

CHAPTER 4

RESULTS OF FIELD SURVEY

4.1 Physical environment of the study site

4.1.1 Location and topography

Oudomxay province is the 9th largest province in the Lao PDR (Figure 1), with an area of 15,370 square kilometers. The province lies within latitudes 21° 15' N and 20° 30' N, and is at the center of northern agricultural region of country. Mountainous terrain covers about 85 % of the area, with an altitude range of 300 to 1,850 m above sea level. The population of the province in 2000 was 240,000 people comprising representatives of three different ethnic groups (Lao loun, Lao theung and Hmong). The province is divided into seven districts and has a total of 776 Villages.

The study area of 'Namkha' is located the southwest of the province, about 113 southwest of the main provincial town of Oudomxay. The study area shares borders with Ban Navang to the north, Ban Nammoui to the southwest, Ban Namterk to the south, and Ban Namnoy and Ban Nammiang to the east. The Namkha area covers about 10,000 ha divided among 14 villages, which, in 2001 had a combined population of 7,727 people. The Nam Beng river runs through the western part of Namkha area. The altitude of the area ranges from 430 to 1,500 m above sea level, (Figure 6).

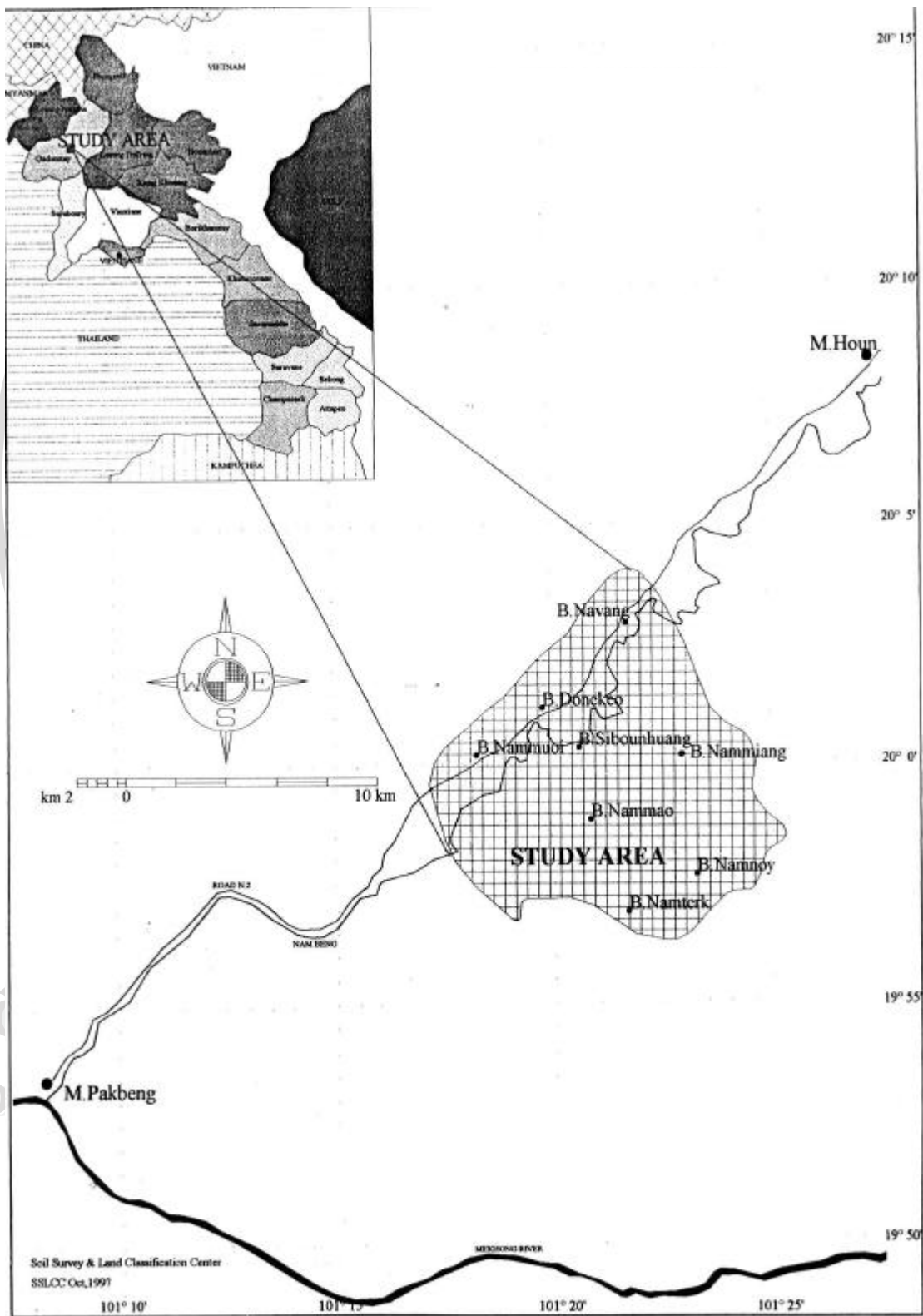


Figure 6. Location of the study area.

