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Australian Centre for International Agricultural Research

SURVEY REPORT ON DEVELOPING POTENTIAL OF SOME CROPS ON MAIZE SYSTEM IN MOC CHAU AND MAI SON DISTRICTS OF SON LA

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Hà Nội, August 2012

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The team is grateful to the Department of Agriculture and Rural Development in Moc Chau and Mai Son districts for their assistance during survey time.

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CHAPTER 1

INTRODUCTION

1.1 Background

The North West Highlands region is among the poorest regions in Vietnam. According to the Vietnamese General Statistics Office (GSO), the regional poverty ratio in 2011 was about 26, 7 percent. Son La is a province of the North West, ranked as the 6th poor province with the average poverty rate of 34.8 percent (GSO, 2011).

Agricultural activities are the main economic source of the region, in which crops production plays a vital role. As in case of Son La, maize is not only the most planted crop but also become high value exchange commodities. Unfortunately, maize is commonly planted from April to September.and the rest of the year, the farm land is fallowed. This indicates that land resource has not utilized effectively.

In order to improve land use efficiency and increase income for farmers, this study will explore the potential for development of the second crop in Moc Chau and Mai Son districts, Son La province. Pumpkin, rice bean, soybean and mung bean are selected crops.

1.2 Objective

The research aim is to determine the market potential of crops complementary to Upland Maize in North West Highland region of Vietnam (e.g. processing pumpkins, rice bean, soya bean and mung bean). The specific objectives of the research are the following:

(1) to outline the current state of production-marketing systems;

(2) to identify the market potential for the selected alternative crops;

(3) to examine opportunities exist to improve chain performance.

HUA team will concentrate on the first and second objective which is to identify production potential for the selected alternative crops and their market potential from perspectives of farmers.

1.3 Synopsis

The remainder of the paper comprises five sections. The background section in Section 2 presents a holistic picture of production of selected crops in Moc Chau and Mai Son. Current state of production system and household resources for production appear in Section 3. This

section also outlines the advantages and hindrances to agricultural production in general and selected crops in particular. Results from a study about production potential and market potential of selected crops in the North of Vietnam are outlined and discussed in Section 4 and 5 respectively. The final section reflects on the reviews and findings and draws some policy implications.

1.4 Methods

1.4.1 Primary data collection

+ Survey time

In order to collect primary data, a survey of HUA team has been conducted in Phieng Luong and Muong Sang communes in Moc Chau district and Na Ot and Chieng Chan communes in Mai Son district from12th – 20th, July, 2012.

- Survey in Phieng Luong from 13-14/07/2012;
- Survey in Muong Sang from 15-16/07/2012;
- Survey in Na Ot from 17-18/07/2012;
- Survey in Chieng Chan from 18-19/07/2012;
- In 12th and 20th working with leaders of Moc Chau and Mai Son districts.

+ Selection of households and local leaders

Surveyed households include farmers planting selected crops and farmers who grow other crops. It is expected that farmers growing selected crops will provide information about current conditions of production and product marketing system, their advantages and hindrances in producing and selling products and supports needed for future development. Working with those who do not grow selected crops, information related to some questions such as why they do not grow selected crops to increase their income, in what conditions they would grow will be explored.

Commune staff interviewed comprises people who are responsible for agricultural production in general (usually vice chairman), extension workers and land management. Data generated by interviewing commune staff is general information about production of targeted crops, factors influencing on production at a broad level and supports of commune for development of those products.

Similarly, district leaders interviewed include staff of Department of Agriculture and Rural Development, staff of Department of Resource and Environment, extension workers and staff of Department of Plant Protection. General information about social and economic situation of districts will be generated while working with them. In addition, a holistic picture about agricultural production of districts, their priorities crops and their supports for development of crops production, especially for 4 selected crops will also be drawn.

+ Data generation methods

- For households, a questionnaire has been designed based on research questions and farmers are interviewed based on the questionnaire. In the questionnaire, both opened and structured questions are used. Structured questions are utilized to explore information related to production costs and revenue and current state of production of household. Differently, opened questions are used to explore opinion of household about advantages and hindrances to production, their future production plan and supports needed if they want to expand production of selected crops.

- For local leaders, in the beginning stage, a questionnaire has been also designed for interviewing them. However, when HUA researchers pre-test the questionnaire, they recognize that generating data by interviewing based on a questionnaire is not as good as by in-depth interviewing by a guide line. It is explained that questions to draw out general conditions of communes and districts have unique answers and it will waste time if those questions are asked every staff. Moreover, each staff works on a very specific field and it would be better if information related to their field is explored deeply. Therefore, a guide line has been developed and used for in-depth interviews with district leaders and group discussion with commune staff.

+ Sample size for household includes

- 27 households in Phieng Luong commune, Moc Chau district;
- 29 households in Muong Sang commue, Moc Chau district;
- 27 household in Na Ot commune, Mai Son district;
- 28 household in Chieng Chan commune, Mai Son district.

1.4.2 Secondary data collection

General information about crops production, especially maize, pumpkin, rice bean, soybean and mung bean in two districts and Son La is collected from General Statistic Office of Son La and anual reports of districts. Social and economic condition of research communes and

general information about agricultural production of those communes is collected from anual reports of communes. Previous research studies are also referenced.

1.4.3 Processing data methods

The questionnaire for households includes both quantitative and qualitative questions. Almost qualitative questions are coded. Therefore, MS Excel and SPSS software are used for tabulating, processing and analyzing both qualitative and quantitative data collected from survey.

Descriptive statistics will be used to describe the production and product selling state in research sites.

Cost benefit analysis is used to determine if producing the second crops will increase income for households. Production costs include seeds, fertilizers, herbicide, pesticide, hired labors... Revalue is estimated from selling products. Return to household labors is equal to subtraction of production costs from revalue. Production costs, revalue and return to household labor are measured per 1 ha of crop production. Some targeted crops are competitive ones. This means they can be grown in the same soil and the same seasonality. Hence, comparison method is used to answer a question of which crops should be grown from economic point of view.

1.4.4 Indicators

* ***Indicators reflecting production capacity of households including*** land area, labor source (quantity and quality), capital (total capital, owned capital, borrowed money), and production tools

**** Indicators reflecting production costs, revenue and return to household labors:***

- Gross output (GO) $GO = \sum Qi * Pi$

Where: GO: Gross output

Qi : Amount of ith product

Pi : Selling price of ith product

- Intermediate Costs (IC)

- Added Value (VA)

$$VA = GO - IC$$

- Percentage of products sold = Amount of products sold/Total products produced

- Average selling price = Total revenue/Total products sold

- Total of potential revenue = Total produced products*average selling price

- Actual price of break even point = Total production costs/Total products sold

- Potential price of break even point = Total production costs/Total products produced

CHAPTER 2

BACKGROUND

2.1 Crops production in Moc Chau district

Moc Chau is a gateway district of Son La province, with an average height of about 1,050m above sea level and 206,150 ha area of land. Climate in Moc Chau is highly humid at about 85 percent. Its average temperature is from 24 - 28 degrees Celsius and average rainfall per year is around 1,650 mm (Extension Office of Moc Chau, 2012). High humidity and amount of rainfall negatively impact on agricultural production. Due to that condition, most local farmers can only produce one crop per year in dry season and post-harvest storage of products is difficult. Moc Chau can be divided into three different sub-climates. The first one is a region along Highway 6 with an average height of 1.050m above sea level. The second one is a region along the Da River which has been divided into many small areas and its land is steep. The last one is near border with a lot of stone mountains. Phieng Luong and Muong Sang communes are located in the sub-region along Highway 6. In comparison to other communes, transportation and travel conditions of those two communes are quite convenient because they are near Moc Chau Town and Moc Chau Farm Town. This is considered as an advantage for agricultural production of two communes in terms of accessing to sources for production such as purchasing inputs and selling products.

