KKU Res.j. 2016; 21(1) : 12-25
http://resjournal.kku.ac.th

Food Diversity of Three Ethnic Groups: A Case Study from Xieng Khuang Province, Northern Lao PDR

Sonemany Pathumphone[1], Jirawat Sanitchon[2], Anan Polthanee[3] and Arunee Promkhambut [4]

[1]Clean Agriculture Development and Food Processing Association, Lao PDR
[2]Department of Plant Science and Agricultural Resource, Faculty of Agriculture, Khon Kaen University, Thailand
[*]Correspondent author: sonemanyph@gmail.com

Abstract

This qualitative research was carried out using formal key informant group discussions and household semi-structured interview. The objectives of the research were to evaluate food diversity and security of three ethnic groups at Nam Chat village, XiengKhuang province in northern Lao PDR, where the village includes three ethnic groups; Khmu, Hmong and Lao Loum. The study found that rice was the main staple food crop for three ethnic groups. However, Hmong and Khmu representing approximately 30% of total household in this village produced insufficient rice for household consumption. Food was gathered from various kinds of cultivated crops and domestic livestock, and also included wild plants, wildlife aquatic animals and insects. The three ethnic groups consumed different quantities of food sources from crops or animal species, depending on specific ethnic groups. The three ethnic groups earned household income both from crops and domestic animals, as well as from non-timber forest products and wildlife. Lao Loum received per capita income greater than Hmong and Khmu in the present study.

Keywords : *XiengKhuang Province, Shannon diversity index, Food diversity, Ethnic groups*

1. Introduction

The Lao PDR is a landlocked country that shares borders with the following five countries namely Thailand, Myanmar, China, Vietnam and Cambodia. The total land of Lao PDR is about 236,800 km^2 and population of 6 million (1). Approximately 3% of the area is used for agriculture with rice as the main crop. Fallow lands in shifting cultivation (slash-and-burn agriculture) may account for another 6-10% of total land area (2). Approximately 77% of the population is rural and 60% of these people depend on subsistence agriculture (3). The population is ethnically diverse with more than 60 ethnic groups (4). All ethnic groups who live in hill areas are engaged in shifting cultivation. The northern part of Lao PDR is the region with the highest poverty rate in the country, particularly in remote mountainous areas where people earn less than 1 US dollar per

day. Shifting cultivation is the main agricultural practice in the region, which results in low land productivity, increasing land degradation and land scarcity (5). Recently, the policy of the Lao PDR government has tried to eradicate the shifting cultivation and to replace it with more ecologically sustainable land use system at the village and household level (6). However, people who live in rural area still practice shifting cultivation. In order to really understand the food situation and the cause of food security, this study aimed at evaluating food diversity of the three ethnic groups at village level, XiengKhuang province, Northern Lao PDR.

2. Methodologies

2.1 Study area

The study area is located in PhouKout district, XiengKhuang province. It is characterized by rolling hills and grass-land whose altitude averages 1,300 m. The province is 400 km northeast of Vientiane and includes 7 districts and it is formed of valley located at about 2,000 meter in altitude with a total land area of 28,000 ha. The PhouKhout districts include 4 sub-districts (Kumban) and 42 villages with 24,372 populations who live in 4,078 households. The research was conducted between November, 2013 and October, 2014 in Soiuy sub-district where Nam Chat village was selected as representative for this study (Figure.1) with three ethnic groups including: Lao Loum, Hmong and Khmu who live together in this village. Since, the three ethnic groups are dominated in XiengKhuang province, where typical highland communities in the province.