4.1.2 General climatic conditions

As precise meteorological data relating specifically to the Namkha area is unavailable, the meteorological information used to describe the area came from the nearby official weather station in the provincial town of Oudomxay. The climate of the area can be described as ‘a wet-dry monsoonal tropical climate’ based on the Koppen type classification.

The mean monthly temperature ranges between about 28.2 °C for April and 17.8 °C for November. Annual rainfall is about 1,360 mm. The monsoon climate of the Namkha area is characterized by a distinct rainy season, with peak precipitation in the months of July, August and September (Figure 7). The cool-dry season prevails in the period November to February, with a hot-dry season in the months March to May. Relative humidity varies throughout the year. The mean RH is about 77 % but it is highest between June and August when it ranges between 80.2 to 83.7 %. And an average sunshine is 4.4 hours day⁻¹, in difference between the longest of sunlight radiation at the dry season on March to May of 5.6 to 5.5 hours per day. For shortest of sunlight radiation on June to August of rainy season at 3.2 to 3.4 hours day⁻¹.

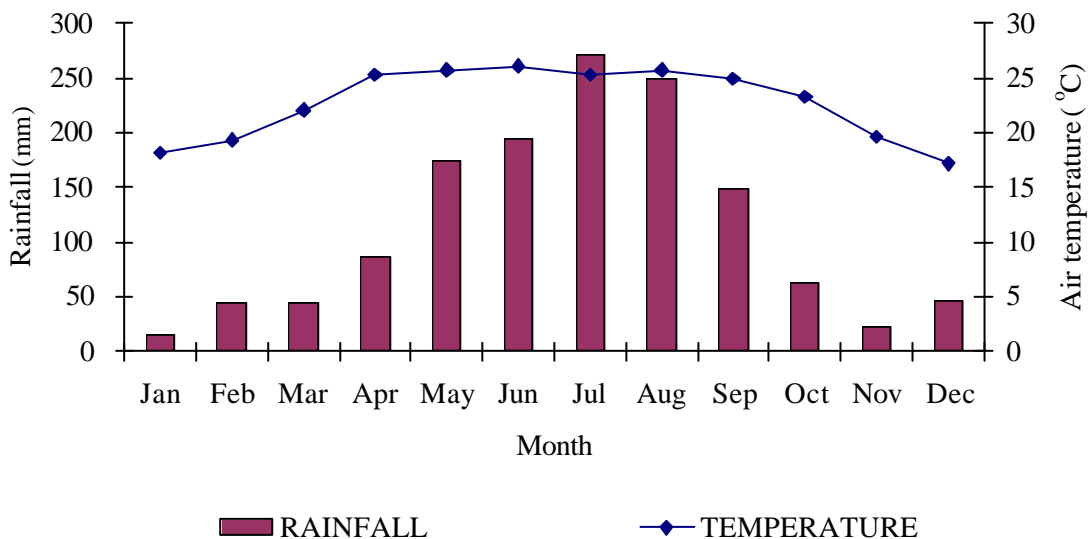


Figure 7. The mean of rainfall and air temperature.

Source: Oudomxay meteorological station in 2002, data from 10 years 1991-2000.

4.2 Soil characteristics

Seven major soils groups are recognized in the four major forms of land use found in the study area (Table 2). The soil groups found are Leptosols, Regosols, Cambisols, Acrisols, Alisols, Lixisols and Luvisols (SSLCC, 1997). The major forms of land use are (i) temporarily unstocked forest; (ii) mixed deciduous forest; (iii) upland shifting cultivation and (iv) rice paddies. Some areas have been affected by soils erosion associated with intensive shifting cultivation practices.

Table 2. Some soil chemical characteristics in different forms of land use.

Land use	pH		OM (%)		N (%)	
	Mean	SD	Mean	SD	Mean	SD
Temporarily unstocked forest	6.46	0.94	2.09	1.33	0.13	0.08
Mixed deciduous forest	6.30	0.97	3.85	2.20	0.23	0.13
Shifting cultivation	6.32	1.04	2.65	1.47	0.15	0.07
Rice paddy	7.20	0.92	1.81	1.12	0.10	0.06
Land use	P ₂ O ₅ (%)		K ₂ O (%)		Available-P	
	Mean	SD	Mean	SD	Mean	SD
Temporarily unstocked forest	0.06	0.04	1.47	7.33	16.87	39.87
Mixed deciduous forest	0.11	0.05	0.85	0.41	12.60	21.52
Shifting cultivation	0.06	0.02	0.66	0.38	5.24	4.33
Rice paddy	0.05	0.03	0.01	0.37	5.82	3.49

Source: SSLCC, 1997.

