



Ministry of Agriculture and Forestry

National Agriculture and Forestry
Research Institute



**Promoting Soybean as a Cash Crop:
Determinants and Possible Impacts**



A collaborative short study by the
Farming Systems Research/Extension Component and
Socio-Economics Component



Ministry of Agriculture and Forestry

National Agriculture and Forestry
Research Institute



LSUAFRP Field Report No. 2005/09

**Promoting Soybean as a Cash Crop:
Determinants and Possible Impacts**

A collaborative short study by the

**Farming Systems Research/Extension Component and
Socio-Economics Component**

September 2005

Lao-Swedish Upland Agriculture and
Forestry Research Programme

Acknowledgement

We sincerely thank the following for their help in conducting this study:

The officers and staff of the Xiengeun District Agriculture and Forestry Office (DAFO) and the District Commerce Office for the information and time they provided;

The farmers of Ban Houykhout and Phonesavanh for sharing their experiences in growing soybeans;

Mr. Phet Rama, Manager, Vilaykhoun International Import/Export Company Limited.

The officers and staff of the Northern Agriculture and Forestry Research Center (NAFReC) for pre-arranging and accompanying us on our field visits and interviews. For this we specially thank Ms. Kongmy, Ms. Phonsaniith, Mr. Sompan, Mr. Bouavanh and Mr. Outhai. We are grateful for the simultaneous translations provided by Mr. Xaysana and Mr. Thansamay during the interviews.

Based on results of this study, a slide set titled “Promotion of Soybeans as a Cash Crop: Is MIS Enough?” was presented during the MIS (Market Information System) Workshop held in Luang Prabang on July 5-6, 2005 sponsored by NAFRI, SNV, LSUAFRP, FAO and Lux-Dev SA. We appreciate the organizers for the opportunity given to us.

Blesilda M. Calub
Farming Systems Research/Extension Adviser

Daniel Talje
Socio-Economics Associate Expert

Khamphou Phouyyavong
Socio-Economics Researcher

Summary

This case study was jointly conducted by the Farming Systems Research/Extension and Socio-Economics Component in order to document, assess and learn lessons from the experience of promoting soybean cash cropping in Xiengeun District, Luang Prabang Province. Such lessons learned will be relevant to the on-farm trials being conducted by LSUAFRP on integrated corn and soybean cropping.

Commercial production of soybean is a potential source of income to farmers, traders and government. Stakeholders, market factors and communication structures are some of the major determinants to successful promotion of soybean as a cash crop in Northern Laos. However, being a new cash crop, soybean production faces many challenges. Rapid large-scale monoculture promotion should be done with caution. Policy guidelines that encourage integrated farming systems plus supportive market information can help promote sustainable soybean production. Likewise a review of existing trading policies needs to be done to motivate farmers and traders for continued soybean production.

The concerted efforts of government, private sector, donor agencies and farmers will maximize positive impacts from agro-ecological, economic, socio-cultural or policy-institutional aspects. By being aware of possible negative impacts, stakeholders can be better prepared to put in place the crucial safeguards to cushion such impacts.

The experiences derived from this study show that providing sufficient technical know-how to both farmers and DAFEO staff in growing a new cash crop will ensure improved yields. Establishing a regular monitoring and feedback system can provide timely support and solution to production problems encountered in the field. It is important that LSUAFRP initiates establishing a market information system that links producers with markets and the private sector but taking care to balance the interests of all stakeholders. Open communication among stakeholders should be encouraged. As a kind of action research, documentation of the processes being undertaken by the program to promote soybean cash cropping is needed. The socio-cultural aspects related to farmers' adoption behavior is necessary to study and document.

Table of Contents

		Page
	Acknowledgement	
	Summary	
1.	Introduction	1
2.	Objectives	1
3.	Methodology	1
4.	Brief background	2
5.	Soybean facts	2
6.	Strategies for promoting soybean as a cash crop	2
6.1.	Production targets	2
6.2.	Production zones	3
6.3.	Contract-growing	3
6.4.	Technical support	5
7.	Soybean performance at end of cropping season	6
8.	Determinants to successful soybean production	6
8.1.	Stakeholders	6
8.2.	Market structure	7
8.3.	Market regulations	9
8.3.1.	Licensing system	9
8.3.2.	Taxation and fee system	10
8.4.	Market competition and efficiency	11
8.5.	Production volumes and informal trading	12
8.6.	Communication Structure	13
8.6.1.	Providing technological information	13
	8.5.1.1. Crop production technologies	14
	8.5.1.2. Pest management	15
	8.5.1.3. Post-harvest technologies	15
8.6.2.	Providing market information	15
8.6.3.	Monitoring and feedback	16
9.	Possible impacts of soybean production	17
9.1.	Agro-ecological impacts	17
9.2.	Economic impacts	18
9.3.	Socio-cultural impacts	19
9.4.	Policy-institutional impacts	20
9.5.	Special concern regarding aflatoxin	20
10.	Conclusions	21
	References	22

List of Table

Table 1	Stakeholder analysis of soybean production in Xiengeun District (2004)	7
----------------	---	----------

List of Figures

Figure 1.	Agricultural production zones in Xiengeun District, Luang Prabang (2004).	4
Figure 2.	Market structure of soybean in Xiengeun District	10
Figure 3.	Stages of agricultural market development from monopsony to perfect competition	11
Figure 4.	Flow of technological information to farmers	14
Figure 5.	Monitoring system among stakeholders of soybean production in Xiengeun District	16
Figure 6.	Feedback flow among stakeholders of soybean production in Xienguen District.	17

1. Introduction

One of the major objectives of the Lao-Swedish Upland Agriculture and Forestry Research Program (LSUAFRP) is to develop technology options based on indigenous and new knowledge that improves the sustainability and productivity of existing upland farming systems. To achieve this, LSUAFRP, through the Farming Systems Research/Extension Component implemented on-farm trials focusing on 12 farming systems technology options.

One of these technology options is on corn + legume (soybean or peanut) intercropping system. Based on farmers' early evaluation of the trials, many farmers are interested to try it in their own farms. This positive feedback encourages the expansion of the trial sites to include more farmers and larger areas. The research objective is to find out the performance of this technology under various growing conditions. Another objective is to document farmers' adoption behavior and their modifications on the technology to meet their particular needs and farm conditions.

But before LSUAFRP promotes soybean planting on large scale it would be good to examine the experiences of farmers in other areas where soybean planting has been recently promoted. The purpose is to learn from those experiences in terms of the determinants to promotion of soybeans. The success factors are those we need to put in place to ensure good results. However, the constraints and challenges should warn us and make us better prepared to face those challenges. It is likewise important to examine the possible impacts of promoting soybean as a cash crop. The idea is to find out what to do in order to favor positive impacts while avoid negative consequences.

2. Objectives

The objectives of this study are:

1. To document and assess the determinants to promoting soybean as a cash crop in Xiengeun District, Luang Prabang.
2. To analyze possible impacts of promoting soybeans as a cash crop.
3. To derive lessons relevant to promotion of soybeans in LSUAFRP sites.

3. Methodology

Semi-structured interviews, focused group discussions and field visits were undertaken in 2 villages, Ban Houykhout and Ban Phonesavanh in Xiengeun District, Luang Prabang province. Soybean cash cropping was newly introduced in the area in 2004. Resource persons included various stakeholders including District Agriculture and Forestry Extension Office (DAFEO) head and staff, District Commerce Office (DCO) head, farmers from study villages and head of Vilaykhoun, a private company in Luang Prabang

The interviews and discussions were done through translation by the staff of the Northern Agriculture and Forestry Research Center (NAFReC).