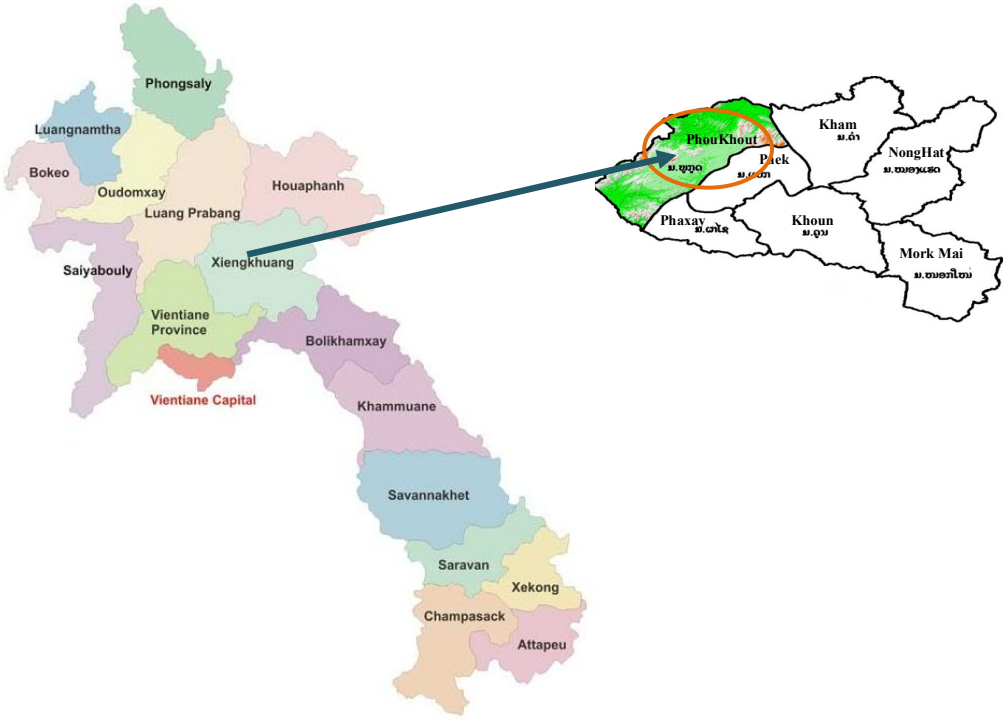

Figure 1. Study site in PhouKout district, XiengKhuang province

2.2 Household sampling method

After the frequent field visits, formal meeting was held with the village headman and their committees to inform the villagers of the objectives of the study. Village information including physical, biological and social-economic conditions of the village were collected and analysed. Total number of households is of 129 which included three ethnic groups; Lao Loum 22 households (19%), Khmu 64 households (46%) and Hmong 43 households (35%). A total of 47 household (30%) out of 129 household were randomly selected representatively among the three ethnic groups. For each ethnic group, population sample was taken as 30% of total number of households (7).

2.3 Data collection

A structured questionnaire was developed for the individual households interviews, a total of 129 households were interviewed and primary data was entered into 37 packages for analysis to reflect food diversity at the household level (8). The secondary data consisted of documents from Provincial Agriculture and Forestry Officer & District Agriculture and Forestry Officer, publications, other related organization's information from journals, proceeding and reports that deal with upland agricultural system and agroforestry (3, 9, 10, 11,12). The primary data was collected by focus group discussion and household semi-structured interviews of the three ethnic groups, namely; Lao Loum, Hmong and Khmu which focused on access to the sources of food in upland shifting cultivation and non-timber forest products, as well as a profile of the respondents of three ethnic groups. The focus group discussions were conducted by group of researches, while household semi-structured interview was done by one researcher. A structured questionnaire pretesting exercises were conducted outside the target villages to further fine-tune the data collection process before the actual interviews.

2.4 Data analysis

Primary data from focus groups discussion and households interview were processed, the answers were coded and processed in the computer using MS Excel program, as well as survey design using stratified and sampling random, Statistical Package for the Social Sciences (SPSS) and including other statistical tests such as T-test, percentages, mean and ranges were used. The species diversity, consumed as food, in each ethnic groups was quantified using the Shannon-Wiener index $H' = -\Sigma (pi \log pi)$, where pi is the relative abundance of occurrence of the ith species in the farm (cultivated crops and domestic livestocks) or natural resources as the proportion of the number of individuals of the ith species to the total number of individuals (13).

3. Results and Discussion

3.1 Profile of the respondents

The result from the face-to-face interview sessions revealed that average age of the respondents was 41.7 years old ranging from 40 to 45 years where 62% and 38% belonged to male and female gender, respectively. The overall average family size of the sampled respondents was 5.7 persons. Data on education indicated that only 2.7% complete the college level, whereas 43.2% completed primary school level and 16.2% complete high school level. The average land size of the respondents was 0.69 hectare, with the

highest of 0.70 ha belonged to Lao Loum (Table 1). Farm size in XiengKhuang province less than 1 hectare, 1-2 hectare and more than 2 hectare was about 37, 38 and 25%, respectively (14).