The main crops of the district are maize, rice, tea, arrowroot, vegetables and fruit trees (peach, plum, etc.). Pumpkin, soybean, rice bean and mung bean are sub crops grown as the second crop in a year. However, their area is very small, except for pumpkin. The area of pumpkin in 2011 is quite large and it is grown mainly in Phieng Luong commune. Nevertheless, the area of pumpkin in 2012 has decreased significantly in comparison to that in 2011. The reason is that the amount of pumpkin produced in 2011 is too large and selling prices are quite low, about 500 – 1000VND/kg. Moreover, farmers mainly grow Taiwan seed pumpkin characterized by thin shell. Therefore, the maximum storage time is one month. Consequently, pumpkin is destroyed and cannot be sold. This results in low income of farmers growing pumpkin.

In relation to soybean, the planted area in 2011 is about 154.4 hectares which has decreased at about 17.9% compared to the planted area in 2010 (Social and economic report of Moc Chau, 2011). Similar to the trend of the district, in 2011, the soybean area in Muong Sang is about 5ha but in 2012, almost all household do not grow soybean. Soybeans are no longer

recorded in general statistics of the commune (Social and economic report of Muong Sang Commune in 2011 and the first half of 2012).

Similarly, planted area of rice bean and mung bean is very small. There are several households producing those crops for domestic consumption. Consequently, this area is also not presented in general statistics of communes and the district.

2.2 Crops production in Mai Son district

Mai Son is located in the center of Son La province and Hat Lot town is located on Highway 6. About three-quarters of Mai Son's area are on Na San plateau. The average height is 700-800 m above sea level (Department of Agriculture and Rural Development in Mai Son, 2012). Climate of Mai Son is presented by two distinct seasons which are the rainy season from April to October and the dry season from November to March of a following year. In dry season, it is very cold and low humidity. Most ofl crops cannot grow well at this time, especially on hill area. As a result, there is one crop per year grown in this region. For low land, two crops can be produced in a year. However, area of low land is very small.

Na Ot is a poor commune of Mai Son district which is adjacent to the Song Ma district. Na Ot is about 40 km far from the district center with poor traffic system, especially in rainy season. Unfortunately, rainy season is also agricultural production time. Therefore, buying production inputs and selling products of farmers face many difficulties.

In comparison to Na Ot and other communes of Mai Son, Chieng Chan has some more advantages for agricultural production. For example, it is only about 15 km far from the centre of the district with a better traffic system. There are gravel roads to commune centre. This is considered as a factors positively influencing on agricultural development.

The main crops of the district are rice, maize, cassava, sugarcane, coffee, tea and fruit trees (plum, mango, etc…) in which corn is the largest crop of the district. In the coming years, priority crops if the district are coffee and sugar cane (maize will be replaced gradually by coffee). In two studied communes, rice bean and pumpkin have not been grown any longer. The situation is similar to soybean in Na Ot. In Chieng Chan, soybean used to be produced at a large area. However, the area of soybean has decreased dramatically to about 50 ha in 2010 and it is estimated at 31ha in 2012 (Social and economic report of Chieng Chan, 2012).

There is not any household in Na Ot producing mung bean and their area is not showed in general statistic of the commune. In contrast, there are still certain households growing mung

bean. They also indicate that the ability to sell products is pretty good and there are production and market potential for those products. Total planted area of soybean and mung bean in 2011 of Chieng Chan is 115.5 ha

CHAPTER 3

CURRENT STATE OF PRODUCTION OF SELECTED CROPS

3.1 General information of surveyed households

In this study, there are 111 households surveyed in four communes with 21.62 percent of poor households and 78.38% of non-poor households. The average age of the household owner is about 44 years old. In this age, household owners have high agricultural production experience and are also able to evaluate their economic efficiency of production.

Table 1 General information of surveyed households

Items	Unit	Amount
1. Average age	Years	43,96
2. Female	%	81,98
3. School year	Years	5,91
4. Qualifications		
- Primary	%	5,41
- Intermediate	%	5,41
- University	%	2,70
Classification of households by		
5. Types of household owner's job		
- Farmers	%	81,08
- Others	%	18,92
6. Household's income		
- Poor	%	21,62
- Non poor	%	78,38
7. Economics activities		
- Farming only	%	85,59
-Others	%	14,41
8. Average persons per household	Persons	4,95
- % male	%	49,09

(Source: Survey data, 2012)

In relation to education, in general, household owners have low level of education with the 6 schooling years on average. Percentage of households with qualifications from vocational to university level is very low and those qualifications are mainly related to political field because some of interviewers are commune staff. Due to relatively low education level, the capacity to adapt new farming practices and access to market for selling products will be limited.

Each household has about 5 members and male members account for just above 50 percent. This is considered as an advantage for agricultural production because each household usually has two main labors that are the head of the household and his/her spouse and 2-3 other members who are children and the elderly. Although household owner is often male, both husband and wife play an important role in making production decision.

Regard to income sources, for most of households, agricultural production is their main economic activity. In practice, there are above 85 percent of households with main income coming from agricultural production. Several households have run sub-sectors such as grocery trade and carpentry to increase income.

3.2 Sources for agricultural production of survey household

3.2.1. Land

Land is an important resource in agricultural production. The area of cultivated land per households in study sites is quite large. Each household has from 2 - 3 ha land on average. However, the main part is hilly land that is mostly suitable to grow maize, tea and coffee. Among selected crops, area of pumpkin is the largest and pumpkin are grown mainly in Phieng Luong commune, Moc Chau district. In contrast, area of other crops is very small. Most households grow with very little area, intercropped with maize, for domestic consumption.

On average, pumpkin area per household in Phieng Luong is about 5,500 m^2 while that number in Muong Sang is around 6,300m^2. However, the number of households growing pumpkin in Phieng Luong is much more than the number of households growing pumpkin in Muong Sang. Pumpkin producing in both communes is a commercial crop. Area pumpkin in Na Ot and Chieng Chan is very small and it is grown as leaf vegetable for family consumption. There are some reasons leading to small area in two communes in Mai Son. Firstly, climate condition with high level of rain in Mai Son, especially in Na Ot, is not suitable for growing pumpkin. Secondly, in this region, pumpkin is often intercropped with

maize. In site with low density of stones, maize is produced at high density and hybrid maize develops very well. Hence, pumpkin cannot grow well. In site with high density of stones, density of maize is low and there are spaces for pumpkin to grow. Consequently, farmers only intercrop pumpkin with maize in sites with high density of stones and area of those sites is not much.

There are only a few households in Na Ot and Chieng chan planting soybean while in Moc Chau, soybean has not grown any longer. However, according to commune staff in Na Ot, soil quality in Na Ot is not suitable for producing soybean. In practice, soybean grown in Na Ot grows very fast with a lot of leaves. The number of fruit is small and some fruite has not seed. Consequently, productivity of soybean is very low. Similarly, area of rice bean is also very small. There are a few households in Muong Sang and Chieng Chan producing rice bean. There are two reasons resulting in low area of rice bean. The first one is that rice bean is only grown for family consumption in Thai community. The second one is that rice bean is usually grown in maize land. In maize production, farmers use a lot of herbicide and this herbicide have negative impacts on the development of rice bean. Mung bean is produced in three studied communes which are Muong Sang, Na Ot and Chieng Chan. In particular, mung bean grown in Chieng Chan is a commercial crop and its economic efficiency is quite high (this will be detailed in next section).

Table 2 Land use of survey households

Unit: m^2

Items	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Land area per household	23.681	29.817	23.283	28.329
2. Cultivated area per household				
- Maize	23.608	22.964	11.760	26.596
- Soybean	N/A	N/A	700	400
- Pumpkin	6.317	5.450	100	167
- Rice bean	1.000	N/A	N/A	2.500
- Mung bean	1.000	N/A	100	1.900
- Rice	2.875	2.927	1.880	4.341
- Other crops	19.375	4.183	10.841	5.683

(Source: Survey data, 2012)

3.2.2 Labor

Along with land, labor resource has also a great impact on agricultural production of households because labor resource will influence production period such as sowing or harvesting time. Each household has about three labors. In terms of quality, about 66 percent of interviewers are trained on crops production and animal husbandry. Those trainings focus on farming practices of tea, rice, and maize, growing fruit trees and pig and chicken production. Most of trainings are hold by extension workers. Unfortunately, up to now, there has not been any trainings focusing on selected crops. Farmers grow those crops based on their experiences.