Some questions remain unanswered in this study. Due to language, cultural aspects and time limitations it was difficult to probe information from the different stakeholders. The finer details of discussions had been difficult to follow. Sometimes different respondents gave incompatible information. Triangulation was done to countercheck the information obtained from various sources. The results of this study are generally true for the situation in Northern Laos. It's applicability to other parts of the country may need to be studied.

4. Brief Background

In 2004, a private company called Vilaykhoun International Import-Export Company Limited initiated a contract growing scheme for soybean production in Xiengeun District. A contract was drawn between the company and the farmers such that soybean seeds are provided by the company at a cost of 8,100 kip/kg. Rhizobium inoculant is provided to farmers optionally at a cost of 8100 kip/200g pack. The farmers provided the land and labor inputs. At harvest, farmers were obliged to sell all soybean produced only to Vilaykhoun. The company bought it at an assured price of 1,500-2,000 kip/kg depending on seed quality. The cost of seeds provided earlier was deducted first and the remaining balance was paid to farmers. It was also possible to repay in kind at the rate of 4kg soybean seeds returned to the company for every kilogram seed loaned by farmers.

Likewise, a non-government organization, World Vision promoted the planting of soybean in Xiengeun. It provided training and seeds for farmers but no contract to buy back harvests was made. Farmers were free to sell to anyone interested to buy. Farmers were only asked to return to World Vision the same amount of seeds loaned to them.

Soybean as a cash crop is relatively new among the majority of farmers in the area. In the past, some farmers have planted it but in limited plots using local varieties. To most of the other farmers, it was their first time to plant soybean using new varieties recommended by Vilaykhoun or World Vision.

Judging from the information provided by farmers and Vilaykhoun, the soybean crop of 2004 did not meet expectations. Many farmers said they only have enough harvests to repay the company. Some said they did not have any harvests and therefore are indebted to the company. Some farmers though declared modest harvests.

The DAFEO, however, claimed 60% success in terms of productivity from the targeted 900 ha planted to soybeans. The basis for this claim was not explained. At a conservative estimated yield of 0.8 - 1.2 ton/ha, 900 ha of soybean farms were expected to yield 720 - 1,080 tons of beans. At 60% productivity, it means about 432 - 640 tons were produced. However, Villaykorn claims to be able to obtain only 200 tons of low quality soybean from the 2004 cropping season in Xiengeun. Because of the low quality and quantity, Vilaykhoun said it was not able to export the soybeans. The company can only sell them in the domestic market.

Assuming the claimed 60% success is correct, there is a remaining 232 – 440 tons of soybean which was accounted for by the following: (1) set aside as seeds for planting in the next cropping; (2) set aside for home consumption; (3) shared to other farmers for trial planting; (4) stored by farmers waiting for better prices; and (5) sold to other traders.

5. Soybean facts

Soybean (*Glycine max* L.) is a highly valued crop. It is an important source of superior yet inexpensive protein and oil for human consumption. A by-product from oil production, called soybean cake or soybean oil meal is an essential high-protein animal feed ingredient. As a legume, soybean's association with rhizobium bacteria enables formation of nodules where nitrogen is fixed from the atmosphere. This helps improve soil fertility.

Soybeans have been grown and consumed in China for more than 5,000 years (Debruyne). Today USA is the world's leading soybean producer. However, Brazil is decided to take the leadership in worldwide soybean production by 2010 (USDA 2003). Soybean is a sub-temperate crop but varieties have been developed to suit tropical growing conditions. In USA and Western Europe soybean is grown on large-scale high-input mechanized farms as a

monocrop. Average yields in USA is 2.6 tons/ha and in Western Europe is 3.5 tons/ha (IITA 2000).

In Brazil, it is grown as part of intensive crop rotation systems such as soybean-corn-millet or soybean-edible beans-rice rotations. Average yield in 2003 is 3.4 tons/ha but they aim to increase it further to 4 tons/ha (Truelsen 2003).

In Africa, soybean is mainly grown in small-holder farms either as a sole crop or mixed with other crops like corn or cassava. Inputs are minimal and field operations are usually done manually with yield average of 0.9 ton/ha.

Aside from China, other Asian countries with long history of planting soybeans are Japan, Korea, Indonesia and India (Shurtleff and Aoyagi 2004). In Lao PDR, soybean cultivation has been newly introduced.

Different from traditional crops in Lao PDR like upland rice, corn, sesame or job's tears which can easily grow in many areas, soybean is a sensitive crop. Soybean responds dramatically to its environment. Germination, growth, flowering, pod development and ultimately yield are highly influenced by variety, nodulation, soil fertility and moisture, climate and cultural management. Known yield reducers are weeds, insect pests and diseases (Pandey 1987). Thus to be able to maximize full yield potentials, farmers must know the factors that affect plant growth at each critical growing stage. It is also important for them to know how to prevent stress at such stages.

6. Strategies for promoting soybean as a cash crop

With the aim of increasing and diversifying income sources for farmers and providing alternative options to shifting cultivation, the government is actively promoting the production of cash crops, most recently of which is soybeans. Integration of soybeans in upland or lowland farming systems in Lao PDR will benefit human and animal nutrition as well as improve soil conditions. With a huge local and international demand, soybean is now regarded as a cash crop that has high potential for increasing income of Lao farmers.

Thailand appears to be a substantial market for exporting soybeans. However, Lao farmers have to produce soybeans the cheapest possible way in order to compete with bulk supplies coming to Thailand from Brazil. According to Villaykorn, domestic demand, is estimated at 1,000 tons per year. Of this only about 50% can be met by local growers. This means that there remains a big potential market that can absorb any volume of soybean produced.

Large-scale production of soybean as a cash crop was promoted in Xiengeun District through the following strategies:

6.1 Production targets

At the District level, production targets are set every year in terms of number of hectares to be planted to particular crops and number of tons to be produced per cropping season. In Xiengeun District, the 2003 production target for soybean was set at 180 ha. In 2004 it was 900 ha and for 2005 the targeted area is 2,000 ha. However, when the DAFEO staff checked with farmers only 1,534 ha can be committed for soybean planting. If expected yields from these areas are estimated at the conservative rate of 0.8-1.2 tons/ha, the district can expect a yield of about 1,200-1,800 tons of soybeans by the end of 2005.

By having production targets, the District is able to plan and provide Vilaykhoun and World Vision a basis for planning the provision of necessary inputs to production, mainly seeds for planting. This way there is some assurance that enough inputs will be provided to cover the targeted production areas. To meet the 900 ha production target for 2004, Vilaykhoun provided seed inputs enough to plant in 810 ha. World Vision provided 1.8 tons of seeds to cover 90 ha.

In addition, production targets enable the District to project volume of sales and expected revenue for the year in terms of fees to be paid to it by Vilaykhoun. In 2004, this was computed at 2% of the value of total soybean purchased by the company from the farmers in the district.

6.2 Production zones

Xiengueun District has a total of 74 villages. In 2004, 12 of these villages were assigned as production zones for soybean. Other villages were assigned as production areas for other agricultural crops such as corn, sesame, job's tears, NTFPs and livestock (Figure 1).



Figure 1. Agricultural production zones in Xiengueun District, Luang Prabang (2004).

Zoning is decided upon by DAFEO staff based mainly on (1) matching bio-physical requirements of the crop or agricultural activity with that of the prevailing biophysical conditions in the villages; (2) interest of farmers to plant the crop or raise the animals and (3) proximity to the roads and points of sale. The idea for the last criteria is to optimize road access for the harvests to reduce transportation constraints and costs.

6.3 Contract-growing

Depending on agreements under a contract growing scheme, an investor usually bears the cost of material and technological inputs to growers. On their part, the growers provide labor

and land to grow the crop. All harvests are sold exclusively to the investor at an agreed contract price before the start of operation.