Most of the soils are medium to heavy textured with a high clay content which gradually increase with depth to as much as 30-50 %, with a topsoil clay content in the range 25-40 %. Sandy surface horizons are only locally present in soil, which have quit high percent of coarse sand throughout the profile. The soils in the valley floors, floodplains and terraces, generally have more favorable textural characteristics than the upland soils; they are also generally graveled free and have higher clay and silt contents.

The soil structure is generally strongly developed and highly compacted on the rolling topography that prevails. The compactness of the soil makes both water and root penetration difficult. The combination of compact soils and steep slopes also makes the soils highly susceptible to erosion, particularly in areas without any forest cover.

The topsoil organic carbon levels in most soil are high (4 to 5 %), except in areas of steep land or areas under slash-and-burn agriculture, where the levels vary and are generally in the range of 2 to 3 %. Nitrogen levels are also correspondingly high, in the range 0.2 to 0.3 %, with the C/N ratio in the range from 10 to 15. However, mostly of C/N ratio were about 13.

Soil reaction of some upland soils (Lixisols) and Alisols) in the study area is strongly acid, with a pH below 5.5. Both the lowland and upland soil, particularly those of flood plain, the pH is quite favorable for crops (pH = 6.5-7.0). But most of soil have a pH of 7.0-8.0, are classified as neutral to slightly alkaline due to soil containing of high cation elements, especially those developed from alluvial deposit parent material. In general, the nutrient status of most soils in the study area is classified as medium to high. The moderately weathered floodplain soils have a relatively high nutrient status. However, in areas of upland soils which erosion has been severe, soil reaction is more acid, limiting the levels of available phosphorus.

4.3 Land use in the study area

Oudomxay province has the total area of 15,370 square kilometers; of which only 24.8% is used for agricultural production (MAF, 2000). The average land area per household used for agricultural production is 1.72 ha per household.

Of the approximate 10,000 ha in the Namkha study area, 1,334 ha is used for agricultural production (0.17 ha per capita or 1.72 ha per household). The area covered by the study was 1334 ha, 13.3 % of the agriculture production land.

The results of land suitability classification clearly reflect the potential and constraints in land use in the study area (Table 3). Land was classified as a highest of

upland rice-based mixture cropping covered 41.2 % and 18.3 % for paddy rice of total area for cultivation land. The medium of marginally suited to cash crop cultivation covered an extent about 37.7 %, of those crops are maize, cassava, soybean, groundnut, pineapple, sesame, cotton and some vegetables etc. The following land utilization type is fruit trees plantation, (mango, tamarind, citrus and other vegetables) was covered an extent of 2.8 % of total area. The remained areas of total area are fallow lands, and unsuitable for cropping thus it is recommended for forest conservation and /or forest plantation.

In the three villages covered by the study (Ban Donkaew, Ban Houayhai and Ban Donthat), the total area of cultivated land was 550 ha, of total area of cultivation land in studied area. The constituted paddy field 110 ha, upland rice cropping 120 ha, maize cultivated area of 308 ha and 12 ha for soybean. Average cultivation land used of holding approximated of 1.84 ha per household, the holding in forty-five households were different in each groups of different in target villages, total area of land holding approximately of 1.43 to 2.27 ha per household in 2001.

Table 3. Distribution of cultivated land use in Namkha area, (hectare per household).

Indicator	Donkaew		Huayhai		Donthat		Average
	Mean	SD	Mean	SD	Mean	SD	
Lowland rice	0.45	0.37	0.13	0.21	0.20	0.26	0.26
Upland rice	0.57	0.30	0.51	0.30	0.59	0.40	0.56
Maize	1.25	1.08	0.58	0.35	0.92	0.92	0.92
Soybean	0.00	0.00	0.23	0.08	0.11	0.12	0.11
Total areas	2.27	1.15	1.43	0.93	1.82	1.86	1.84

Source: Field survey, 2002.