Table 3 Labor quantity and quality of surveyed households

Items	Unit	Amount
* Number of labors per household	persons	3
1. Male	%	50,30
2. Trained labors	%	65,77

(Source: Survey data, 2012)

3.2.3 Capital source

The proportion of households lacking capital for production is large, accounting for about 75 percent. In practice, the percentage of households who borrow capital for production is also large (about 69 percent of households lacking capital). The reason is that they are minority ethnic (Thai and Dao people) and the rate of poverty is at high level.

Loans of households are mainly from social policy banks, agricultural banks, relatives and input suppliers (eg. Farmers buy fertilizers in credit). There are certain households who borrow money for building house and buying cows and buffalos. Most of them borrow capital for crops production. They usually pay money back at the end of production seasonality when they harvest and sell products. Therefore, the proportion of households who pay money back on time is quite high (around 75%). However, this also leads to the fact that households cannot storage product to sell later at higher prices. It consequently reduces economic efficiency of crops production and income and farmers find it difficult to accumulate their own capital for next crop.

Table 4 Credit loan of surveyed households (2011)

Items	Unit	Amount
* (%) of households lack of capital	%	74,77
1. (%) of households access to credit loans	%	69,37
2. Source of loan		
+ VBSP	Mil. VND	20,91
+ Agri Bank	Mil. VND	39,76
+ Project funds	Mil. VND	25,00
+ Relatives	Mil. VND	19,35
+ Input outlets	Mil. VND	21,18
+ Others	Mil. VND	33,90
3. Payment capability		
+ Before due date	%	84,41
+ After due date	%	7,79
+ Incapable to pay	%	5,19
+ No answer	%	2,60

(Source: Survey data, 2012)

3.2.4 Tools for production of surveyed households

Households regard that they have sufficient tools for production. In practice, the majority of households have motorbikes, televisions, cell phones, cows/buffalos and spraying. Those tools has helped them to travel to visit farm, purchase inputs for production, refer input and output prices, and access to information about new farming practices as well. Moreover, some households have plowing, threshing machines, water pumps, etc. Those equipment and machinery assist them to save time and labor in production. As a result, production time will be shortened, especially land preparation and harvesting time. This will facilitate farmers to have ability to increase the number of crops in a year.

Table 5 Capital assests for production of surveyed households

No	Items	Percent (%)	Amount/household (unit)
1	Plough	33,33	1,11
2	Thresh machine	9,91	1,00
3	Water pump	24,32	1,07
4	Pesticide pump	69,37	1,21
5	Storage house	25,23	1,21
6	Generator	8,11	1,00
7	Wagon truck	10,81	1,00
8	Car	3,60	1,25
9	Motorcycle	94,59	1,53
10	Bicycle	16,22	1,06
11	Cattle	77,48	1,97
12	Television	93,69	1,14
13	Telephone	95,50	2,55

(Source: Survey data, 2012)

3.3 Current state of production of selected crops

3.3.1 Current state of production of target crops and relevant rotations

Total households surveyed are 111. In which, the number of households growing soybean and rice bean is very small, which is 3 and 2 respectively. As mentioned before, in practice, the area of those two crops is also very small and it has decreased. There are 36 household growing pumpkin and they are mainly located in Phieng Luong. Regard to mung bean, there still several households in Chieng Chan producing them as commercial crops.

Table 6 Number of survey households growing target crops

Item	Mường Sang (n=29)	Phiêng Luông (n=27)	Nà Ớt (n=27)	Chiềng Chăn (n=28)	Total (n=111)
Soybean	0	0	1	2	3
Pumpkin	6	24	3	3	36
Rice bean	1	0	0	1	2
Mung bean	1	0	2	5	8

(Source: Survey data, 2012)

Potential rotations including selected crops are shown in Table 7. Noticeably, pumpkin involves in a number of rotations. For example, in Muong Sang, pumpkin is grown as the second crop in the rotation of maize – pumpkin in high land and rice – pumpkin in low land. In Phieng Luong, pumpkin is grown in a large area as both the first crop and the second crop in rotations of maize – pumpkin and pumpkin – pumpkin.

Table 7 Some major crop rotation in local area

No.	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1	Maize - Rape	Maize - Pumkin	Maize	Maize
2	Maize - Pumpkin	Pumpkin - Pumpkin	Terrace rice	Maize - Mung bean
3	Rice - Maize	Maize	- Rice - Rice	- Rice - Rice
4	Rice - Pumpkin	Pumpkin – Rice	Cassava	
5	Rice – Vegetables	- Arrowroot		
6	Vegetables	Rice - Rice		
7	Cassava	Terrace rice - Tea		

(Source: Survey data, 2012)

Rotations of a commune are different from those of other communes. The explanation for that are differences in terms of climate conditions and conventional farming practices in those communes. For example, in Na Ot, due to unfavorable climate conditions, farmers can produce only one crop per year and they often grow maize because maize is a traditional crop

and has become a commercial crop for years. In addition, maize production has also high economic efficiency. In Muong Sang and Phieng Luong, farmers usually sell maize product as soon as they harvest. This coupled with more favorable climate in Moc Choc leads to a result that farmers can produce two crops in a year. In contrast, in Chieng Chan, most of farmers dry maize and store the product for future selling at higher prices. Therefore, harvesting time is longer and more labor is required. Consequently, farmers in Chieng Chan often produce one crop in a year.

3.3.2 Post harvest practices

For mung bean, households often store product at home because they have a small amount of products. Besides, in Chieng Chan, some households put the product outside in both day and night time until it dries (dry practice under dew). With this post harvest practice, the product and be stored about 4-5 months without any damage caused by termites. This practice is highly regarded in terms of safety for both producers and consumers because it does not use chemicals in the preservation process. Another storage method currently applied by certain households is that after drying under sunlight, they use some pesticides permeated on cotton to put on storage tools for preserving. This kind of post harvest practices is quite dangerous for both producers and consumers. However, the team has not figured out what the drugs are.

In relation to pumpkin, the product is often sold as soon as harvesting. Storage conditions of pumpkin at households are very poor. In addition pumpkin is characterized by a large volume and bulky. Therefore, the product is often stored at porch as shown in a below picture.

Fig. 1 Storage condition of selected crop (pumpkin) by surveyed households, Phieng Luong commune

Soybean and rice bean are mainly produced for family consumption.

Fig. 2 Rice bean products, Là Ngà 2 village, Mường Sang commune

3.3.3 Production costs and return to labor of selected crops

As mentioned above, the number of households growing soybean and rice bean are very few and most of them produce those products for family consumption. Therefore, production costs and return to households cannot be estimated. However, there are some studies looking at economic aspects of soybean production including soybean farming system, production costs and farm family income. Hence, those papers will be referred for soybean production costs and household income. Unfortunately, for rice bean, there have not been any studies estimating production costs and household income. Consequently, rice bean will not be presented in this section.

In this section, in the case that pumpkin is grown as the first crop, production costs and household income of pumpkin will be compared to those of maize. In this case, pumpkin and maize are competitive crops. In the second scenarios that pumpkin and mung bean are grown as complementary crops, production costs and household income will be estimated in order to see the role of production of those plants for increasing income for farmers.

Scenario 1: Comparison production costs and household income of pumpkin to those of maize

In general, total production cost of pumpkin is higher than that of maize.