Contract growing protects the investments of the company. In the Vilaykhoun contract, farmers are obliged to sell their harvests only to the company. Selling to other traders is considered illegal and offenders shall be fined 10 times the value of the products illegally sold. Likewise, farmers are obliged to sell to the company upon harvest and drying. Storage of their products is considered illegal. When found out, they shall be fined 10 times the value of the illegally stored products.

If production is lost due to natural disasters such as flood, drought, pests or failed germination, this should be reported immediately to the DAFEO. If not, the company will not take responsibility. The farmers will have to payback the inputs loaned to them. Additionally, if production was lost because farmers did not follow the recommended techniques, farmers will be fined 5 times the amount of the credit they obtained.

In that same contract, it states that the company will buy at the price of 1,500 kip/kg for small-seed varieties and 2,000 kip/kg for big-seed varieties. The contract states that farmers should sundry their soybean for at least 4 days to achieve 12-14% seed moisture content. The company may refuse to buy it if grain is infected with molds and is of very low quality. It is not clear whether farmers are made to understand that certain quality standards will affect the price of their soybean harvests.

An advantage under a contract-growing scheme, is that there is an assured price and buyer of the harvests. An assured price means that even if prevailing farm gate prices are lower than the agreed contract price, the investor will still buy at the agreed contract price. As stated in Chapter IV of the contract drawn between Vilaykhoun and farmers, the company shall be fined 10 times the value of the soybean produced by farmers if Vilaykhoun refuses to buy at the agreed contract price. If this is followed strictly, then it is good for farmers.

One question though is how the contract price is determined and who determines it. Whether farmers were able to negotiate for the 2004 contract price is not clear. If they want to join, they sign the contract according to the price stated there. If the price is not agreeable then they do not join, meaning they cannot avail of the seed and inputs credit.

6.4 Technical support

Of the 12 villages assigned to produce soybeans in 2004, only 7 have planted soybean as a cash crop. These villages belong to Khet Keukacham. Except for these villages, most farmers in the other villages assigned to soybean production do not have previous experience in growing the crop. Their technical know-how for soybean production is therefore limited.

Even among DAFEO staff, technical knowledge on soybean production is also limited. To address this limitation, Vilaykhoun and World Vision provided training on soybean production to DAFEO staff and heads of farmers' production groups. In turn, these DAFEO staff and heads of production groups provided training to the farmers in their respective villages. Further technical support was claimed to have been provided to farmers during the growing season.

7. Soybean performance in 2004 cropping season

On its first year of soybean cropping in 2004 in Xiengeun District, farmers and Vilaykhoun claimed that yields were quite low. Expected yields can range from 0.8-1.2 tons/ha but majority of farmers' actual yields were as low as 0.1- 0.5 tons/ha. Some farmers claimed better yields at 1.0 ton/ha.

According to interviews, causes of crop failure were due to the following:

- 1) Timing of planting. Planting in early April resulted to drought stress on the young soybean plants when rains did not come later. Early planting resulted to pod ripening during rainy season. This resulted to poor bean quality. Some seeds germinated while still in the pods.
- 2) Seedlings died at 4-5 leaf stage; roots dried up. Planting in June during high rainfall resulted to rotting of newly germinated seeds;
- 3) Too many seeds per hill resulted to competition for sunlight, soil moisture and nutrients between plants. Farmers used 10 seeds per hill instead of the recommended 3.
- 4) Too close planting space between hills resulted to shading and competition between plants.
- 5) None or poor germination of seeds
- 6) Not uniform growth of soybean plants

Below are other experiences by farmers:

- 1) Soybeans planted in good fertile soil grew very well but did not develop pods while those planted in rocky soil gave good yields.
- 2) Flowering of soybean is critical. Weeding done during late flowering stage resulted to low yields. If high rainfall coincided with flowering stage this resulted to poor pod development.
- 3) Soybeans planted in a newly cleared teak plantation had poor growth and many pods were unfilled. Those which had filled pods were black (probably molds) and therefore farmers were not able to harvest them.
- 4) Soybeans planted after rice harvest, with minimum tillage and mulched with rice straw gave good yields. Income was good because the rice mulch suppressed weed growth. This meant savings on labor for weeding.
- 5) Seed borers and molds were observed in the harvested soybean crop. One farmer used the left-over rhizobium to the harvested soybeans with the thought that it has insecticidal or insect repellent properties.
- 6) Some farmers harvested very small seeds. It is not known whether this is due to variety or to poor seed development because of lack of soil potassium and phosphorus.
- 7) Soybean seeds coming from Keukacham had better yields than those provided to them by Vilaykhoun.

8. Determinants to successful soybean production

Many factors determine the successful promotion of soybeans as a cash crop in Xiengeun District. Some of the more important ones are discussed below.

8.1 Stakeholders

The major stakeholders for soybean production in Xiengeun are: (1) Vilaykhoun; (2) DAFEO; (3) DCO; (4) heads of production groups; (5) farmers; (6) other traders and (7) World Vision. Their roles as well as their performance as perceived by other stakeholders are presented below:

Table 1. Stakeholder analysis of soybean production in Xiengeun District (2004).

Stakeholders	Roles	Performance as perceived by other stakeholders
Vilaykhoun	<ul style="list-style-type: none"> • Provide initial seeds and rhizobium inoculant • Provide technical advise • Buy back harvests from farmers • Gives assurance to buy harvests at agreed contract price even if prevailing farm gate price is higher. 	<p>As perceived by farmers:</p> <ul style="list-style-type: none"> • Vilaykhoun's buying price is lower (2,000 kip/kg) than prevailing prices of 2,500-3,000 kip /kg, thus they feel they are being exploited. • They are not clear why they are required to sell harvests only to Vilaykhoun even if they did not have a contract with this company; even if their seeds came from World Vision or even if they used their own local seeds. They feel they are trapped in this system. • Vilaykhoun did not give them good quality seeds for planting; the seed bags do not even have labels nor some kind of certification on quality • Farmers are not sure if the company will keep its word. They had a bad experience with job's tears in 2000-2001 from another company. When the prices became low no one bought their job's tears. <p>As perceived by DAFEO:</p> <ul style="list-style-type: none"> • Vilaykhoun is justified to buy all harvests (even if price is low) in order to protect the investments of the company • Vilaykhoun staff did not coordinate well their monitoring activities with DAFEO • Vilaykhoun staff went directly to the field sites without informing DAFEO thus DAFEO cannot fully assist them in monitoring the farmers
District Agriculture and Forestry Extension Office (DAFEO)	<ul style="list-style-type: none"> • Assist Vilaykhoun to establish contracts between farmers and the company • Train farmers on recommended techniques for soybean growing • Conduct inspection and monitoring visits to farmers' fields during the soybean growing season • Monitor farmers' harvests • Monitor total amount of soybean purchased by Vilaykhoun 	<p>As perceived by farmers:</p> <ul style="list-style-type: none"> • DAFEO staff were not really able to do something when the farmers reported that the seeds given to them failed to germinate. • Very little training was actually provided to farmers. <p>As perceived by Vilaykhoun:</p> <ul style="list-style-type: none"> • DAFEO and the District government as a whole are helping to protect the investments of the company by reminding farmers to sell only to Vilaykhoun and also by providing technical training to farmers