Table1. Socio-economic characteristics of the interviewed respondent of three ethnic groups

Characteristics	Average	Frequency (N=37)	Percent (%)
Family size			
Khmu	5	17	45.9
Hmong	6	13	35.1
Lao Loum	6	7	18.9
Gender distribution			
Female		14	38
Khmu		8	22
Hmong		4	11
Lao Loum		2	5
Male		23	62
Khmu		9	24
Hmong		9	24
Lao Loum		5	14
Age (year)			100
Khmu	40	17	45.9
Hmong	40	13	35.1
Lao Loum	45	7	18.9
Education levels			
Primary (1-12)			
Khmu		9	8.1
Hmong		3	24.3
Lao Loum		4	10.8
High school (13-18)			
Khmu		2	5.4
Hmong		4	10.8
Lao Loum		0	0.0
College (18-23)			
Khmu		0	0.0
Hmong		0	0.0
Lao Loum		1	2.7
Farm size (ha)			
Khmu	0.69	17	45.1
Hmong	0.68	13	35.1
Lao Loum	0.70	7	18.9

Characteristics	Average	Frequency (N=37)	Percent (%)
Rice consumption			
Khmu	345	17	100
Hmong	352	13	100
Lao Loum	244	7	100
Off-farm			
Khmu	3	17	35.6
Hmong	3	13	21.2
Lao Loum	3	7	43.1

3.2 Rice production, consumption and loan

Average rice production ranged from 1,400-1,800 kg/hh/year. Among the three ethnic groups, Khmu produced the maximum annual rice production, while Hmong exhibited lower rice production (Figure 2). In both cases however, Hmong and Khmu produced insufficient rice for home consumption. They had to borrow from relatives and village rice banks. Only Lao Loum produced adequate quantity of rice to match consumption needs (Figure 2). When considering all three ethnic groups, about 70% of respondents produced sufficient rice for consumption and the remaining of 30% of household experienced rice shortage. Within 30% who faced rice shortage, the maximum 8% of households had a rice shortage for 4 and 6 months in June to November of the following year (Figure 3**)**. Similar result was obtained where studied in Namo and Phonsay districts, Oudomxay province northern of Lao PDR, indicates that all villages experience a minimum of 3 to 4 months of rice shortage from July to October (14).

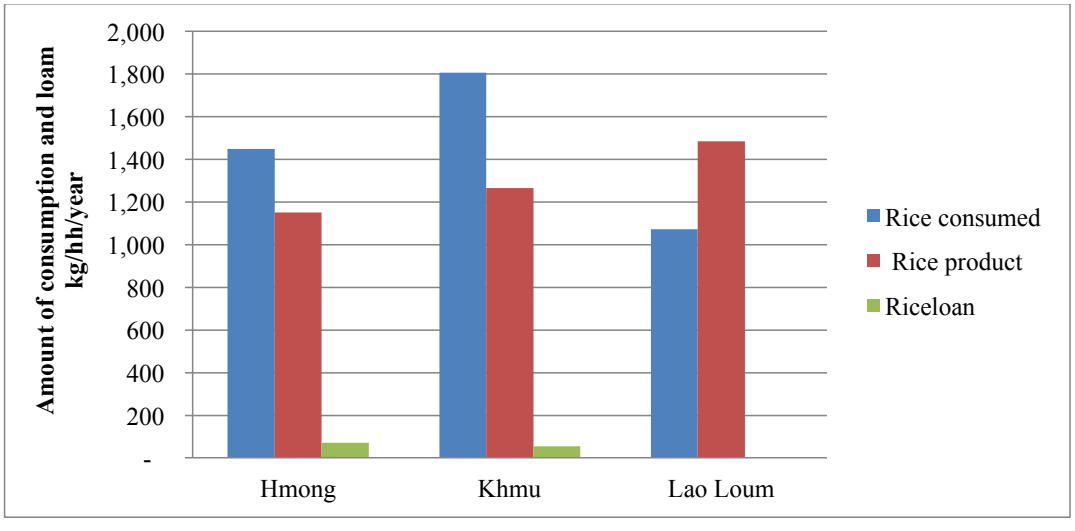

Figure 2. Production, consumption and loan (kg/hh/year) of the three ethnic groups in Nam Chat village