Table 8 Production costs and household income of pumpkin and maize in 2011

(Average per ha)

Items	Unit	Maize	Pumkin
1. Total production cost*	1000đ	**6.789,27**	**9.424,03**
- Seed	1000đ	1.380,71	2.352,21
- N	1000đ	2.152,40	1.993,17
- P	1000đ	84,33	0,00
- K	1000đ	306,52	195,47
- NPK	1000đ	1.834,40	2.474,49
- Pesticide	1000đ	17,24	1.006,83
- Herbicide	1000đ	455,01	989,36
- Services	1000đ	536,81	337,50
- Storage cost	1000đ	21,85	75,00
2. Amount of products	Kg	**6.760,82**	**16.081,33**
- Percentage of products sold	%	97,68	85,39
3. Average price	1000đ/kg	**3,86**	**1,49**
4. Potential revenue	1000đ	**26.096,77**	**23.961,18**
6. Real revenue	1000đ	**26.096,77**	**20.460,45****
7. Real return to household (6-1)	1000đ	**19.307,50**	**11.036,42**
8. Potential price of break even point	1000đ/kg	**1,00**	**0,59**
9. Real price of break even point	1000đ/kg	**1,00**	**0,69**

(Source: Survey data, 2012)

** Excluding household labors cost*

*** The rest of products cannot be sold due to being destroyed*

In general, pumpkin price in 2011 is low, ranging from 500 VND/kg to 2,000 VND/kg. An average price is about 1,500 VND/kg. Previously, pumpkin price reached to more than 3,000 VND/kg. With the current conditions of production, post-harvest practices and selling products, there are about 85 percent of total amount of pumpkin sold. The rest part is damaged during storage. Consequently, household income from pumpkin production is much

lower than that from maize production. If price of pumpkin were stable at above 1,800 VND/kg, household income from pumpkin production would be higher than that from maize production (in practice, recently, maize prices have been quite stable).

Scenario 2: Production costs and household income of complementary crops

Table 9 Production costs of pumpkin and mung bean in 2011

(Average per ha planted)

Unit: 1000 VND

Items	**Pumpkin (n=2)**	**Mung bean (n=6)**
Production costs	**12.812,50**	**3.044,25**
1. Seed	2.250,00	1.914,68
2. Manure	5.000,00	N/A
3. Urea	1.500,00	300,83
4. Potash	N/A	32,14
5. NPK	500,00	239,44
6. Pesticide	312,50	557,14
7. Herbicide	2.437,50	N/A
8. Transportation cost	625,00	N/A
9. Others	187,50	N/A

(Source: Survey data, 2012)

Table 10 Productivity and household income of pumpkin and mung bean

(Average per ha planted)

Items	**Unit**	**Pumpkin** (n=2)	**Mung bean** (n=6)
1. Total production	Kg	12.500,00	1.293,25
- Percentage sale	%	100	76,73
2. Average price	1000đ/kg	1,65	35,55
3. Revenue	1000đ	20.625,00	45.975,04
4. Return to household labors	1000đ	7.125,00	42.930,79
5. Price at break even point	1000đ/kg	1,025	2,35

(Source: Survey data, 2012)

In comparison to pumpkin grown as the first crop, total production cost of complementary pumpkin is higher. However, selling price is higher than that of pumpkin produced as the first crop because there are a few households growing. On average, household income is about 7 million VND/ha. Therefore, farmers should consider this as a chance to increase their income. Nevertheless, they should also maintain a suitable area to avoid a decrease in selling prices.

For mung bean, currently, household income is quite high. In addition, they are complementary crops and are suitable for soil quality in research sites. Hence, they have high production potential. However, a question emerging is that what demand for those products are. In other words, if farmers expand their production, where and at which price farmers can sell their products. Therefore, there should be more research about market potential for those crops.

For soybeans, in Muong Sang, income from this plant is much lower than income from other crops such as maize, vegetables, etc. Soybean yield in research sites is also lower than that in other regions of the Northwest. For example, in Tam Duong district, Lai Chau province, soybean intercropped with tea or completed with rice and maize has an average yield of about 1.4 ton/ha and selling price is high, from 35,000 to 38,000 VND/kg. Therefore, total revenue reachs over 50 million/ha (Thu Minh, 2012). Another example is in Muong Ang district, Dien Bien province. Soybean yield is 2.5 tons/ha and price in May 2012 is about 15,000 VND/ha. Hence, Total revenue is approximately 37.5 million VND/ha. After deducting production costs such as seed, fertilizer, pesticide, etc., household income is about 21.8 million VND/ha (Duc Viet, 2012). Therefore, there should be more research on soil quality, suitable soybean seed and farming practice to increase soybean productivity in research communes if farmers want to increase soybean area.

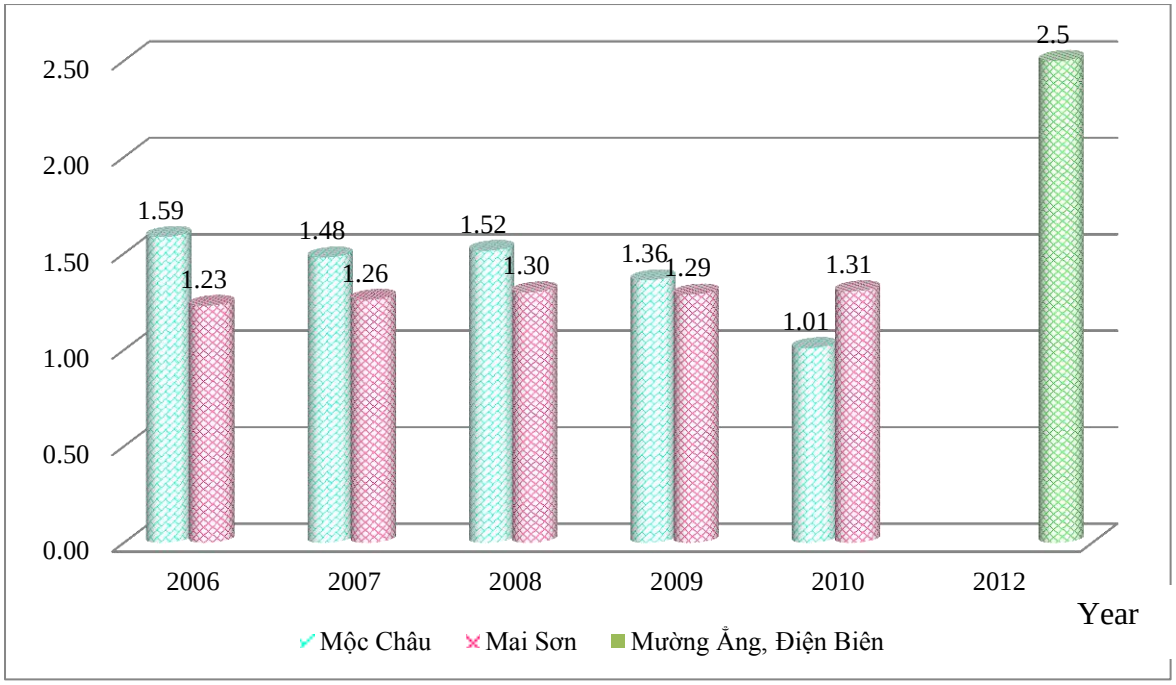

Fig. 3 Productivity of soybean in Moc Chau and Mai Son districts (2006 – 2012; Unit: tons/ha)

(Source: Sơn La Statistic Office, 2011)

3.4 Input supply services and infrastructure

3.4.1 Fertilizer services

Fertilizers are one of important factors influencing on production performance and efficiency of production. With intensive and large-scale commodity production, the use of fertilizers in production process is indispensable for farmers. In practice, 100 percent of the respondents reported that they use fertilizers for agricultural production. Fertilizer services in the research sites are quite good. There has not been any shortage occurred in the study communes and fertilizers are diversified. Farmers are freely to choose a type of fertilizers they want to use for production. In relation to ways of purchasing, the majority of households buy fertilizer from outlets by themselves. Some farmers form a group to buy fertilizers. A representative of the group work with an outlet or a company to decide quantity purchased and prices. Thereafter, the outlet or company will deliver fertilizers to centers of communes for farmers. This form of purchasing fertilizers has been developed in Phieng Luong, Na Ot and Chieng Chan. In Chieng Chan, Mai Son Food and Agricultural Material Company is the fertilizer supplier. Besides, in Moc Chau Farmer Union plays a role of a representative for farmers to negotiate with fertilizer outlets and companies. Generally speaking, if farmers want to expand

their production area, they will not find nay difficulties in buying fertilizers for their production.