Stakeholders	Roles	Performance as perceived by other stakeholders
District Commerce Office (DCO)	Determine amount of fees and taxes that Vilaykhoun needs to pay to the district	As perceived by DAFEO: DCO staff are doing their job as expected of them
Heads of production groups	<ul style="list-style-type: none"> • Relay training to farmers • Coordinate with DAFEO to facilitate signing of contracts with Vilaykhoun • Provide feedback to DAFEO regarding production problems encountered by farmers • Coordinate collection of harvest from farmers within his group 	Information not available
Farmers	<ul style="list-style-type: none"> • Provide land and labor • Follow instructions from DAFEO and Vilaykhoun regarding recommended techniques for growing soybean • Sell all harvests to Vilaykhoun • Repay initial seeds in kind (at the rate of 4kg per kg seed received) or the value is deducted from the sales at 8,100 kip per kg seed received.) • Provide feedback to DAFEO regarding any problems from soybean growing 	As perceived by Vilaykhoun: <ul style="list-style-type: none"> • Farmers have learned growing soybeans from 2004 so they are expected to perform better this 2005. • Farmers have learned from their mistakes and are now following recommendations better. • Farmers sell their harvests to other traders therefore they are violating their contract. Selling to other traders is “illegal”.
		As perceived by Vilaykhoun and DAFEO: <ul style="list-style-type: none"> • Farmers did not follow instructions given to them regarding proper techniques for soybean growing; according to Vilaykhoun it is quite a tradition among Lao farmers not to follow instructions.
Other traders	<ul style="list-style-type: none"> • Buy soybean harvests according to prevailing farm gate prices (usually higher than that offered by Villaykhoun) 	As perceived by Vilaykhoun and DAFEO: <ul style="list-style-type: none"> • Other traders are opportunists in that they gain profits even if they did not make any investments in growing soybeans • What they are doing is illegal because they are able to buy products without paying appropriate taxes and fees to the government
		As perceived by farmers: <ul style="list-style-type: none"> • Other traders enable them to sell at better prices and therefore gain better profits from their produce
World Vision	<ul style="list-style-type: none"> • Provide soybean seeds • Provide technical know-how for planting soybeans 	Information not available.

Different stakeholders regard each other positively or negatively. This becomes aggravated by lack of communication among them. Perhaps joint meetings or workshops among the different stakeholders can help improve working relationships among them.

How the different stakeholders regard each other has consequences both from the production, economic and social aspects. The production aspects include lack of interest of some farmers to plant soybean again because of the failure they experienced and because of the low buying price offered to them. However, there are farmers who are willing to try again this year.

The social aspects include feelings of distrust among and between stakeholders. On one hand, farmers feel they are being exploited by Vilaykhoun because the buying price is too low and that they are prevented from selling to other traders. On the other hand, Vilaykhoun regards farmers as not keeping with the contract. There could be suspicions that farmers are declaring small harvests only enough to repay the loaned seeds. They do not fully declare all harvests with the intention to sell it to other traders that offer better prices.

Economic implications are discussed in more detail in the following sections.

8.2. Market structure

Figure 2 presents the interaction of the different stakeholders involved in the marketing aspects of soybean in Xiengueun District. Inputs in the form of seeds are mainly provided by Vilaykhoun and World Vision to heads of production groups. These are then distributed to farmers within their assigned groups. Some farmers have their own local seeds. At the end of the cropping season, outputs or the soybean harvests from farmers are assembled by the heads of production groups. DAFEO is notified if the soybeans are ready for pick-up. This is then coordinated with Vilaykhoun which sends its trucks to haul the harvests. In 2004, these harvests were intended to be sold to the international market in Thailand. However, because of the low volumes, Vilaykhoun could only sell to the domestic market in Vientiane and Luang Prabang.

Though it is not admitted openly, there seems to be common knowledge that farmers sell part of their produce to the informal traders who come to the villages and buy directly from farmers. By the nature of this sales, it is difficult to determine the volume of soybeans actually traded.

The role of the Provincial Commerce Division is to issue the annual license and collect taxes based on net profits. The District Commerce Office (DCO), on the other hand, collects taxes based on the amount of soybean shipped out from the district. This amount is based on what is reported to the DCO by Vilaykhoun. How this volume of sales is verified by the DCO is not clear.

8.3. Market regulations

Market regulation in the form of taxes and the licensing system serves as a legal barrier for entry by other traders in the district. According to DAFEO, this is done to protect the trader's investment, otherwise, no one will want to make any investments and therefore there will be no trading to speak of. Likewise, the licensing system helps monitor revenues for the government.

8.3.1 Licensing system

In the case of Xiengueun District, the Luang Prabang Provincial Commerce Office issues the "license to operate". A new license has to be purchased every year and its cost is related to a trader's scale of business. In 2004, Vilaykhoun paid 5 million kip to obtain the license. In addition, a tax of 35% of net profit has to be paid by Vilaykhoun at the end of trading.

Vilakhoun accepts this system because in return it gives the company legal rights to buy all soybeans produced in Xiengeun, whether it comes from its contract growers or not.

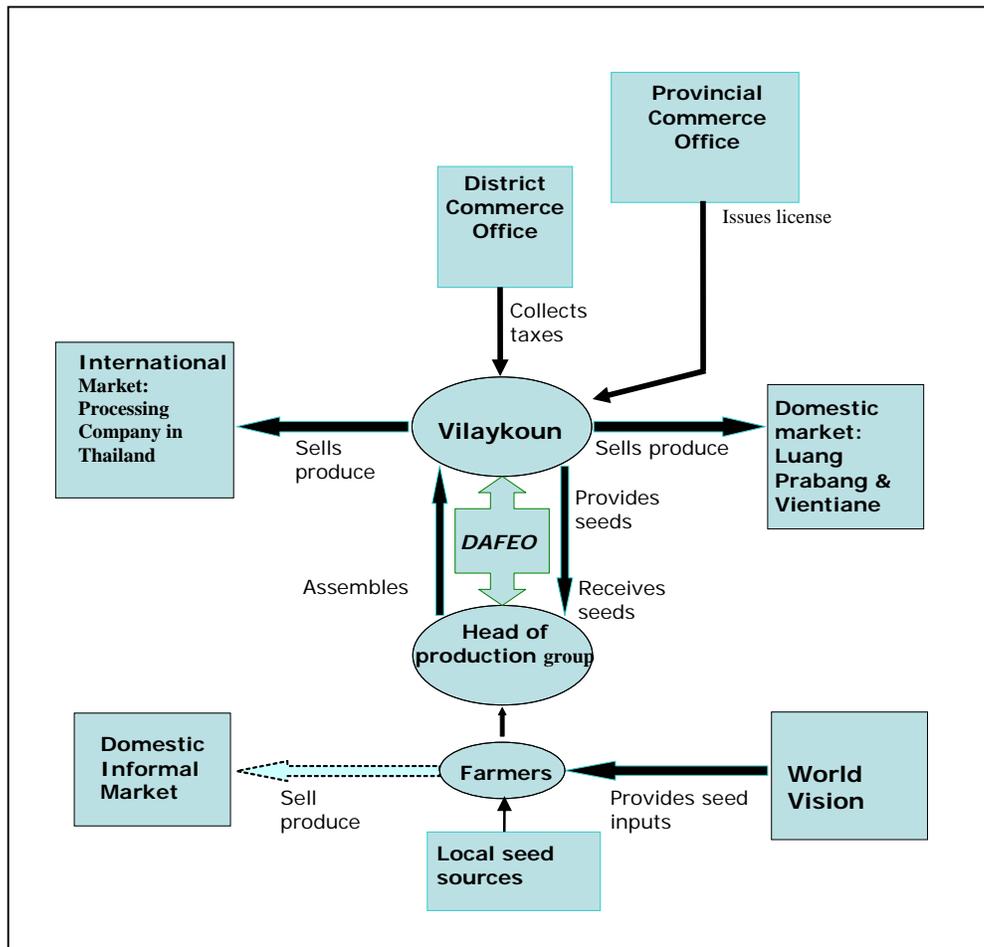


Figure 2. Market structure for soybean in Xiengeun District.

8.3.2 Taxation and fee system

In addition to the license and taxes at the provincial level, there are also taxes paid at the District level. Vilaykhoun pays a tax of 2 percent on all sales of soybeans that are bought by the company from the District. If in case Vilaykhoun exported the soybeans to Thailand, the company has to pay 15 kip/kg at the border crossing.