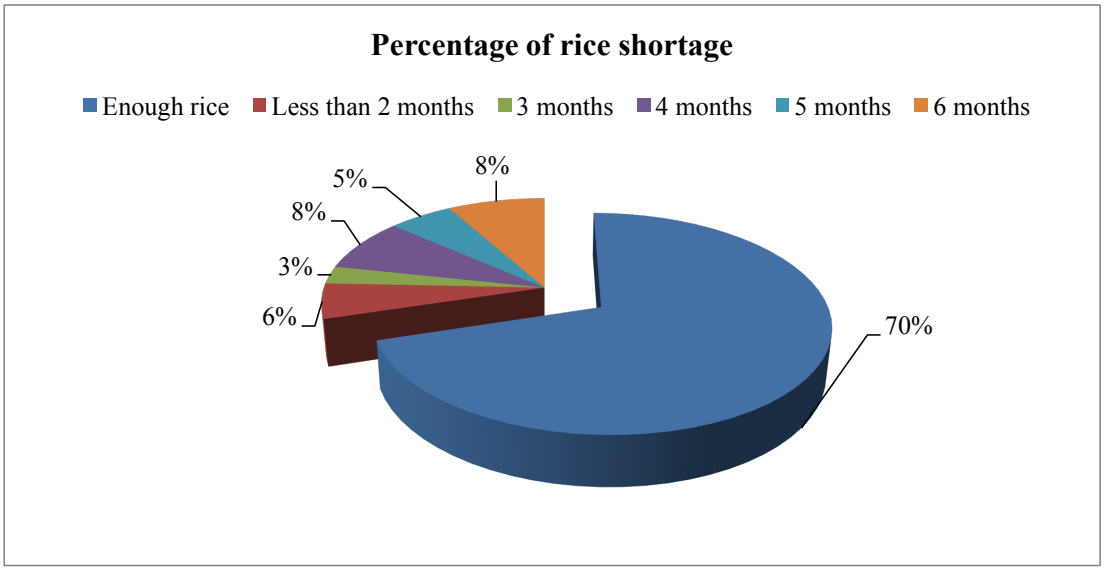

Figure 3. Percentage of sufficient and shortage rice consumption of three ethnic groups in Nam Chat village

3.3 Food consumption of three ethnic groups

In general, all three ethnic groups obtained food mainly from two sources; domestic food (crops and livestock) and wild foods (wild plants and wildlife). Among the three ethnic groups, Khmu and Hmong received higher amount of wild foods (49.4% and 51.7%, respectively) than those of domestic foods. On the other hand, Lao Loum access to domestic foods (62.2%) is higher than those of wild foods. This was due to the fact that Lao Loum mostly work on off farm activities Khmu 35.6%, Hmong 21.2% and Lao Loum 43.1% respectively (Table 1), and then mobilise cash income to buy food for consumption. Food diversity obtained from crops cultivation included green vegetables: lettuce (Brassica chinensis), cucumbers (Cucumis melo L.) and eggplant (Solanum xanthocarpum), chili (Capsicum frutescens) pumpkin (Cucurbita pepo L.), sweet corn (Zea mays Linn) and banana (Musa sapientum L). In the present study, there was significant difference on chili and banana consumption among the three ethnic groups (Table 2). Lao Loum consumed the highest quantity of chili, while Khmu consumed the maximum quantity of banana but not significantly different from Lao Loum. Regarding foods obtained from domestic livestock, Lao Loum beef meat consumption was significantly higher than Khmu but not significantly different from Hmong (Table 2). This is because both ethnic groups work more on on-farm activities such as livestock raising and maize (field corn) production for trading, making cash available to buy meat. In the present study there was no significant difference on chicken, pork and fish consumption among the three ethnic groups (Table 2). However Hmong tend to consume poultry and fish in higher quantity than Khmu and Lao Loum, whereas Lao Loum households tend to consume pork in higher quantity than Khmu and Hmong (Table 2).

Table 2. Foods consumption of cultivated crops and domestic livestock of three ethnic groups in NamChat village

Food diversity	Ethnic group			F-test
	Khmu	Hmong	Lao Loum	
Cultivated crops consumption (kg/hh/year)				
1. Vegetables	20.3 ± 3.1[1)]	17.9 ± 2.5	22.7 ± 4.0	NS
2. Chili	16.1 b	18.6 b	62.5 a	*
3. Pumpkin	10.1 ± 2.1	9.0 ± 1.4	15.0 ± 5.7	NS
4. Sweet corn	30.1 ± 7.4	23.1 ± 3.4	38.0 ± 11.1	NS
5. Banana	32.0 a	16.0 b	30.0 a	*
Domestic Livestock consumption (kg/hh/year)				
1. Beef cattle	7.12 b	10.1 ab	15.6 a	*
2. Poultry (chicken and duck)	8.12 ± 0.9	8.38 ± 1.0	6.71± 1.3	NS
3. Pork	7.06 ± 1.1	5.46 ± 0.7	7.71 ± 1.4	NS
4. Fish (Tilapia and cat fish)	4.24 ± 0.5	6.08 ± 1.1	4.86 ± 0.7	NS