Table 11 Current situation of purchasing fertilizer by surveyed households

Items	Unit	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Source of supply					
+ Outlet	%	81,48	58,62	70,37	96,43
+ Groups of farmers	%	0,00	6,90	29,63	3,57
+ Farmers' union	%	18,52	34,48	0,00	0,00
2. Distance to the nearest outlet	Km	2,34	3,96	22,21	15,79
3. Quality of service					
- Large quantity	%	100,00	96,55	85,19	89,29
- Diversity	%	96,30	93,10	85,19	85,71
- Convenient to purchase	%	88,89	65,52	59,26	75,00
- Low price	%	62,96	51,72	70,37	53,57

(Source: Survey data, 2012)

3.4.2 Pesticide services

Similar to fertilizers, most of surveyed household apply pesticides in their agricultural production. There are a few households in Na Ot and Chieng Chan who do not use pesticides in production because they only grow maize that does not require pesticides. The percentage of household buying pesticides from outlets is quite large, from 83-100 percent. The rest of farmers buy pesticides from farmer unions and wet market.

Table 12 Current situation of purchasing and using pesticides by surveyed households

Items	Unit	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Percentage of hh buying pesticides	%	100,00	100,00	92,59	96,43
2. Source of supply					
- Outlets	%	100,00	82,76	88,89	96,43
- Groups of farmers	%	na	6,90	na	Na
- Farmers' union	%	na	10,34	3,70	Na
3. Distance to the nearest outlet	Km	3,26	6,37	12,80	16,74
4. Quality of service					
- Large quantity	%	100,00	100,00	59,26	89,29
- Variety	%	100,00	100,00	62,96	85,71
- Convenient to purchase	%	88,89	48,28	66,67	64,29
- Low price	%	81,48	72,41	48,15	78,57

(Source: Survey data, 2012)

Pesticide supply services in the research sites are highly regarded. In general, there are many types of pesticides and farmers therefore are freely to choose the one they want to apply for their production, especially for farmers who buy pesticide at big shops in town. In addition, shop tenants are also pleased to guide farmers buying products at their shops ways to use relevant pesticides.

3.4.3 Seed services

Fig. 4 Pumpkin planted field (upland) of H'mong people, Pieng Sang, Phieng Luong commune (2012)

Variety is one of key factors influence on production schedule, productivity and product quality. Regarding soybean, rice bean and mung bean, farmers usually use their own seed or buy seed from other farmers.

In contrast, for pumpkin, farmers often purchase seed from outlet shops for their production. Pumpkin seed currently produced are imported from Taiwan and Japan with high productivity about 20-40 tons per ha. However, pumpkin seed quality is not highly regarded. This is explained that pumpkin seed is not homogeneous. For example, seed is packed in one package. However, when it is grown, products look different in terms of shapes. Some products are round and others are long. This leads to certain difficulties for harvesting and selling products. Moreover, as mentioned before, Taiwan and Japanese seed is characteristic by thin shell. This coupled with harvesting time in rainy season leads to disadvantages in product storage. Therefore, in order to enhance pumpkin production, there should be more research on post-harvest practices with relevant conditions and marketing product to reduce the length of storage time period.

3.4.4 Irrigation

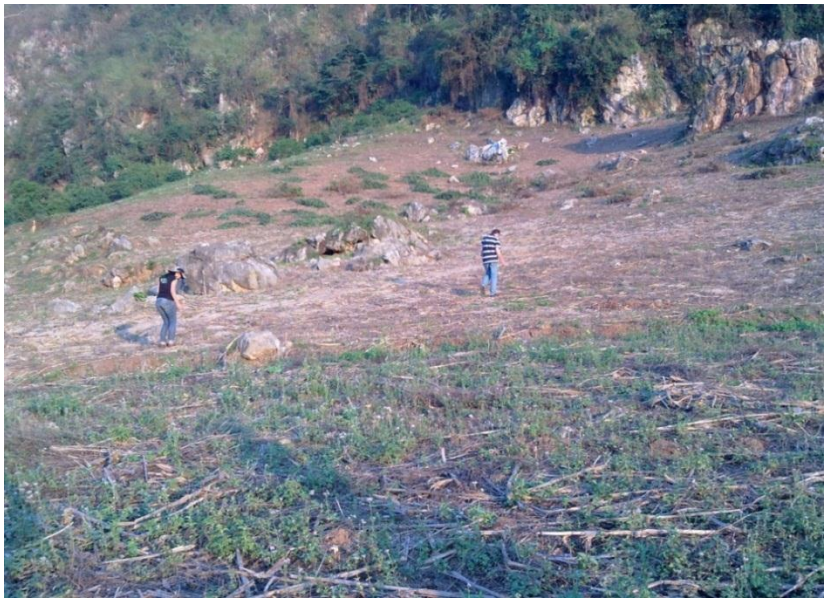

Fig. 5 Unpreprared upland field for maize production, Muong Sang commune (25/4/2012)

A long with seed, irrigation condition also impacts on production schedule and economic efficiency of production. Up to now, irrigation systems in target communes have provided water mostly for rice which is grown in valleys. Selected crops are mainly grown on hill land and production water is from rain water. Hence, their production schedule depends on annual

climate condition. For instance, in 2012, production season in Muong Sang was started latter than that in 2001. The explanation is that in April, 2011 raining season has begun. However, in 2012, raining season has only started in late of May.

3.4.5 Infrastructure and other services

Table 13 Evaluation of surveyed households about infrastructure and other services*

Items	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Extension services	1,72	2,07	2,36	1,93
2. Infrastructure	2,00	2,28	1,72	1,41
3. Irrigation service	2,32	2,86	2,00	2,19
4. Supports of local authorities	1,96	2,52	1,88	2,04

Note *: *1= Good, 2= Medium, 3= Poor*

(Source: Survey data, 2012)

Infrastructure in target communes is poor, especially for two communes in Moc Chau district. Most of inter-village and inter-field roads are just “land lines”. Hence, it is very difficult to travel in raining season.

Fig. 6 Road to Pieng Sang, Phieng Luong commune (2012)

Extension services and supports of local leaders for agricultural production are also limited. Most of farmers interviewed do not respond to questions related to extension services and supports of local leaders for their agricultural production.

3.4.6 Information about inputs for production

Table 14 Source of information about input prices

Source of information	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Major source of information of surveyed households *(% hh. answered)*				
- Outlets	88,89	77,78	59,26	85,71
- Relatives and neighbors	74,07	81,48	59,26	46,43
- Mass media (Televison, radio, newspaper, etc.)	22,22	18,52	11,11	25,00
2. Frequency of information seeking *(1=regularly,2=not often,3=rarely)*				
- Outlets	1,67	1,48	1,88	1,63
- Relatives and neighbors	1,50	1,68	1,44	1,77
- Mass media (Televison, radio, newspaper, etc.)	1,67	1,60	1,67	1,86

(Source: Survey data, 2012)

Information about inputs for production mentioned in this section focuses mainly on input prices. Farmers often collect information related to input prices from shop tenants, neighbors and relatives. Prices for inputs such as fertilizers purchased at sight are often publicly listed at the shop. Those prices are changed over time. Moreover, farmers can also refer to prices reported on television regularly. For farmers who buy inputs in credit, input prices always include interest rate. Therefore, those farmers usually search for information about interest rate from their neighbors and relatives before buying. This will assist them to negotiate with shop tenants to determine a suitable interest rate.