A particularly village transect survey was conducted for recording the existing land use patterns in target area. Four different land use patterns were identified, being paddy rice, mixed deciduous forest, ray/shifting cultivation and temporarily unstocked forest. Most of land areas in three villages are planted rice crops contributed of 41.8% of total cultivated areas. In many last year farmers in this region had only rainfed

upland rice base-cropping with single crop a year. Most of farmers were rice cultivated for consumption in their household around year. The goal of growing rice was mainly for rice-self sufficient in the region. However, rice production in this region, especially for rainfed upland rice environment that, the government tries reducing and to cut down until to stop. Therefore, the rice production areas have been declined. Rice is an important crop in this region; the following crops after rice are maize, mungbean, soybean, peanut, sweet potato, vegetables and some cash crops etc. The result of cultivated land use for some crops in three villages target group for farm field survey in Namkha area, Houn district, Oudomxay province, Laos.

4.4 Farm household, farm size in studied site

The three target village namely: Donkaew, Houyhia, and Donthat have a total population of 2199 people. Among them, 107 are male, occupying 48.7 %, and other 1128 are female. The labor resource, because there is relatively high of young people in the population in Namkha area, the labor resource of this area is in relative shortage. In the three villages, there are about 944 labor forces, only 42.9 % of the total people.

The results of household interviewed and recorded of data from forty-five of farm house hold and farm size that is an average family member of 8.15 people, among them 3.51 are male and also 4.64 are female per family. In term of villages' ages, 45.27 of them are under 15 years old, 27.0 % of them are 16-30 years old, 17.67 of them are 30-60 years old and 10.1 % of them are over 60 years old. On average labor force in family about 2.4 labor forces per family and more due to backwardness of education, and the occurrence of epidemic diseases, the quality of labor forces is low. It can directly influence the economic development and the augmentation of the living standards of villagers in the area. The relationships for mean of farm household and farm size in three villages were showed in table 4.

Table 4. The mean of farm household and farm size in three villages in target group.

Indicators	Unit	Donkhaew		Huayhia		Donthat		Average
		Mean	SD	Mean	SD	Mean	SD	
Family member	(person)	8.27	2.46	7.47	2.97	8.73	3.89	8.15
Male	(person)	3.40	1.06	3.27	1.28	3.87	1.68	3.51
Female	(person)	4.87	1.51	4.20	1.74	4.86	2.21	4.64
Age:								
1-15 years old	(person)	2.93	1.22	3.94	2.31	4.20	2.31	3.69
16-30 years old	(person)	2.27	0.46	1.93	1.53	2.40	1.80	2.20
30-60 years old	(person)	1.40	1.18	1.40	0.91	1.53	0.83	1.44
Over 60 year old	(person)	1.67	0.90	0.20	0.41	0.60	0.83	0.82
Labor in a family	(labor)	2.87	1.06	2.73	0.88	2.80	1.61	2.40
Total land holding	(ha)	2.27	1.15	1.43	0.93	1.82	1.86	1.84

Source: Field survey, 2002.

Most of the farmers are land holding the small farmer size, the highest of land holding was 2.27 ha in Donkaew Village, the lowest was 1.43 ha for Huayhia village and 1.82 ha for Donthat village. However, there can be found the larger farm size in this area where have being possesses less than 2 ha of farm size. Most of their farm operations are still relied on there on their owner farm and can be usefully with their farms for crop cultivation.

4.5 Cropping systems and cropping patterns

The rural economic of the Namkha area is a typical subsistence oriented agro-economy which takes crop cultivation as its major part. However, because of the limitation of locality and lack of market, the cultivation of the area is still in a backward stage. Paddy rice, upland rice based mixture cropping, maize, some cash crops and vegetables are the major crops in this area. There are not perennial economic crops. The land use pattern differs among the villages located in different altitudes and different of sloping land. There are floodplain land at 0-2 % for lowland rice, these terraces have slops range from 2-8 %, undulating to rolling terrace and foot

slopes area range from 816 %, for some cash crops and 16-35 % or higher than 35 % upland for mixed deciduous forest and slash-and-burn agriculture production, most of crop growing that for their consumption in their family and some surplus for sale.

In generally, cropping practices on the farm of farmers in this region is existing cropping pattern on the upland cropping systems were presented in figure 8.