*= Significant at P= 0.05, NS= Not significant, mean in the same row with different letters are significantly different at P= 0.05 by LSD [1)] = Mean ± Standard error

In general, bamboo shoots are the main food sourced from the wild by all three ethnic groups. Hmong consumed vegetables in significantly higher quantity than Lao Loum, but not significantly different from Khmu (Table 3). However, there was no significant difference in consumption of bamboo shoots, young rattan, mushroom and wild fruit such as Phyllanthus emblica and Nephelium hypoleucum among the three ethnic groups (Table 3). In the current study, there was significantly different consumption of fowls, rats and barking deer among three ethnic groups (Table 3). Hmong and Khmu consumed significantly higher quantity of fowls meat than Lao Loum (Table 3). In the present study, Khmu consumed rats in significantly higher quantities than Hmong but not significantly different from Lao Loum (Table 3). Hmong consumed barking deer meat in significantly higher quantity than those of Khmu but not significantly different from Lao Loum (Table 3). There was no significant difference in consumption of jungle fowl and squirrel meat among the three ethnic groups (Table 3). In general, rodent meat is the main food source from wildlife for Khmu and Lao Loum. While, barking deer meat is the main food source for Hmong. This is due to difference in food preference and in hunting skills and habits among the three ethnic groups.

Table 3. Consumption of wild plants and wildlife of three ethnic groups in NamChat village

Food diversity	Ethnic group			F-test
	Khmu	Hmong	Lao Loum	
Wild plants consumption (kg/hh/year)				
1. Wild vegetables	4.9 ab	7.4 a	4.0 b	*
2. Bamboo shoots	59.4 ± 15.0[1)]	55.8 ± 0.6	37.8 ± 12.2	NS
3.Young rattan	3.9 ± 0.8	4.2 ± 1.4	3.0 ± 1.3	NS
4. Mushroom	4.3 ± 0.6	4.7 ± 0.7	3.2 ± 0.6	NS
5. Wild fruit	4.0 ± 0.5	9.7 ± 1.6	10.0 ± 0.7	NS
Wildlife consumption (kg/hh/year)				
1. Wild fowls	7.2 a	7.7 a	4.0 b	*
2. Jungle birds	3.8 ± 0.4	5.3 ± 0.8	3.3 ± 1.0	NS
3. Squirrels	5.0 ± 0.5	6.0 ± 0.8	5.7 ± 1.1	NS
4. Rats	15.8 a	2.0 b	13.0 a	*
5. Barking deer	3.0 a	9.0 a	5.7 ab	*

*= Significant at P= 0.05, NS= Not significant, mean in the same row with different letters are significantly different at P= 0.05 by LSD [1)] = Mean ± Standard error

For aquatic animals and other foods, Hmong consumed eels is significantly higher quantities than those of Lao Loum, but not significantly different from Khmu (Table 4). However, there was no significant difference in consumption on fish, frog, snail, insect and honey among the three ethnic groups in the present study (Table4). In general, fish is the main food source of protein from animal for the three ethnic groups. A key result of this study indicates that wild plants and wildlife seasonally gathered and utilized were very important for food security among ethnic groups. When comparing sources of consumed food among ethnic groups, it was found that Hmong consumed wild plants (54.0%) in higher quantities than cultivated crops (45.9 %) while Khmu and Lao Loum consumption of wild plants amounted to 46.9% and 27.6% respectively. On the other hand, Lao Loum consumed cultivated crop (72.3%) in higher amount than wild plants (data not shown). Hmong and Khmu consumed domestic animals (54.0% and 50.8% respectively) in greater proportion than wild animals (45.9% and 49.2% respectively). On the other hand, Lao Loum consumed wild animal in higher quantities than domestic livestock (51.7% and 48.2% respectively, data not shown).

Table 4. Consumption of aquatic animals, edible insect and honey of three ethnic groups in NamChat village

Food diversity	Ethnic group			F-test
	Khmu	Hmong	Lao Loum	
Aquatic consumption(kg/hh/year)				
1. Fish	9.6 ± 1.3[1)]	12.4 ± 2.7	12.7 ± 2.1	NS
2. Frog	7.4 ± 1.1	5.0 ± 0.5	6.8 ± 1.4	NS
2. Snail	5.7 ± 1.3	5.7 ± 2.3	5.0 ± 0.1	NS
3. Eels	3.0 ab	5.0 a	1.0 b	*
Insect consumption (kg/hh/year)				
1. Insects	6.0 ± 0.4	7.0 ± 0.2	8.0 ± 0.5	NS
2. Honey	2.1 ± 0.7	2.3 ± 1.1	4.5 ± 1.9	NS

*= Significant at P= 0.05, NS= Not significant, mean in the same row with different letters are significantly different at P= 0.05 by LSD [1)] = Mean ± Standard error

3.4 Food diversity and richness

As mentioned earlier, rice is the main staple food for home consumption of the three ethnic groups (Table 1). In the present study, 30% of the households of the three ethnic groups experienced rice shortage. Those results indicate that a critical issue of food insecurity occurred in the village.