Table 15 Ways to obtain information

Unit:%

Items	Relatives and neighbors	Mass media	Outlets
- Direct	87,32	100,00	90,59
- Telephone	1,41	na	2,82
- Both	11,27	na	28,57

(Source: Survey data, 2012)

Talking face to face with neighbors and relatives is a main way that farmers get information about input prices. For several farmers, in the day of buying fertilizers they go around for getting price information from different shops (3-5 shops) and decide to buy at a shop with the cheapest price. In practice, the relationship between farmers and shop tenants are not closed. This is illustrated that there is not any farmer getting price information by making a call to shops. Differently, for pesticides and herbicides, farmers usually purchase from regular shops to take advantages of being royal customers. The percentage of farmers purchasing pesticides and herbicides from regular shops in Muong Sang is the highest at above 80 percent. This number in Na Ot is the smallest at nearly 70 percent.

Table 16 Advantages of buying material inputs from regular sources

Unit: %

Item	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Percentage of hh. buying from regular sources	80,77	75,00	69,57	73,08
2. Benefits				
+ Input supply assurance	61,90	66,67	68,75	68,42
+ Discount	42,86	47,62	62,50	31,58
+ Delay in payment (no interest, only short time period)	42,86	33,33	18,75	5,26
+ Technical supports	28,57	14,29	18,75	15,79
+ Quality assurance	52,38	66,67	31,25	52,63
+ Support in transportation service	19,05	9,52	6,25	10,53
3. Approaches to pricing				
- By market price	68,97	63,33	56,25	54,84
- By seller	27,59	23,33	21,88	16,13
- Bargaining	3,45	13,33	21,88	29,03

(Source: Survey data, 2012)

Purchasing inputs from regular sources bring some benefits to producers. Of which, input supply assurance, quality assurance, discount and delaying payment in short time are the most important advantages. Moreover, from their point of view, the quality of products seems to be higher.

Prices are mostly established based on current market prices. Several farmers report that prices are discovered by directly bargaining between them and sellers. There are still some cases that prices are decided by sellers.

3.5 Pros and cons in agricultural production

On the one hand, there are some advantages of production of selected crops. Firstly, those crops are generally suitable with soil quality in research sites, except for soybean. In addition, land of household is concentrated. Each household has from 1-2 plots. Hence, it makes production process more convenient. Secondly, farmers have experience in producing those crops because they have produced them for years. Furthermore, those crops do not require high farming practice techniques. Thirdly, input services are highly regarded. Farmers can purchase inputs for production easily.

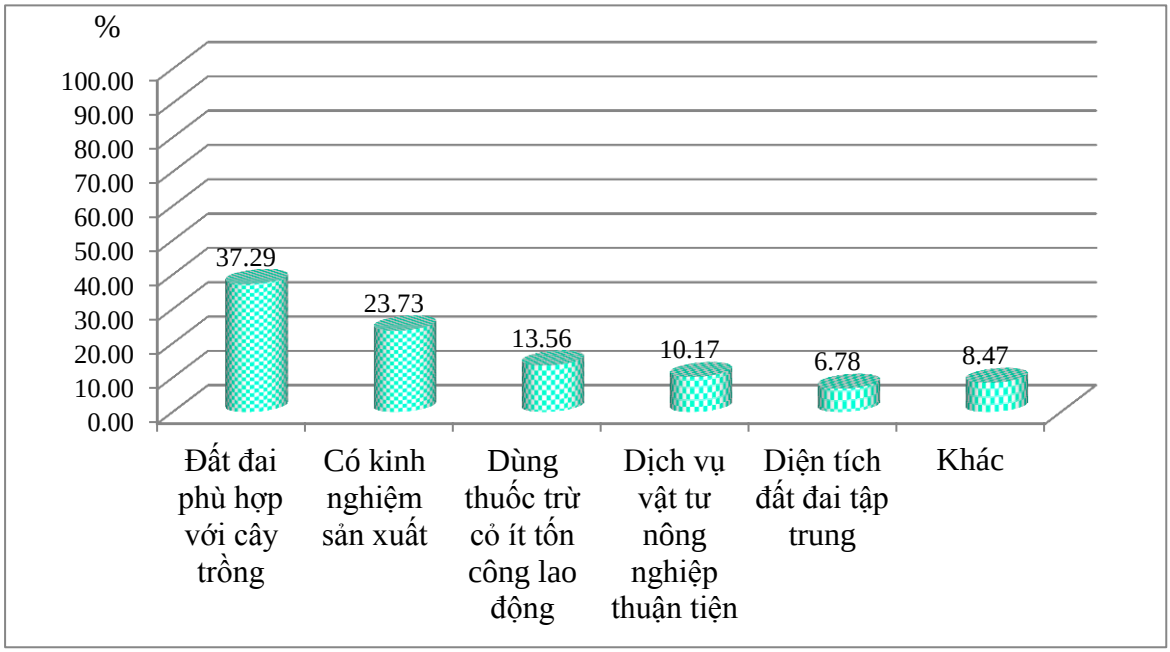

Fig. 7 Advantages in production of selected crops (percentages of respondents)

On the other hand, currently, farmers producing target products also face some difficulties. For instance, the most difficulty is water shortage. Agricultural production depends on raining water. This difficulty is reported by about 35 percent of interviewees. The following hindrance is lack of capital. Most of farmers are ethnic people and they are poor. Hence, they do not have enough capital for production. They usually purchase inputs in credit and pay back at harvesting time.

Table 17 Difficulties in agricultural production

Responds	Percentage (%)
1. Dependent on natural water	34,83
2. Lack of capital	32,58
3. High input price	5,62
4. Difficult in transportation	10,11
5. Lack of labors	4,49
6. Lack of technical supports	4,49
7. Others	7,87

(Source: Survey data, 2012)

CHAPTER 4

PRODUCTION POTENTIAL

In order to determine production potential of selected crops, examining household sources for production is necessary. Sources will be examined in this chapter are labor, capital, stored condition and willingness to apply new farming practices.

4.1 Expectation and capacity to increase production area of households (with assumption of stable prices and profitable production)

The number of households being willing to enhance production area of selected crops and amount of area they want to increase are shown in Table 18. In the case that output prices are stable and production is profitable, farmers are willing to increase their production area, especially for farmers growing pumpkin in Muong Sang and Phieng Luong communes. In that case, farmers will transfer area currently producing maize and arrowroot to produce pumpkin.

Table 18 Willingness to expand production of target crops

Items	Mường Sang		Phiêng Luông		Nà Ớt		Chiềng Chăn	
	No. (hh)	Area (m^2)	No. (hh)	Area (m^2)	No. (hh)	Area (m^2)	No. (hh)	Area (m^2)
Soybean	3	1.667	2	4.000	9	2.222	3	4.100
Pumpkin	**9**	8.289	**19**	8.326	3	1.833	1	2.000
Rice bean	2	7.000	1	10.000	2	5.000	1	2.500
Mung bean	2	1.650	1	2.000	1	50	**9**	2.611

(Source: Survey data, 2012)

For rice bean, an increase in its area does not influence on production area of other crops because rice bean is a complementary crops grown as the second one in a year. However, rice bean is often grown on maize-based land and a large amount of herbicide is used for maize production. Therefore, productivity of rice bean is low. Moreover, its ability to selling product is also low. Rice bean is mainly for family consumption. Consequently, there are a few households who want to expand production area of this product. Several households report that if selling price of rice bean is high, they will stop using herbicide to increase rice bean production.

Similar to rice bean, mung bean is a complement crop. Hence, there is a potential to increase its production area. A hindrance for increasing production area of rice bean is a shortage state of labor, especially in Chieng Chan because farmers spend a lot of their time for harvesting maize.

It is well known that soybean is very good at improving quality of soil. However, because of its low economic efficiency in comparison to other crops and soybean planted in other region as well, farmers are not willing to increase its production area.