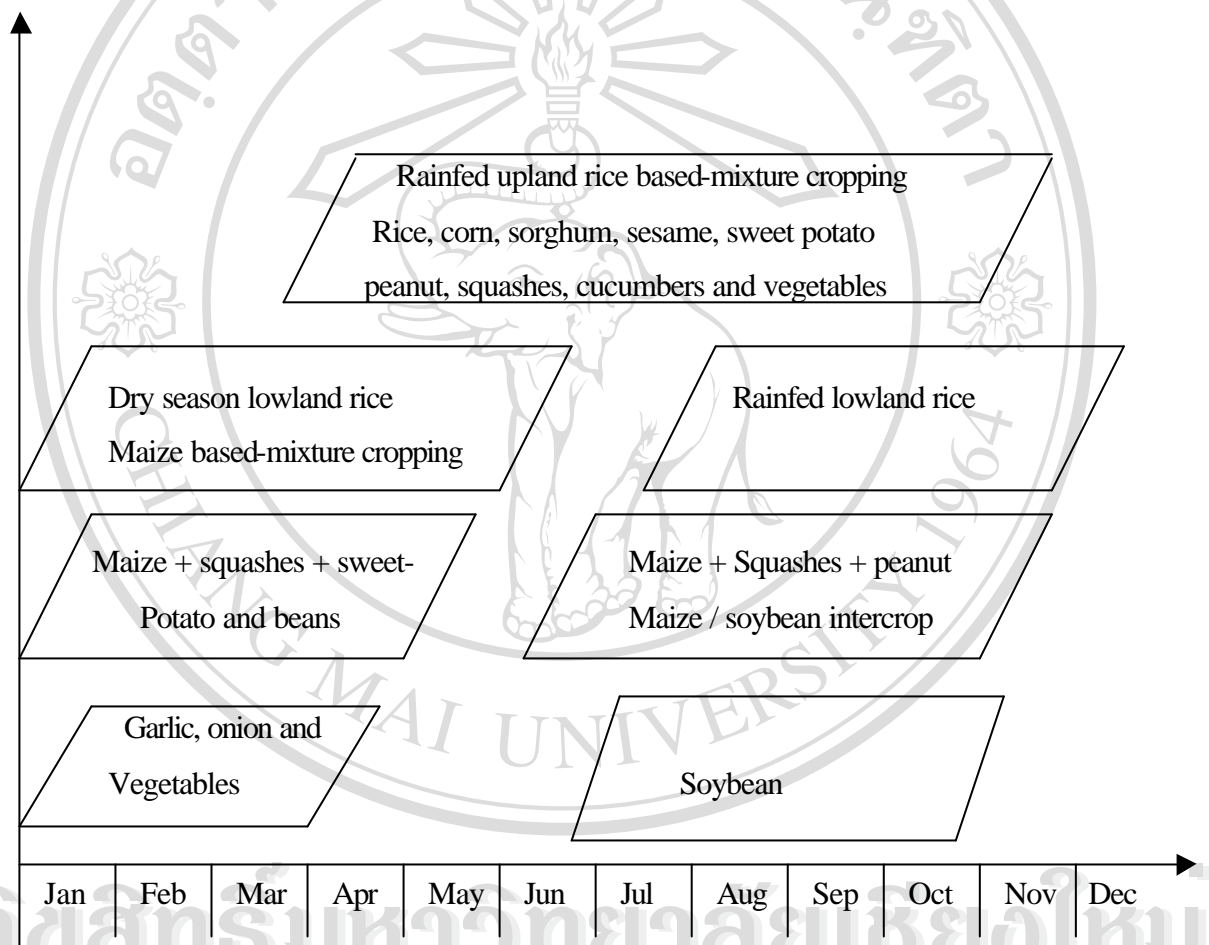


Figure 8. Some cropping pattern in Namkha area.

Source: Field survey in 2002.

Most of crops on farm practices were mixture on the rainfed upland rice base-cropping system; there were rice/ corn, sorghum, sesame, cotton, sweet potato peanut, squashes, cucumbers and vegetables. Particularly, maize based mixture cropping such as maize-squashes-cucumbers-sweet potato, and peanut. For intercropping such as

upland rice based/ maize, rice/ soybean, maize/ peanut, intercrops. In the studied area, soybean was very smallest area in intercrop with upland rice and soybean. Generally, soybean had grown after upland rice released to fallow land (upland rice-fallow-soybean). Most paddy rice is only single crop, had last few years farmers just started grown rice in dry season because, not irrigation, after rice farmers have been grown vegetables.

Most of cropping pattern in this area was only grown one crop in year of rainy season, just only some farmers had grown some crops in the dry season such as maize crop. If comparing the yield crop of maize are growing in the plain land that area are nearly Nam Beng river was higher than sloping land about 15 to 20 %, for soybean had only grown on the upland areas following with upland rice and maize.

4.6 Weed management in study area

4.6.1 The response of weed management for maize and soybean in the study site

The majority of the respondents listed weeds are important constraints in maize and soybean production in rainfed upland mixture cropping system in studied area. Weeding is required the work peak for the labor force use a higher than another activities. Farmers, generally provide adequate weed control and weeds are thus not a yield constraint but rather a constraint to labor productivity.