Describing diversity can be quantified by Shannon-Wiener diversity index (13). In the present study, the three ethnic groups did not differ significantly with respect to the Shannon-Wiener diversity index on cultivated crops and domestic animals (Table5). They prefer to cultivated different kind of crops and animals. However, Lao Loum tends to give higher Shannon-Wiener diversity index than those of Hmong and Khmu. This implies that Lao Loum produced higher number of categories of plant species and animal species by farm. In the current study, the three ethnic groups obtained equal value of Shannon-Wiener diversity index on wild crops, wildlife, aquatic and insect (Table6). This indicates that the three ethnic groups do not differ in gathering wild crops, wildlife, aquatic and insect species for household consumption, but preferring different kinds of those. In general, food diversity received from cultivated and NTFPs, provided food security at household level. As mentioned earlier, Lao Loum cultivated crops and livestocks more species than those of Hmong and Khmu, and then make them better food security.

Table 5. Shannon-Wiener diversity index for cultivated crops and domestic animals of the three ethnic groups

Type	Variables	Hmong	Khmu	Lao Loum	95% Confidence Interval of the difference		p-value*
Shannon-Wiener diversity index		**0.69**	**0.70**	**0.70**	**1.37**	**1.53**	**0.93**
Cultivated crops (kg/hh/year)	Banana	5.00	10.00	3.00	18.18	38.03	0.52
	Chili	8.00	11.00	4.00	11.59	38.49	0.02*
	Corn	8.00	12.00	5.00	21.95	35.80	0.35
	Pumpkin	5.00	11.00	2.00	7.04	13.51	0.56
	Vegetable	13.00	17.00	7.00	4.63	6.64	0.01*
Domestic (kg/hh/year)	Cattle beef	13.00	17.00	7.00	8.10	11.41	-
	Fish	13.00	12.00	7.00	3.95	6.04	0.28
	Pork	13.00	17.00	7.00	5.28	7.95	0.41
	Poultry	13.00	13.00	7.00	6.71	9.18	0.62

Value are means or back-transformed from the means for log-transformed data unless mentioned otherwise

*P-value of ANOVA for difference between mean values

Table 6. Shannon-Wiener diversity index for wild crops, wildlife, insect and aquatic of the three ethnic groups

Type	Variables	Hmong	Khmu	Lao Loum	95% Confidence Interval of the difference		p-value*
Shannon-Wiener diversity index		1.36	1.33	1.36	0.96	1.42	0.96
Insect (kg/hh/year)	Honey	3.00	3.00	2.00	4.10	9.64	0.84
	Insect	3.00	4.00	4.00	2.06	4.02	0.01*
Aquatic (kg/hh/year)	Eels	1.00	1.00	1.00	1.96	7.96	-
	Fish	11.00	14.00	7.00	8.82	13.67	0.53
	Frog	3.00	8.00	5.00	5.28	8.21	0.47
	Snail	3.00	3.00	2.00	3.40	7.59	0.96
Wild crops (kg/hh/year)	Bamboo shoots	12.00	17.00	6.00	38.26	70.64	0.63
	Wild fruit	7.00	7.00	2.00	3.14	9.68	0.15
	Mushroom	10.00	16.00	6.00	3.36	5.07	0.45
	Wild vegetable	13.00	17.00	6.00	16.23	23.60	0.65
	Young rattans	10.00	10.00	4.00	2.46	5.11	0.81
Wildlife (kg/hh/year)	Barking deer	2.00	3.00	6.00	2.92	8.17	0.26
	Rats	1.00	6.00	2.00	5.64	21.60	0.53
	Wild fowl	9.00	9.00	7.00	4.72	8.23	0.19
	Jungle birds	3.00	4.00	3.00	2.39	5.80	0.60
	Squires	4.00	5.00	3.00	4.07	6.92	0.82

Value are means or back-transformed from the means for log-transformed data unless mentioned otherwise