4.2 Labor sources

Table 19 Potential of labor force in expanding production

Percentage of hh.		Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Surplus labors	%	70,37	72,41	51,85	71,43
2. Willing to hire extra labors	%	18,52	31,03	22,22	10,71
3. Needed technical supports	%	77,78	82,76	92,59	71,43

(Source: Survey data, 2012)

In relation to labor quantity, around two third of households in Muong Sang, Phieng Luong and Chieng Chan report that they have enough labor for production if area of selected crops increases. Most of households will not hire labors for production because it is difficult to hire labors in seasonal time. Moreover, farmers do not have off-farm activities to generate income. Therefore, in order to increase income, they prefer spending more time for agricultural production in seasonal period to hiring labors.

Noticeably, as mentioned before, in Chieng Chan, households lack labor for increase production area of mung bean because they spend a lot of time for maize harvesting. Hence, there should be more research on harvesting and post harvesting practices and technologies to release labor for a development of other crops. Consequently, household income will increase.

Regarding quality of labor, farmer regard that they are lacking good farming practices and they would like to be trained to have better production performance. The percentage of

farmers who want to be trained is quite high, from above 71 percent in Chieng Chan to more than 92 percent in Na Ot.

4.3 Capital for enhancing production

The proportion of farmers who need to borrow money for production if they expand their agricultural production is quite high, especially in Phieng Luong. The amount of money they want to borrow is also large, from 17 to around 31 million VND. In addition, they would like to borrow in long time period, at least one and a half year. However, a large part of that money will be spent for maize and pumpkin production because total production cost of those crops is high, at 6 million VND and 9 million VND respectively. Total production cost of mung bean is small (about more than 3 million VND per ha). Therefore, capital is not a hindrance for the development of mung bean production.

Table 20 Potential source of capital in expanding production

Items	Unit	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Percentage of hh. access to credit loans	%	51,85	72,41	59,26	35,71
2. Average amount of loan	Million VND	31,14	30,00	22,44	17,00
3. Average lending term	Months	21,64	17,58	30,87	21,20

(Source: Survey data, 2012)

4.4 Irrigation

As represented in previous section, irrigation systems in target communes have not been developed. Water provided for production of selected crops is mainly from raining water source. However, those crops do not need much water for their growth. Water is really need at the beginning of production season, especially when land is prepared. Fortunately, land preparation is often still in raining season. Therefore, water is not an obstacle for enhancing production area of complementary crops.

4.5 Willingness to apply new farming practices

The proportion of farmers who are willing to apply new seed in their production is high, especially for pumpkin growing farmers. Nevertheless, as mentioned before, pumpkin seed quality has not been highly regarded. Therefore, when a new seed is introduced to farmers, there should be more attention paid on seed quality investigation.

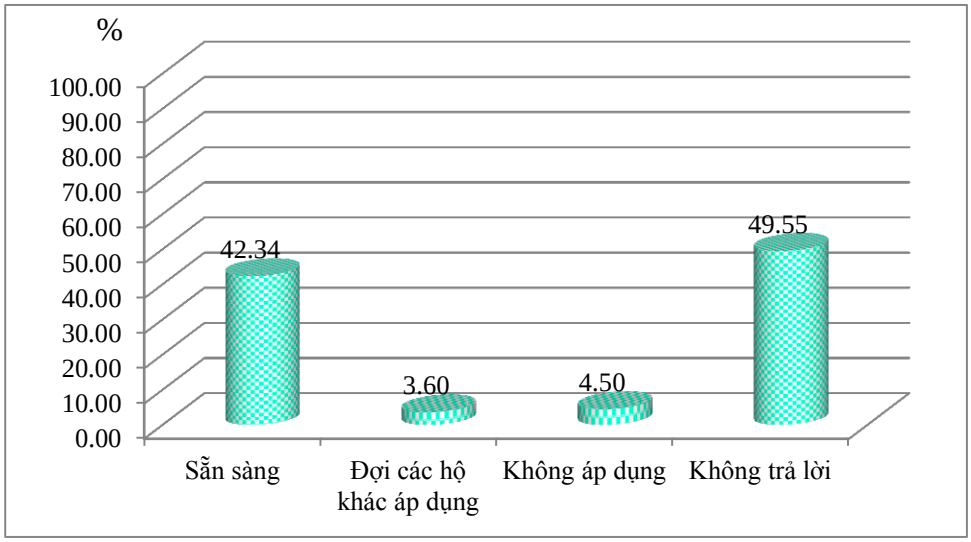

Fig. 8 Percentage of farmers willing to apply new pumpkin seed

Note: None-respondents are those who are not growing pumpkin

(Source: Survey data, 2012)

When asked about willingness to apply new farming practices, there are only a few farmers reporting that they will not apply (from 3.5-3.7 percent). Most of respondents are willing to apply as soon as they are introduced. There are several farmers reporting that they will apply if other farmers are successful in production with new farming techniques. It can be seen clearly from this analysis result that there is a chance to introduce new farming practices to farmers to increase their economic efficiency of production. However, in early stage, it should be an innovation based on traditional practices. This does not only assist farmers to apply easily with their current knowledge and production conditions but also takes advantages of traditional practices.

Table 21 Availability of surveyed households to apply new farming practices

Unit: %

Items	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
Available to apply	59,26	89,66	33,33	50,00
Unavailable	3,70	3,45	3,70	3,57
Available only when seeing the results from other households	3,70	3,45	11,11	7,14
No answer	33,33	3,45	51,85	39,29

(Source: Survey data, 2012)

4.6 Storage capacity

Post-harvesting practices in general and storage capacity in particular play an important role for production development, especially at a large scale. This is more important for agricultural production because agricultural products are fresh, bulky and easy to be damaged. In relation to target products, pumpkin is the one facing many difficulties in storage. This consequently leads to low selling prices and low economic efficiency. Therefore, if a recommendation of expanding production area of pumpkin, there should be more research on storage capacity and product selling as well.

CHAPTER 5

PRODUCT SELLING AND MARKET POTENTIAL

5.1 Product selling state and price fluctuation

Among four selected crops, pumpkin and mung bean are commercial crops with the rate of products sold at 85-100 percent and above 75 percent respectively (the rest of pumpkin is damaged during storage time and the rest of mung bean is for family consumption). For pumpkin, selling prices are much fluctuated. For instance, in 2011, selling prices ranged from 500 VND to 2000 VND per kg. In contrast, selling prices of mung bean are quite high and product selling seems to be easy because of a small amount of product.

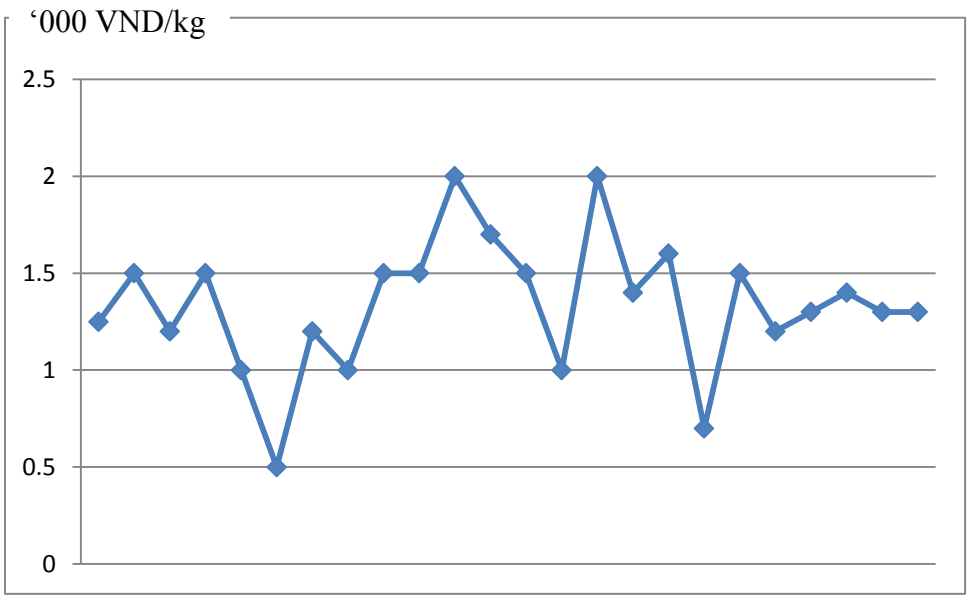

Fig. 9 Price fluctuation of pumpkin in Moc Chau in 2011

Source: Survey data (2012)

5.2 Sources of information about output price (3 most important sources)

Information related to prices and buyers seem to be the most important one in a process of selling products. If that information is available, trading will be fair. In practice, before selling products, farmers often collect information related to prices from collectors and neighbors. This will help them to negotiate with buyers in order to obtain an appropriate price. Up to now, contract farming has not developed in research sites. There has not been any close relationship between producers and collectors. Their contact is usually ended as soon as transactions complete.

