this study includes variables of crop production, sufficiency of crop production, livestock production and sufficiency of livestock production. The variable “sufficiency of crop production” refers to whether the respondents have enough production of crops to feed all members of the family at all times while level of sufficiency of crop production refers to the level of sufficiency as “enough”, “more than enough”, “sometimes enough”, and “not enough”. On the other hand, sufficiency of animal for consumption refers to whether the animals are enough for home consumption and the “level of sufficiency of animal for consumption” indicates whether the level is “enough”, “sometimes enough” and “not enough”.

Based on the results of the study, the farmers plant upland rice in large areas with supplementary wetland rice and raising a number of animals. Some farmers have enough or more than enough rice production to feed their family members and animals at all times and can sell the surplus for family income. However, almost 50% of the farmers cultivate upland rice in 0.1 -1.5 ha that cannot produce enough rice to feed their family members and animals at all times. Furthermore, a similar majority (82%) of farmers raise pigs, ranging from 1-5 heads, and poultry, ranging from 1-20 heads, which are minimal and can lead to insufficiency of family consumption.

Food accessibility has three variables, namely income (farm and non-farm), crop and animal consumption, and crop production. Results of the study show that farmers who have high income can buy food such as condiments, fish, meat, processed foods, canned goods, fruits and others in the market. Findings show that more than half (53%) of the respondents have an annual income of $\leq$ 5,000,000 kip (USD 625), but every respondent needs to generate a monthly family income of 539,111 kip (USD 67.39) that will be enough to buy their basic needs especially food. This implies that there are half or equivalent farmers whose annual income is deficient to buy their basic needs such as food, medicine, education equipment for their children, and others.

For utilization, two main variables are involved in this study, namely food consumption and nutrition particularly potable water. As shown in the conceptual framework, food consumption includes meals taken per day, occurrence and duration of rice shortage, nutrition focusing on availability of potable water year-round. Results of the study show that all farmers take meals three times a day comprising of rice, fish, meat and vegetable. However, more than one-third (36%) of the respondents declared that rice suffices for family consumption

only, while others (31%) stated that rice is insufficient. One out of three respondents chose not to answer because of their perception that if they answered they have sufficient rice, GOs and NGOs will no longer implement any project (such as paddy expansion and irrigation) in their village. Furthermore, more than one-third (44%) of the respondents declared that they experienced rice shortage for more than three months during the last two years. This points out that taking three meals a day does not warrant rice sufficiency because when faced with rice shortage, the respondents resolve the situation by exerting effort to borrow from relatives and offering manual labor in exchange for food. However, while they experience shortage in rice, almost all (93%) of the respondents declared that water is available year-round. This means that water is sufficient in the households and villages.

CONCLUSIONS

In the light of the research results presented and discussed, the following conclusions were drawn:

The male-dominated respondents have an average age of 40 years, are married, have no formal education, and are farmers by occupation. Majority (69%) are migrants but have stayed in the village for an average of 24 years. The average total annual household income is 5,703,770 kip (USD 712.97) which supports a family of five. They are endowed with natural resources such as agricultural land, fertile soil, river and stream, and forest resources which serve as sources of non-timber forest products.

As traditional farmers, their single crop of upland rice per year is insufficient and causes rice shortage. Their household level practices towards food security include use of farm tools, planting variety of crops, raising livestock, land allocation, gender division of labor, seasonal calendar of activities, and to some extent availment of credit. On the other hand, community level practices include availment of food distribution, limited participation in livelihood programs, and conduct of livelihood activities.

In terms of food availability, access, and utilization, the villages under study have food available in meager quantities only. Not all of them have livelihood activities, and so rely on crop and livestock production for income.

Household level farming practices on food security are positively related to educational attainment, length of stay in the area, and total household income of the respondents. Farmers who have higher educational attainment, higher total household income, and have stayed longer in the village resort to household level practices such as planting a variety of wetland rice, use higher seeding rate, raise livestock, and avail credit.

Community level practices are likewise positively correlated with the respondents' age, length of stay in the area, and household size. Older farmers with bigger household size and have stayed longer in the village have more access to food and livelihood programs.

The communities are food secure if they have access to livelihood programs, if their consumption of animals is sufficient, and if their income is sufficient to support the family.

RECOMMENDATIONS

In the light of the research results presented and discussed in the previous sections, the following recommendations are put forward:

1. The six villages under the study must be constantly monitored by their benefactors (GOs and NGOs) in terms of the programs which are related to food security such as crop production, livestock production, and livelihood so that these programs will be sustained and further improved.
2. Since women's participation in agriculture is high, they should be given opportunities to practice sustainable home gardening of local vegetables. This will contribute to food production and security.
3. Conduct feasibility study on the possibility of establishing irrigation systems in the remote villages. Monitoring should also be conducted by the DAFO in the previously established irrigation systems in order to assess whether these are still functional or not.
4. As single cropping per year is risky, the DAFO should initiate and assist the farmers to practice multiple cropping, home gardening, and mixed cropping.
5. Land registration should be facilitated and prioritized by the Land Allocation Office. On the other hand, the villagers should voluntarily register their lands and consider the benefits of having land titles such as tenure rights.
6. The farmers should be assisted with the marketing of their products. The DAFO and District Trade Office (DTO) should work hand-in-hand in setting up price monitoring system, conducting market studies, monitoring quantity and impact of export and import of agricultural products, and promoting purchases of local crop and livestock products, among other things.
7. Level of education determines the farmers' decision on the quantity of crops that they will plant and results show that quantity is limited. The farmers (both men and women) should therefore be given free training-workshops by the DAFO. These trainings must focus on methodical/scientific farming, forest conservation and optimization, water management, and the like.
8. The DAFO should provide technical training on how to choose the appropriate upland rice and wetland rice varieties and to use quantity of upland rice planted when farmers do not experience rice shortage.
9. As method of raising pigs determines the level of sufficiency of crop production and sufficiency of income, DAFO should conduct training on proper method of swine raising. Since higher income denotes better livestock raising, the villagers should be given access to free training courses given by the GOs and NGO on proficient livestock raising particularly on animal primary health care in order to contribute to food production.
10. The DAFO should be reminded that the farmers' access to livelihood programs determines their food sufficiency so that the DAFO must revitalize its thrusts and improve its services like providing alternative livelihood projects to supplement crop and livestock production.
11. For future researchers, a similar study should be expanded and conducted in other regions of Lao PDR in order to validate the results of the present study, and establish the usefulness of household and community level practices toward attaining food security. This is because phasing out slash-and-burn cultivation and eliminating opium plantation

have varied and complex impacts on the economic, cultural and food insecurity issues of affected households and communities. Lao PDR, being a developing nation, needs to learn from the experiences of other countries with the same plight so that development-induced resettlement can be implemented and integrated with the true goals of development.

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