Besides these formal taxes, there are optional informal incentives that the company pays. The heads of production groups receive 50 kip/kg of soybean produced by their respective groups. The District receives 20 kip/kg of total soybeans purchased by the company. All together, the taxes and fees add up to approximately 200 kip/kg. Using the figure of 200 tons of soybean traded in 2004 as claimed by Vilaykhoun, this means a total of 40 M kip was paid as taxes and fees.

This could be a burden to the company. This added cost could also be the reason why other traders are discouraged to register and become accredited legal traders.

Finding the right balance between generating tax income without setting back the trader's business activities is certainly not an easy task. Taxes bring income to the District, which are

highly desirable. On the other hand, if tax rates and fees are above a certain level, there will be no incentives for traders to increase its scale of business or for others to join the market. High taxes may also encourage traders to under-declare the real volume they traded in the market. In the long run, that might in fact result to reduced tax income for the District.

8.4. Market competition and efficiency

Figure 3 presents the stages of development for agricultural markets from monopsony to the more pro-farmer stage of perfect market competition. Under a monopsony there is no competition. Overall productivity and efficiency of the market is much below its maximum potential. Development from monopsonistic competition towards the ideal perfect competition leads to better bargaining power and increased income for the farmers. It also opens up possibilities for new traders to enter the market. Productivity and efficiency of the market is thus maximized.

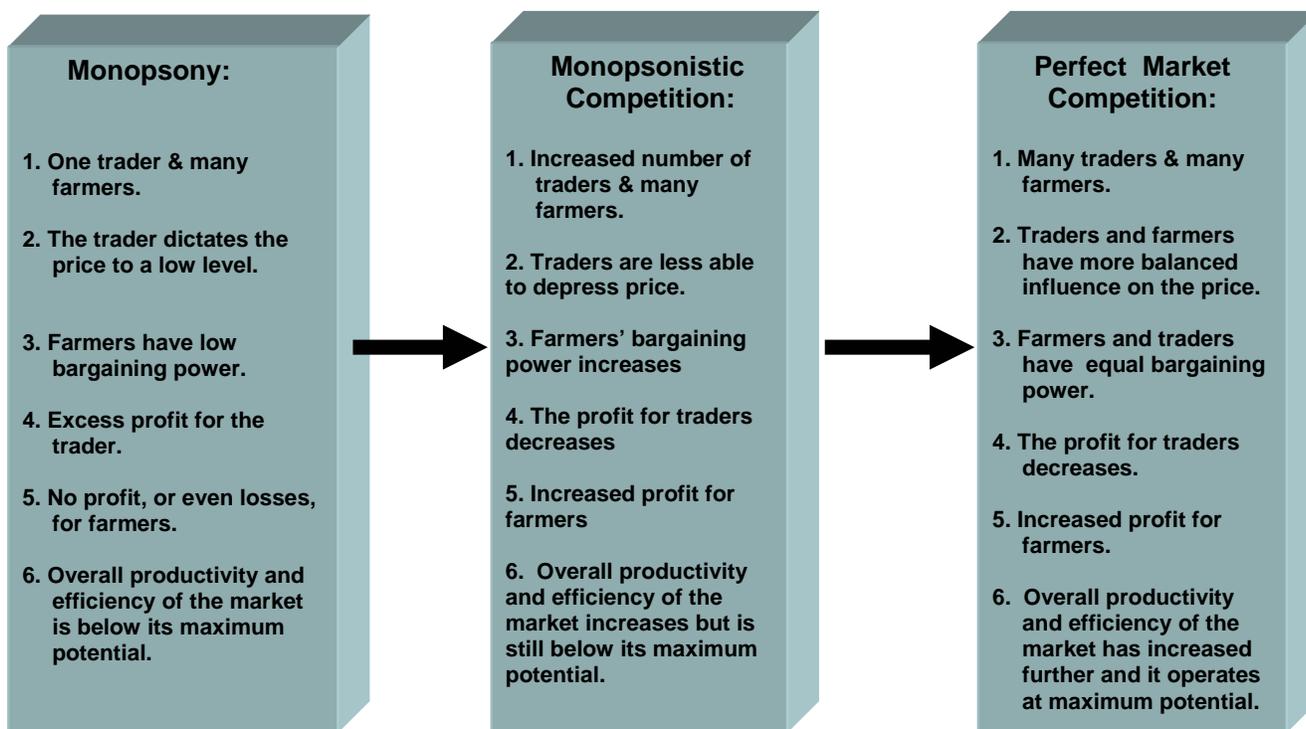


Figure 3. Stages of agricultural market development from monopsony to perfect competition.

Monopsony is a market situation where in there is only one buyer but many sellers. In this case, Vilaykhoun is the buyer while farmers are the sellers. In such a situation where there is only one buyer, that buyer can dictate the price. As Vilaykhoun is the only buyer, it somehow dictates the price by stating it in the contract that farmers sign. Farmers have to accept whatever they are being offered in the contract. If they refuse to take part then they do not receive the input credits. What's confusing though is that at harvest time, all farmers in Xiengeun are obliged to sell only to Vilaykhoun whether or not they participated in the contract or not. Farmers who used their own local seeds or obtained seeds from World Vision were still required to sell only to Vilaykhoun.

Some District officers claim that trading is not exclusive for Vilaykhoun. Other traders can apply for a license and start trading in Xiengeun. However, if a new trader wants to participate in the market, the DAFEO officers recommend that the market should be geographically divided between the two traders. All farmers producing soybeans in zone 1 shall sell to trader 1 and soybean-producing farmers in zone 2 shall sell to trader 2. On closer look, this situation still results to monopsony. In essence, this is still a situation where there is one buyer and many sellers in a given area. The preferred situation is where farmers can sell to any trader who can give them a better price.

There is a common belief among District officers that protection of a single trader is the way to reach a state of higher efficiency and welfare for the market actors. On the contrary, competition should in fact be encouraged. Competition is the very factor that will force companies to become efficient and strong in the long-run. In a market system that is heavily regulated, the benefits associated with high competition will not materialize. Instead, the market is likely to be fixed in a stage of monopsony with negative wealth consequences for farmers and the economy as a whole.

8.5 Production volumes and informal trading

Based on the current regulations in Xiengeun District, two main obstacles for the functioning of the market are recognized:

1. The volume of soybeans that farmers sold to Vilaykul in 2004 was far too small to enable the company to lower soybean costs per unit and reach economies of scale.
2. The contract-growing farmers violated the contract with Vilaykul and sold a considerable volume of their production “illegally” to traders in the informal market (thus informal trading).

The monopsony situation, as regulated by the contract, allows Vilaykul to set the price at a low level to maximize its short-term profits. The negative consequence of this is that Vilaykhoun was not able to meet production volumes that will enable it to reach economies of scale. First, this low price resulted to illegal trading. It discouraged farmers from selling to Vilaykhoun while it encouraged them to sell to traders in the informal market. While this is considered a violation of the contract and an act against the law, farmers are actually showing logical economic behavior. Any rational human being would want maximum returns from his inputs. This so called “illegal trading” can be understood as a coping strategy for farmers to earn decent income from their products.

Second, the low price has also discouraged, further planting of soybeans among farmers. They may rather go into other more profitable income-generating activities.

In the long run, Vilaykhoun may not find it profitable anymore to continue the business. The low volume of soybeans sold to it will be too small for it to recover fixed costs and reach efficiency of production. This then becomes a lose-lose situation. Farmers lose the assured buyer and government loses a source of revenue.

On the other hand, if competition were allowed to increase among traders, Vilaykul would be forced to offer the farmers a higher price for their products. Positive effects are expected. First, a higher price would create more incentives for farmers to expand soybean production. Other farmers may also be encouraged to start growing soybeans. This ultimately increases the total volume of produce. Although Vilaykul needs to share the total produce with

competing traders it is likely that they still will be supplied with a larger quantity than what is the case today.