Farmers in Namkha area were poor technology for weed control on their farm. Weeding is required the work peak for the labor force, and higher than another activities. Currently, weed control practices had only handed weeding on their farms and using traditional implements such as spade, small draw-hoe, and sickle. Some majorities of weeds largess amount of weed species are *Ageratum conyzoides* L, *Chromolaena odorata* (L), *Cyperus rotundus* L, *Murdannia nudiflora* (L.) Brenan, *Amaranthus spinosus*, *Eluesine indica* (L.) Gaertn L, etc.

In the duration of maize planting in rainy season, the weeds were growth increased, in this case farmers will be to weeding about 1-2 times per one season for land preparation in flood plain lands and 2-3 times for sloping lands and 1-2 times

for soybean. Farmers in this area never to application herbicides they had only hand weeding and farmers required highly the labor force on the July and August for weeding. Because, crops are not normally planted in rows, weeding is a time consuming task, taking up to 88 labor days ha^{-1} for maize and 65 labor days ha^{-1} for soybean in 2001, (Field survey, 2002).

4.6.2 Labor use for weed management in the study site

The result of interview and discussed with difference of farm practiced and farmers labor input for each process of maize and soybean cultivation. In the forty-five households of target group selected from three villages, there are about 197 labor force, only occupying 35.3 % of full-time farm workers, and 16.5 % sometime farm workers the total population. In generally, labor use was required for crops cultivation practices. Mostly, farmers have labor exchange for each process activities on farm practices. All family labor force are used on farm activities practices, the total of labor input in many activities in maize of 232 labor days ha^{-1} and 207 labor days ha^{-1} for soybean, but weeding activities was used labor higher than other activities that was covered 37.9% for maize and 31.1 % for soybean. Labor use in each process of maize and soybean cultivation in Namkha area showed that in figure 9.

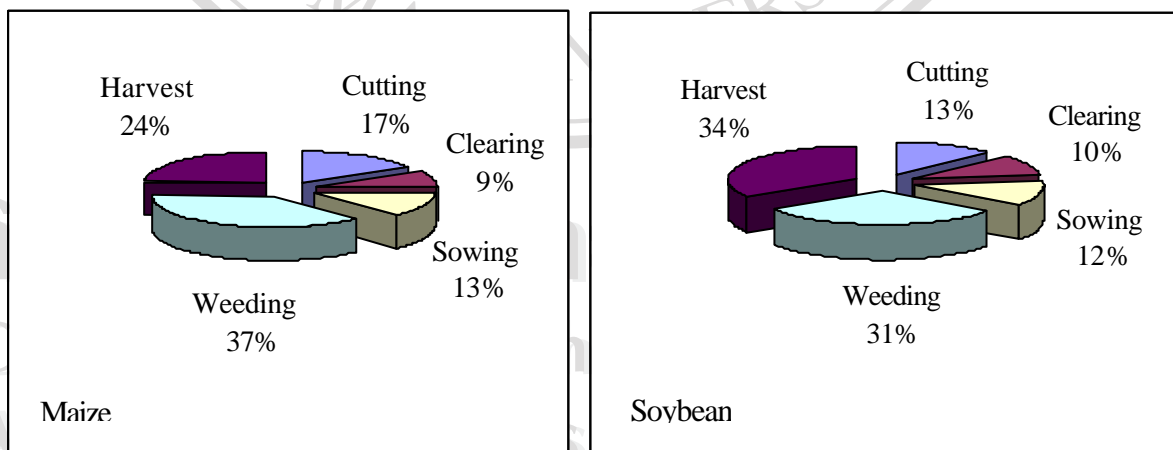


Figure 9. The labor disposition in each process of maize and soybean cultivation

in Namhha area in 2001..Source: Result from field survey, 2002.

4.7 The limitation and some constraints for weed control in maize and soybean

According to the results of household interview and discussion which different groups of farmers represented and villager communities in maize and soybean cultivation in studies area. Many limitations and constraints are discussed with an order in term of importance according to farmer's opinion.

All family labor force are using in the farms practice, weeding was a single of worked with others activities on crop-cultivation. Farmers had not enough labor force in their family to farm practices. Most of labors used for weeding were old people and young children. Farmers in this region never application chemical or herbicides, lack of technique knowledge, poor production tools, and non-herbicides available in location. In during of maize and soybean cultivation was in rainy-season environment, that reasons lead to weed growth very fast. Some time rainy very heavy, farmer cannot weeding, if weeding the weeds were not death, and some time the hot weather makes the people tired. All most of weeding period as same time, not enough labor available in their family and not labor for hire.

The majority of limitation and some constraint discussion in above that relatively to reduction crop yield, needs increase capital investment, labor costs, and final relatively to decrease household income. In term of weed control in Oudomxay, Lao PDR was related with internal input, labor cost, social and economics. Some other socioeconomic constraints common to traditional small-scale producers are scarce land, expensive and relatively limited capital, low technical capabilities as a result to limited education, lack of economies of scale, uncertain markets and high risk from weather, insects, diseases, others.