Table 22 Sources of information and frequency of collecting information by surveyed households

Items	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Source of information *(% percentage of households responded)*				
- Collectors	70,37	89,66	70,37	71,43
- Relatives and neighbors	74,07	75,86	62,96	71,43
- Mass media (TV, radio, newspaper, etc.)	14,81	6,90	7,41	17,86
2. Frequency of collecting information *(1= usually, 2=often, 3=average, 4=rarely, 5=hardly ever)*				
- Collectors	1,65	2,27	1,71	2,00
- Relatives and neighbors	2,50	1,50	1,50	2,00
- Mass media (TV, radio, newspapers, etc.)	1,95	2,31	1,74	2,00

(Source: Survey data, 2012)

Table 23 Ways to get information about output prices of households

Unit: %

Items	Collectors	Relatives, neighbors	Mass media
- Direct	78,57	78,48	100,00
- Telephone	4,76	0	na
- Both	16,67	21,52	na

(Source: Survey data, 2012)

Ways to ger information of households are also very simple. They often ask collectors and their neighbors directly.

5.3 Selling products to regular buyers

As mentioned before, contract farming has not developed in research sites and relationship between producers and buyers is not closed. Hence, there are a few farmers selling their products to regular buyers, except for Phieng Luong. Those farmers report that selling products to regular buyers brings some benefits such as cash payment, lower quality requirement and higher price. However, those benefits are not always obtained. Selling prices are usually discovered by direct bargain between producers and buyers.

Table 24 Percentage and benefits of households selling to regular customers

Unit: %

Item	Mường Sang	Phiêng Luông	Nà Ớt	Chiềng Chăn
1. Percentage of hh. selling to regular customers	29,6	55,2	14,8	21,4
2. Main benefits				
+ Higher price	12,5	31,3	100,0	33,3
+ Pay in cash	87,5	100,0	100,0	83,3
+ Less requirement for product's quality	12,5	31,3	50,0	66,7
3. Approaches to pricing				
- Sellers	3,70	3,45	0,00	0,00
- Buyers	14,81	20,69	3,70	14,29
- Negotiation	81,49	75,86	96,3	85,71

(Source: Survey data, 2012)

5.4 Location of selling products

For pumpkin, most of products are sold as soon as harvesting at farm gate. There is only a small part sold in from a week to three weeks later at home. In contrast, mung bean is often harvested, dried and sold at home. In research sample, there is not any household selling rice bean and soybean. With those methods of selling products, farmers do not have to pay any costs for transferring products.

5.5 Difficulties in selling products

Generally speaking, the most difficulty in selling products of households is unstable prices. The follower is a difficulty in transferring products, especially for pumpkin because it is very bulky. In practice, farmers have not enough vehicles to transfer pumpkin to markets for selling. Another difficulty is that farmers have low capacity to negotiate with buyers to obtain fair prices. Therefore, in order to increase production of selected crops to increase household income, there should be more research addressing those obstacles.

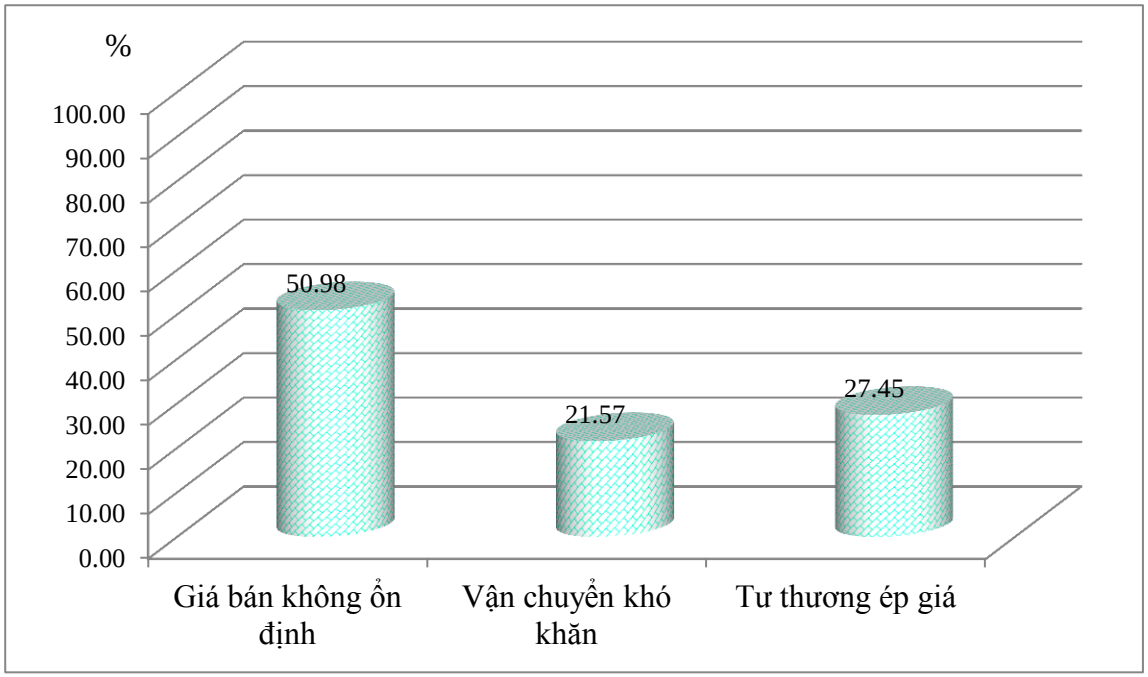

Fig. 10 Difficulties of surveyed households in marketing products

(Source: Survey data, 2012)

5.6 Concern about marketing channels of products

Currently, farmers have not paid much attention on marketing channels of their products. They just sell product to collectors and do not care about where their products are consumed and by what ways. This may be a result of their poor knowledge of market and production of commercial goods. This may also be considered as a factors leading to low product selling performance of them. Hence, in near future, there should be trainings on those topics.

CHAPTER 6

CONCLUSION AND IMPLICATIONS

6.1 Conclusion

- Pumpkin is grown at large area. However, that area is concentrated in Phieng Luong commune, Moc Chau district. Pumpkin can be grown as the first crop which is competitive with maize and as the second crop which is complementary crop to maize. In contrast, the number of households growing rice bean and soybean is small. There are also several household living in Chieng Chan commune, Mai Son district who grow mung bean. Those three crops are all grown as the second crops.

- Among selected crops, pumpkin and mung bean are considered as commercial crops while rice bean and soybean are mostly produced for family consumption. Recently, selling prices of pumpkin is fluctuated. This coupled with difficulty in storage of pumpkin due to thin shell leads to a significant decrease in pumpkin area. In contrast, selling prices of mung bean is quite high and stable.

- In relation to production potential, there is possibility to expand production area of pumkin, rice bean and mung bean. Diffirently, production potential of soybean is limited due to unsuitability of soil quality.

- In general, household resource for production development of target crops is sufficient, except for labor, especially in Chieng chan. This is explained that farmers spend a lot of their time on harvesting maize.

- Horizotal linkage/relationship among farmers and vertical linkage/relationship between farmers and other stakeholders in production and selling agricultural products have not been developed. Farmers have not pay attention on value chain.

6.2 Implications

- There should be more research on market potential of pumpkin and mung bean.

- There should be trainings on market knowledge for farmers, especially on improving market access.

- Contract farming should be introduced to farmers and other stakeholders.

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