Second, farmers' illegal trading will decrease considerably. If there is little or no difference between buying prices, the incentives for farmers to take part in illegal selling will diminish. The small gains to be made from selling part of their produce illegally will be negated by the risk of getting caught and be made to pay fines. So transforming the market from the current monopsony situation into a state of increased competition among traders is expected to discourage illegal trading, increase profit for farmers and channel more of the produce to legal traders thus enabling them to reach economies of scale.

8.6 Communication Structure

8.6.1 Providing technological information

Provision of technological information regarding best practices for growing a new and sensitive crop like soybeans in Xiengeun is crucial to ensure a good harvest. Without good harvests there is nothing to trade. How to deliver information effectively and in a timely way is the challenge.

Figure 4 presents how technological information was provided to Xiengeun farmers. Vilaykhoun hired a Thai professor who trained DAFEO who in turn relayed the information to farmers. The relay training took half-day per village. In some villages, training lasted for only 2 hours. The training was more of discussion sessions rather than formal training. Problems related to soybean growing were tackled. A leaflet on recommended cropping practices for soybean was provided by the Thai professor during the training.

On the other hand, World Vision hired a "model" successful soybean farmer from Sayaboury and a Thai technician who trained both DAFEO and Heads of soybean production groups who in turn trained farmers. It should be noted that some farmers have their indigenous knowledge regarding soybean growing. However, the planting they did in the past was on a limited scale intended for home consumption.

Whether farmers were able to learn sufficiently from the training or whether they were able to apply what they learned was not directly measured. However, judging from the feedback on the possible causes of crop failure, one begins to think about the effectiveness of the training provided, how it was conducted and what kind of information was given.

According to interviews, the farmers did not follow the instructions because they are known to be like so. But according to farmers there was very little training given to them. Learning the lessons from this experience, farmers would benefit much if follow-up training is conducted as a series throughout the growing season and accompanied by practical field work and demonstrations. One time "training" as was done in Xiengeun proves it was not enough.

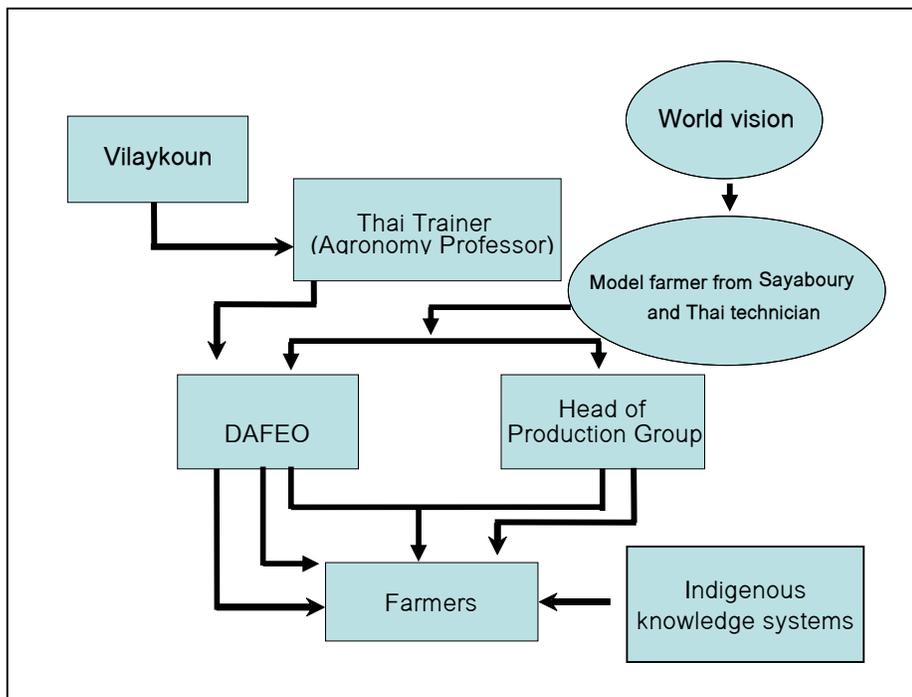


Figure 4. Flow of technological information to farmers.

8.6.1.1. Crop production technologies

The kind of information being given to farmers needs to be reviewed. For example, the Vilaykhoun contract recommends a seeding rate of 60kg/ha whereas elsewhere the recommended seeding rate is 20-25 kg/ha. High seeding rate results to overcrowding of plants, shading, nutrient competition and eventual reduction in yields. From the economic point of view, high seeding rates result to high input costs, which in this case means that farmers get indebted unnecessarily.

Information for soybean growing also needs to be classified according to cropping system. Planting in upland areas at the start of the rainy season will require a different set of practices from those planted in lowland areas after the rice harvest towards the start of the dry season. It would be good to provide specific recommendations to farmers.

Different locations will differ in soil types and fertility. It is important that farmers are guided in the choice of land where soybean will be planted. As a legume with the ability to fix its own nitrogen, soybean does not need additional nitrogen unless the soil is too degraded. However, soybean requires adequate amounts of phosphorous and potassium. These need to be added at planting time if the soil lacks them. Lime may need to be applied if the soil is too acidic. The decision to add any elements to the soil should be based on a reliable and timely soil analysis and diagnosis.

Different varieties of soybeans will require different planting techniques, soil water management, fertilizer application and harvesting periods. Farmers have to be properly informed about these varietal differences so they will know how to make the necessary adjustments.

8.6.1.2. Pest management

In the succeeding cropping seasons, when soybean planting will involve larger areas and more farmers, attention should be given to pest dynamics. Soybeans are attacked by many insect pests and diseases beginning at seedling stage, pre-flowering, flowering, pod formation and pod development. Farmers and DAFEO staff need to know in advance what these pests and diseases are and the proper control measures. Appropriate integrated pest management (IPM) options should be chosen against indiscriminate use of hazardous chemical pesticides.

8.6.1.3. Post-harvest technologies

Aside from providing information on crop production practices, it is important for farmers to learn about correct post-harvest and storage technologies. Yields can be spoiled by as much as 80% with improper storage. Infestation by insect pests or contamination by *Aspergillus* (a fungi that produces aflatoxins, a cancer-causing poisonous compound) can be minimized by properly harvesting on time and immediately drying the crop after harvest.

8.6.2 Providing market information

Market information includes prices, quality standards, volume demands and markets. It is also about identifying products, sellers, traders, and mapping out market channels. As the main producer, farmers should be provided clear market information. It is important for them to understand that their crop production and post-harvest practices have direct effects on the resulting quality of their products. Depending on that quality, the price of their products and therefore their income will be affected.

As an example, international market standards accept 12% moisture content and aflatoxin levels of not more than 20 ppb (parts per billion) (ARPRODUC 2005). Aflatoxin is a cancer-causing substance produced by *Aspergillus flavus* fungi which grows quickly in seeds with high moisture contents ranging from 13-32%. Immediately drying the crop to 12% reduces this aflatoxin risk (ICRISAT).

A company gives a lower price for soybeans with high moisture content because they will have to spend for the drying process to make the product acceptable to the international market. This is the reason why seed moisture content affects price. Thus, soybean with a high moisture content of 18-19% is priced at 2,000 kip/kg while soybean with the desired moisture content of 12 % is priced by Vilaykhoun at 2,500 kip/kg (2004 prices).

In the case of some farmers in Xiengeun, they revealed they are not selling their soybean yet with the intention of waiting for a better price. Meanwhile, they observed that insect pests are eating up their stored soybean crop but they don't know what to do. One farmer said he applied the left-over rhizobium powder to his stored soybean believing it has insecticidal or insect repellent properties. Providing farmers with knowledge on correct storage techniques will enable them to store their products safely.