*P-value of ANOVA for difference between mean values

3.5 Income sources

The three ethnic groups earned income from two sources; domestic products and wild products. In this study, Lao Loum per capita income from cultivated crops and domestic livestock is of 1,354 USD/capita, higher than Hmong (743 USD) and Khmu (722 USD) respectively (Table7) The GDP data of World Bank reported of per capita income was about 708 USD (15). The Khmu and Lao Loum earned more from domestic livestock than from cultivated crops. While, Hmong income from cultivated crops is greater than from domestic livestock. The village ethnic groups vary in their motivation and capacity to improve livestock production as well as preferences for keeping particular livestock (16). The main income from domestic livestock comes from pig raising by Khmu, cattle raising by Hmong and Lao Loum. The main source of income from cultivated crops come from maize (field corn) production by Hmong (Table7). Most of the maize production area is located in the northern part of the country in the mid hills, such as LuangPrabang, XiengKhuang, Oudomxay, Phongsaly, Hauphanh, Sayabouly and Bokeo covering 57% of the total maize area. Maize production is more popular with the Hmong people in the northern Lao PDR (17).

Regarding income earned from selling wild products, Hmong earned an average annual gross income of 1,130 USD/hh, higher than Lao Loum (824 USD/hh) and Khmu (633 USD/hh) (Table7). For all three ethnic groups, income come from wildlife was higher than income from selling wild plants. The main sources of income from selling wildlife are: barking deer meat for Hmong, fish and other aquatic animals (fish, snails and eels) for both Lao Loum and Khmu (Table7). Villagers collected non-timber forest product for sale to generate income to purchase rice, especially the villagers who produced insufficient rice for annual consumption (8).

Results of the present study also concord with previous research that concluded the products traded to earn household income mainly come from non-timber forest product in Ngoi district of Luang Prabang province in northern Laos (18). This finding is similar as in Thailand, where for community living nearby Sirikit dam at Uttaradit, 15 vegetable plants were most commonly utilized for food and traded to earn extra household income (19).

Table 7. Gross income per household and per capita income of three ethnic groups come from cultivated crops and domestic livestocks in NamChat village

Income sources	Ethnic group		
	Khmu	**Hmong**	**Lao Loum**
Cultivated crops (U$/hh/year)	**928.33**	**3,296.39**	**417.85**
1. Vegetables	14.1	35.2	19.6
2. Chili	27.7	6.8	312.5
3. Pumpkin	6.8	10.2	25.0
4. Corn	879.8	77.5	60.7
5. Maize	-	3,166.7	-
Domestic Livestock (U$/hh/year)	**2,932.1**	**1,161.4**	**7,704.5**
1. Cattle	357.1	728.7	6,843.2
2. Poultry (chicken and duck)	231.3	38.5	459.0
3. Pig	2,343.8	144.2	402.3
4. Fish	-	250.0	-
Total gross income (U$/hh/year)	**3,860.5**	**4,457.8**	**8,122.4**
Per capita income (U$D)	**772.1**	**743.0**	**1,353.7**

Table 8. Gross income per household and per capita income of three ethnic groups comes from wild plants and wildlife in NamChat village

Income sources	Ethnic group		
	Khmu	**Hmong**	**Lao Loum**
Wild crops (U$/hh/year)	158.80	94.50	101.70
1. Vegetables	22.1	65.4	32.1
2. Bamboo	119.9	10.4	69.6
3. Rattan	15.6	8.3	-
4. Mushroom	1.2	10.4	-
Wildlife (U$/hh/year)	504.3	1,035.6	722.4
1. Fowls	66.7	95.5	25.0
2. Jungle Fowls	-	-	40.0
3. Rats	30.0	-	-
4. Barking deer	-	750.0	122.9
5. Frog	41.7	-	30.0
6. fish	118.8	190.1	504.5
7. Aquatic plants (Freshwater algae)	247.1	-	-
Total gross income (U$/hh/year)	663.1	1,130.1	824.1
Per capita income (U$D)	132.6	188.4	137.4