4.8 Cultural practices in maize and soybean cultivation

4.8.1 Maize cultivation

Maize is important crop cultivation in the Namkha area; totally, about 308 ha of maize were cultivated for 3 villages in year 2001. Land uses for maize cultivated, with an average nearly of 1 ha per family (range from 0.2-2.0 ha). Farmers in this area

can identify two sites of maize cultivation such as in the bank of the Nam Beng river (0-2 %) for flood plain areas. The second site is a slopping land such as a low slope plot is from 28 %, a moderate slope is from 8-16 %, and high slope is from 16-30 %. They have only one time a year in rainy season, that site is on the slope hill and terrace area and they use area for 3-4 years then released to fallow for rotation.

Fallow land is very shortest just only 2-3 years rotation of fallow land. If the shortest of fallow land that is resulted to the requirement to labor use for weeding, soil fertility is reduced and have soil erosion nearly high.

The growing season of maize crop planting in this studies area, before upland rice at the of April to May for rainy season, and at the end of September to October for dry season, and harvest be for Lao water festival.

Yield is available according to agronomic and climatic condition, average of maize yield in this area average about 3.5 to 4 tons ha^{-1} , (range from 2.5 - 6 tons ha^{-1}), Yield depends on soil texture, soil nutrients content depends on the fallow period, slope land, and weed control. In the flood plain land was high yield than slope land and some plot had land preparation was higher than non-land preparation.

Varieties of maize cultivation in this area just for few varieties, one of them are modern variety from Vietnam (LVN 10) and two of them are traditional. One of them is Hmong variety that it for animal feed and for sale and last one is generally grows for consumed in the household.

4.8.2 Soybean cultivation

Soybean was the second cash crop in Namkha area with very small area of land unit in this site with a total area of 12 ha, for two of three target villages in 2001. Each family has 0.1-0.2 ha, (soybean seeds about 3-5 kg per family) in average accounting for 6-8 % of their arable land. They grow soybean on upland rice area but different plot, so soybean can be grown with follow the upland rice every years and another hand soybean can be grown rotation with upland rice (the year after). Mostly, soybean grows on fallow land after upland rice cropping. The area for cultivated land

use on the slope land range from about 816 % or higher than of slopes land and some family grown mixture with maize cropland. In which of those is small area of soybean that independent upon land availability but depend on the market, farmer cannot sale their product.

The growing season of soybean, farmers had grown after second timing of weeding in upland rice and/or maize cropped (at the end of July to August), but harvest before upland rice and maize crop.

Soybean yield in this area was not high like another area, with an average yields between of 0.8 to 1.0 tons ha⁻¹. Soybean variety in this area only one of soybean was found. It was a traditional variety (Hmong variety).

4.9 Some constraints of maize and soybean to producers

According to the results of structure and unstructured household interview, discussion with different farmers, villagers represented of target groups. The main constraints to maize and soybean cultivation in studied area are presented (Figure 10). Arrange with an order in term of the majority of constraint respondents, according to the personal interview opinion. The major constraints of maize and soybean to growers were investigated with two aspects as bio-physical and socio-economical factors.

The majority of the respondents listed weed as the most important constraint to maize and soybean cultivation. Farmers generally provide adequate weed control and weeds are thus not yield constraint but rather a constraint to labor productivity.

Weed control is by far the most labor-consuming task in maize and soybean production.