Farmers also need to know prevailing prices of products, traders, channels and other market information. Based on that they can make informed decisions on when or where to sell or what crops to grow that they think can give them better income. Their capacity to negotiate can be improved if they are equipped with correct and timely market information.

8.6.3 Monitoring and feedback

Figure 5 shows the monitoring system among stakeholders of soybean production in Xiengeun District. Monitoring in farmers' fields is done either solely by DAFEO (shown in the figure as bold lines) or sometimes jointly with the staff of Vilaykhoun or World Vision. Vilaykhoun and World Vision do not necessarily always go to the field to monitor farmers' activities but may only check with the DAFEO. We have conflicting information regarding frequency of the monitoring visits. According to the DAFEO and Vilaykhoun staff, they jointly monitor regularly together with the heads of production groups, but according to farmers this is not so. Monitoring by the District Office is minimal (shown as broken lines).

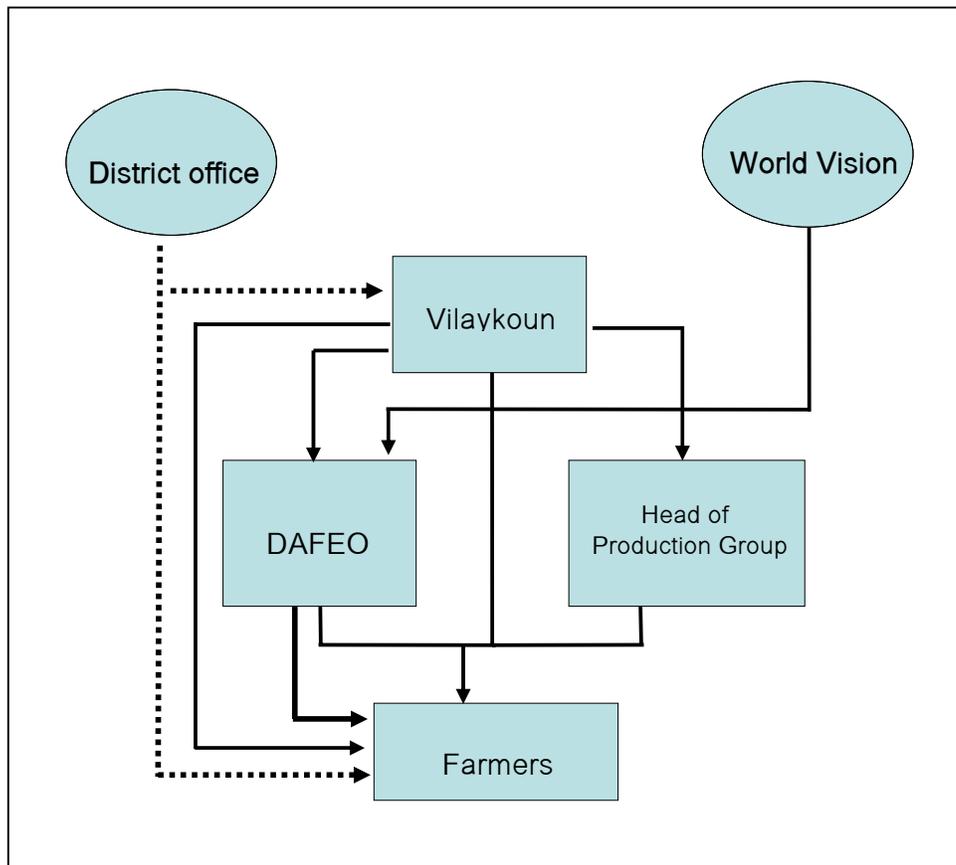


Figure 5. Monitoring system among stakeholders of soybean production in Xiengeun District.

At present there are only 5 DAFEO staff in Xiengeun district. One DAFEO staff is assigned to one Khet (development zone). Each Khet consists of 6-14 villages. The DAFEO staff does not only monitor soybean production but also other crops and products. By sheer ratio of DAFEO staff to the number of farmers they have to serve, the number of various crops they have to monitor and the road conditions of the areas they have to visit, it is understandable that not enough monitoring and technical support can be provided to farmers.

The feedback mechanism is shown in Figure 6. Farmers report to their heads of production group regarding problems with their soybean production. The heads would then pass on the information to DAFEO staff. In turn, DAFEO staff passes on the information back to

Vilaykhoun or World Vision. How and when Vilaykhoun or World Vision responds to those problems is not clear.

According to the experience of some farmers whose seeds did not germinate, they immediately informed their head of production group about their situation. They were expecting that some replacement seeds can be provided by Vilaykhoun. Unfortunately, no such replacement seeds arrived. It is not clear whether the problem reached the intended receiver or whether the message was received but was not acted upon. Had the feedback and response system been more efficient, possible solutions to production problems could have been provided on time.

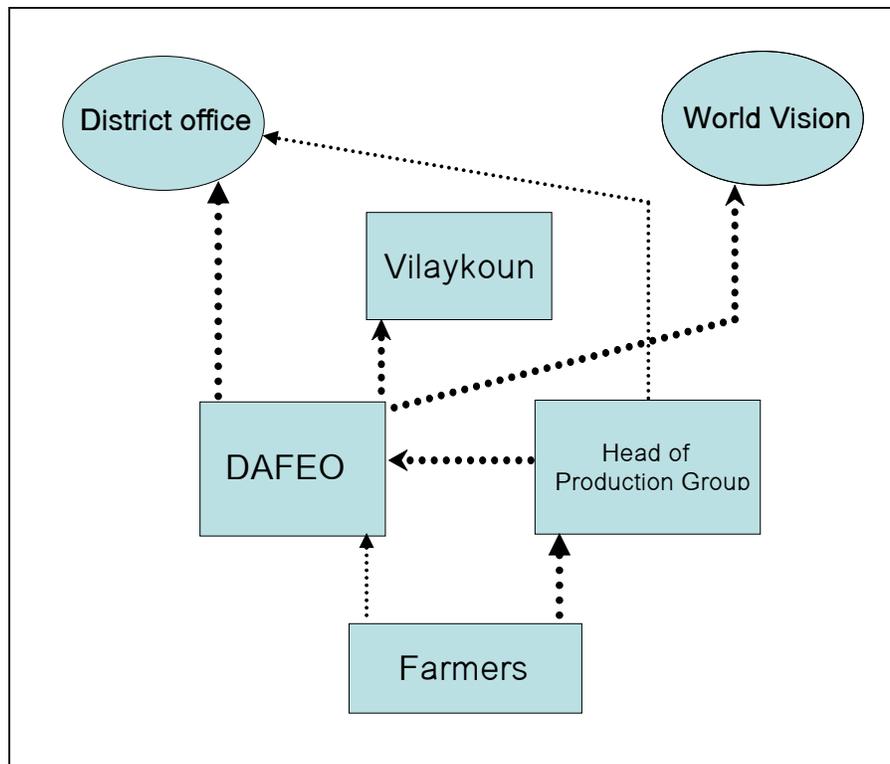


Figure 6. Feedback flow among stakeholders of soybean production in Xiengueun District.

9. Possible impacts of soybean production

The overall impact of soybean production can be viewed according to 4 major aspects. While they are presented separately for clarity, it should be noted that these different aspects are actually inter-related. Each aspect can directly or indirectly influence the other.

9.1 Agro-ecological impacts

Because soybean is a nitrogen-fixing legume it will have positive impact on soil fertility in the long term. However, depending on inherent soil nutrients, soybeans may require additional applications of phosphorus and potassium fertilizers.

Integration of soybeans in existing cropping systems will maximize land utilization as well as provide additional income to farmers. As part of a crop rotation system, soybean planted

after harvesting lowland rice will have positive effects on the following rice crop due to soil improvement and soil moisture retention. This is most favored when rice straw from the previous crop is used as mulch to the soybeans. Mulching also controls weed growth thus saving labor for weeding. In upland farms, soybean maybe integrated in a block crop rotation system for soil improvement. Soybean can also grown as an intercrop to corn without reducing corn yields.