4. Conclusion

In general, food consumed by interviewed households was obtained from various kinds of cultivated crops and domestic livestock, as well as wild plants and wildlife. Hmong and Khmu consumed wild plants in greater quantities than cultivated crops, while Lao Loum consumed cultivated crops in higher proportion than wild plants. All three ethnic groups consumed wild meat in greater amount than domestic animals meat. With respect to the Shannon-Weiner diversity index which described diversity, Lao Loum produced slightly higher number of plant and animal species by farm than those of Hmong and Khmu. In the present study, rice is the main staple food crops for the villagers of three ethnic groups; Khmu, Hmong and Lao Loum. Hmong and Khmu produced insufficient rice for household consumption with approximately 30% of the total households in the village facing rice shortage. Only Lao Loum household were able to produce adequate rice for household consumption. Regarding cash income, villagers earned income from sale of domestic crops and livestock products, as well as wild plants and wild animal. Lao Loum earned a higher annual gross income than Hmong and Khmu. Income was mainly from domestic livestock rather than cultivated crops. Income from selling non-timber forest product (NTFP's) was higher in Hmong households than in Lao Loum and Khmu households. In general, NTFP's still play an important role for food consumption and household income of three ethnic groups. This study also suggested that the ethnic group whose practice shifting cultivation in the northern Lao PDR still heavily depending on NTFPs. Therefore, Lao PDR government policy should be play an important role maintain community forest or forest product and forest conservation area, to province goods and to services ecosystem for long term stability.

References

(1) Keoboualapha B, Philavanh and N. Jintrawet A. Intensifying upland rice systems with Stick lac Production in Northern Lao PDR. 2010. Multiple Cropping Center (MCC), Chiang Mai University (CMU), Thailand.

(2) Roder W. Slash-and-burn rice systems in the hills of northern Lao PDR: description, challenges, and opportunities. Int. Rice Res. Inst. 2001. 201p.

(3) NSC. Agricultural censen 2010-2011. National Statistic Center, Vientaine, Lao PDR. 2012.

(4) Stuart FOX M. Laos – Politics, economics and society. Frances Pinter, London. 1986.

(5) Phengsavanh P. Forage Legumes as feed for pigs in smallholder production systems in the North of Lao PDR. Ph.D. Thesis, The Swedish University of Agricultural Sciences, Uppsala. 2013. 65p.

(6) Thongmanivong S. and Fujita Y. Recent land use and livelihood transitions in northern Laos. Mountain Research and Development. 2006. 26: 237-244.

(7) Krejcie, RV and Morgan DW. Determining sample size for research activities. Educational and Psychological Measurement. 1970.3: 607-610.

(8) Beebe J. Rapid appraisal: The evolutoin of the concept and the definition of issues. Proceeding of the 1985 International conference on Rapid Rural Appraisal, Khon Kaen University. 1987:47-65.

(9) NSC. Agricultural census 1988-1999. National Statistic C enter, Vientaine, Lao PDR.2000.

(10) Yasuyuki K, Badenoch N, Shinsuke T, Douangsavanh L and Kenichi N. Agency, opportunity and risk: Climercialization and human-natural relationships in Laos. Southeast Asian Studies.2010.47 (4); 365-478.

(11) Keoboualapha B, Simarak S, Jintrawet A, Onpraphai T and Polthanee A.2013. Farmers's perception of Imperata cylindrica infestation in a slash-and-burn cultivation area of Nothern Lao PDR. Southeast Asian Studies. 2013.2(3): 583-598..

(12) NAFRI, NAFES, NUOL. Improving livelihoods in the upland of the Lao PDR, Volume1: Initiatives and approaches, National Agriculture and Forestry Research Institute, Vientiane, Lao PDR. 2005:264p.

(13) Kent M, Cocker P 1992. Vegetation Description and Analysis: A Practical Approach. London: Belhaven Press.

(14) Douangsavanh L. Food security of shifting cultivation systems: case studies from Luang prabang and Oudomxay Province, Lao PDR. Journal of Mountain Science. 2006. 3 (1) : 48-57.

(15) Trading economics. 2015. Laos GDP per capita. Available: http://www.tradingeconimics.com/laos/gdp-per-capita. Accessed Jul.29,2015.

(16) Millar J, Sengdala B and Stelling A. The role of livestock in changing upland livelihoods in northern Lao PDR: Facilitating farmer learning according to ethnicity and gender. Journal of Mekong Societies. 2011. 7 (1): 55-76.

(17) Douangsavanh L, Bouahom B and Pouyavong K. Enhancing sustainable development of diverse agriculture in Lao PDR. UNESCAP-CAPSA Working Paper Series. 2005. 89 : 54p.

(18) Satoshi Y. The trading of a gro-forest products and comodities in the northern mountainous region of Laos. Southeast Asian Studies. 2010. 47 (4): 374-402.

(19) Satean S, Wattanasap N and Premprasit S. Community utilization of plants in Sirikit Dam. Jounal of Community Development Research. 2012. 5(1): 74-80. (in Thai with english abstract).