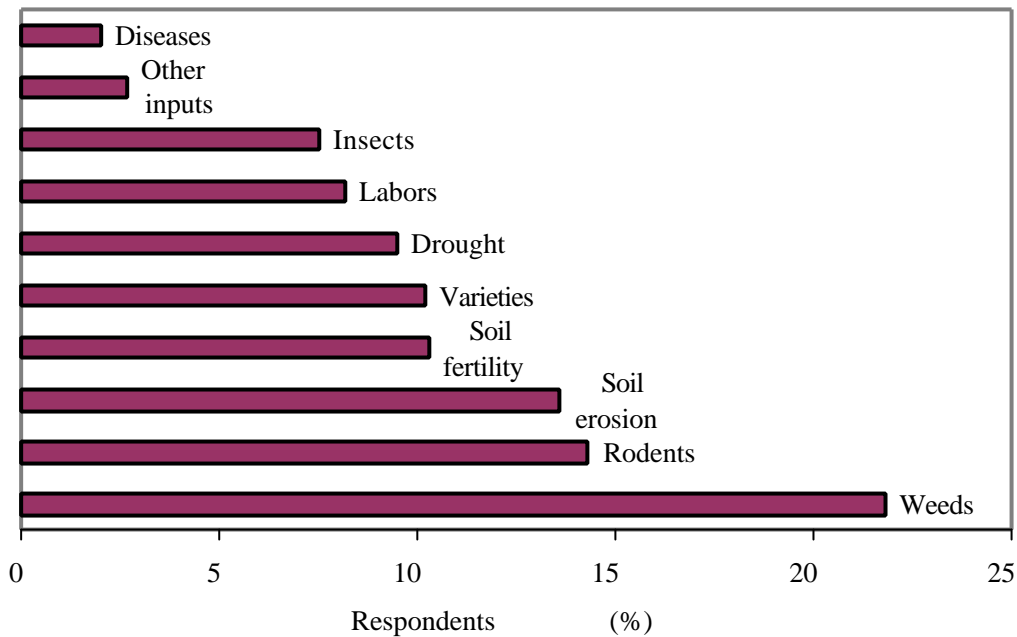


Figure 10. The major constraints of cropping pattern in Namkha area.

Source: Field survey, 2002.

Insect pests and rodents are other constraints to maize and soybean cultivation. Soil fertility, soil erosion, weather, and suitable cultivars have also been majored of constrains to reduced crop yield.

Most of farmers in studied area are poor technique knowledge, lack of production tools, lack of transportation tools, non marketing, and low price. The marketing oriented is dependent upon foreign countries such as Thailand, China, and Vietnam. Notwithstanding the production technique in this area is very extensive, no one mention that the lack of technique knowledge was constraint obstructing the development of agriculture.

4.10 Economic return for labor use in some cropping pattern in study site

The result of rural economy of Namkha area is a typical subsistence-oriented agro-economy, which takes crop cultivation as its major part. The major of some cropping patterns as lowland, upland rice base-mixed cropping, cash crops such as maize and soybean.

Gross margin over variable costs of some cropping in studies area as present (Table 5). Economic values of some cropping pattern by Kip per hectare and Kip per labor day per day on the field survey showed that each cropping pattern gave a gross margin, which depend on natural and social condition in this region. Analysis of economic efficiency is a final necessary process for assessment production of outputs and investment efficient in farming production systems in the region.

Table 5. Net income of some cropping patterns, (* 1,000 Kip ha⁻¹, and *1,000 Kip Ld⁻¹ day⁻¹).

Cropping patterns	Total Revenue	Total Variable Costs	Gross Margin ha ⁻¹	GrossMargin Ld ⁻¹ day ⁻¹
Lowland rice	2137.5	200.5	1937.0	8.34
Upland rice	1175.5	355.0	822.5	2.23
Maize	2275.0	325.0	1950.0	8.41
Soybean	1600.0	150.0	1450.0	7.00

Source: Field survey, 2002.

Note: 1 US\$ = 10,000 Kip, (Ld = labor day)

Return over variable cost and gross margin of cropping pattern in the study site, showed that the maize, and lowland rice cropping pattern had highest gross margin, which are 1950.0 (* 1,000 ha⁻¹) for maize and 1937.0 (*1,000 ha⁻¹) for lowland rice respectively, and 1450.0 (* 1,000 ha⁻¹) for soybean. The lowest of gross margin that as upland rice, which as 822.5 (* 1,000 ha⁻¹). The highest of gross margin per labor days was indicated that, maize crop and lowland rice crop were of 8,410 and 8,340 Kip Ld⁻¹ day⁻¹, respectively. The medium of gross margin return of 7,000 Kip Ld⁻¹ day⁻¹ for soybean, and the lowest of gross margin was 2,230 Kip Ld⁻¹ day⁻¹ for labor used in the upland rice. However, the internal input costs in this area were not so high, because cropping pattern in the study site was used household within inputs and their family labor forces.

In the studied area, most of crop popularly to grow for cash crops was maize production. Because, it had market orientated, and price was higher by yearly. The average grain yield for maize was quite higher than other location, which as 3.5 to 6 tons ha⁻¹. The lowest of grain yield, which was a soybean crop about 0.8 to 1.0 tons ha⁻¹, was the lowest compared with other province or national. The rice production was an important crop in this region, but rice yield were lower than other locations, in upland rice yield of about 1.57 tons ha⁻¹ and low land rice in wet season as medium yield of 2.85 tons ha⁻¹. But hence as agricultural sustainable in the rural development area and household income in this region was very low. Because, there are many conditions related with agriculture production especially cropping systems in rainfed upland area environment included agro-ecosystem and socio-economics in situation. In additional of status for cropping pattern in this region that, it was a necessary to things about agricultural sustainable production systems in the rural development of Namkha area.