Planting soybeans as a monocrop could be more simple to manage but we should be careful to consider that it can easily give way to the wanton use of agro-chemicals. Pest outbreaks are more likely to erupt in monocropping systems. Knowing that soybeans have a lot of pests in all stages of growth from pre-planting up to post harvest, farmers can easily be tempted to use pesticides. Thus while this early, sustainable practices of Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) needs to be promoted. Crop rotation, intercropping and use of disease-resistant varieties are some of the good practices. Indiscriminate use of agro-chemicals should be discouraged since they are not only hazardous to the environment but also reduce the profit margin for farmers. Agro-chemicals in Lao PDR are currently expensive and most are imported which will then have implications on the dollar reserves of the country.

Soybean production may have negative impact on soil erosion if planted in sloping areas without erosion control measures. It is thus important to include conservation farming techniques like contour cropping or hedgerow intercropping when promoting soybean production to upland farmers.

It should be cautioned that economic pressures to intensify soybean production nationwide should not encourage more slash-and-burn cultivation as what is now experienced in South America. "In Brazil and Paraguay vast tracts of rainforests were cleared to give way for soybean production. The Brazilian government, in its most recent evaluation of the pace of the destruction of the Amazon rainforest, has sounded alarm bells. It said in the 12 months to August 2004, the pace of destruction was at a 10-year high, and it attributed the destruction to Brazil's economic recovery in general and its soybean export boom in particular" (Monahan 2005).

9.2. Economic impacts

At a farm gate price of 2,000-3,000 kip/kg, soybean has higher value than paddy rice at 1,200-1,500 kip/kg or corn at 1,000-2,000 kip/kg (2004 prices in Xiengueun District). With proper integration into existing cropping systems, soybeans can provide additional source of income for farmers. In Ban Houykhout, Xiengueun District, Mr. Lunjamdee obtained an additional net income of 120,000 kip from a 500m² plot that he planted to soybeans after harvesting his lowland rice crop.

LSUAFRP on-farm trials in selected villages in Phonsay District, Luang Prabang and in Namo District, Oudomxay have shown that yields of corn were not significantly reduced when intercropped with soybean. The advantage is that soybean yields provided an additional income of 1.3 M kip/ha versus 0.6 M kip/ha from pure corn cropping. Furthermore, 7 out of 15 farmers say that intercropping reduced the number of times to do weeding from 3 times to 2 times per cropping season (Sisavath et al 2005). This means savings on labor inputs especially for women who usually do the weeding operation for corn.

As a cash crop intended for export, soybean is highly susceptible to price fluctuations in the international market. Price is dictated by the main buyer, in this case Thailand. What will happen if the international market refuses to buy as what had been experienced with job's tears in the early 2000s. Safeguards need to be put in place so that farmers do not become

totally helpless just in case. Multiple cropping versus monocropping has its economic advantages. If income from soybean fails, the other crops can provide fall back alternative income.

It could be difficult for Lao farmers to compete with the large-scale mechanized farming in Brazil, the US and Europe which enables these countries to produce the crop at lower costs. Can Lao farmers take advantage of niche markets instead? There is now a growing health consciousness among the public especially in Europe and the US. Preference for organically grown food and the reduction of meat consumption in favor of vegetarian food is a trend that Lao traders and government can take advantage of. By focusing on niche markets, organically grown soybeans will be able to command a higher price.

Soybean trading should look into exporting not raw beans but semi-processed or finished soy products to provide added value. Local processing will also help reduce the need to import basic soy-based products like cooking oil and soy sauce that are indispensable to Lao households.

The by-product soybean meal or cake is a highly nutritious animal feed ingredient. This has big potential for improving the quality of animal feeds if directly used. It can also encourage a spin-off business to set-up feedmills for processing concentrate feeds. The economic advantages of aiming for self-sufficiency in basic soybean products and by-products deserves study. Increased domestic utilization also reduces reliance on export markets.

9.3. Socio-cultural impacts

Soybean as a source of income has the potential positive impact of reducing poverty among farmers. However it is important that farmers are empowered to be active participants in the trading aspects. They should be able to negotiate for better prices especially under contract-growing schemes. Opportunities for forming cooperatives for production and marketing needs to be explored. Providing reliable and timely market information plus technological know-how is important.

Soybean is a high-protein human food. Promoting household consumption will improve nutrition and consequently health of the farm family. Likewise, soybean by-products are nutritious animal feeds. By providing good quality feed to domestic animals, better animal health, growth and reproduction is expected. Better animal production leads to increased sources of income and assets of the farm household. However, care should be given regarding aflatoxin and its effects to humans. Farmers need to be informed properly how to prevent or minimize aflatoxin contamination of soybean during harvest and storage.

Does ethnicity play role in promoting soybeans as a cash crop? According to the LSUAFRP on-farm trials by Sisavath et al 2005, soybeans has been traditionally grown by Hmong farmers thus it was easy to promote further cultivation among these ethnic group. The women normally cook it for home consumption and can process it into tofu and traditional fermented products. They know the markets for raw beans as well as processed soy food products. However, among Phousang people in Ban Saysamphan, Namo District, Oudomxay, soybeans is not a familiar crop. It was their first time to plant it in 2004 when it was introduced by LSUAFRP. Only a few were interested to plant again the following year. Others who did not continue to plant said, they don't know where the markets are, and besides they don't like to eat it because they said "bo sep" (not delicious). Perhaps, providing them market information and teaching them different ways of food preparation will enable them to appreciate the value of this crop.

It is encouraging to see soymilk, tofu and soy fermented products being sold in major markets in Lao PDR and along streets in Vientiane. It provides income for the women who

sell them. It was mentioned by farmers in Xiengeun that the so-called “illegal buyers” of soybean in their district were actually small traders who buy for domestic processing into soy products.

9.4. Policy-institutional impacts

The taxation and licensing system may need to be reviewed in order to encourage more investments and free trade. The international market sets a floor price which local traders cannot influence. In order to make decent profits, the company tends to lower the buying price of soybeans in order to recover its operating costs and taxes. In effect, the farmer also bears the burden of the taxes. Vilaykhoun says that if taxes were kept low or were removed, they can raise the buying price of soybeans from farmers.

Determining optimum tax and fee levels for the soybean market in Xienguen District is not within the scope of this study. Yet, at a glance the fees and taxes for Vilaykhoun seem substantial. For that reason, it is important for policy makers to recognize how tax and fee burden on traders influence market efficiency and income generation for traders, farmers as well as government.

Promoting wide-scale planting of a new crop like soybeans where both farmers and DAFEO have limited technological know-how can result to a “trial and error” production system. In a situation where survival of the farm family is at stake, this is undesirable. Therefore, investments should be made in strengthening the technical capacity of the DAFEO who in turn can teach and support the farmers. Policies that support integrated versus monoculture cropping should be encouraged.

The ratio of DAFEO staff in relation to the number of farmers they have to serve needs to be looked into. In the case of Xiengeun, only 4 agronomists serve farmers in 74 villages or an average of 18-19 villages per DAFEO staff. The number of DAFEO staff can be increased. An alternative would be to strengthen the technical capability of heads of production groups. They will not only serve as center points for technological knowledge but also for market information. Closer coordination, monitoring and feedback systems can be improved through these better trained heads.

Post harvest and transportation facilities plus improved road networks can be big investments but government and private sector can collaborate put these in place.

9.5 Special concern regarding aflatoxin

Aflatoxin contamination has agronomic, economic, socio-cultural and policy-institutional implications. From the agronomic standpoint, growth of *Aspergillus* in soybeans can be minimized by the following measures: (1) use good quality seeds at planting; (2) use aflatoxin-resistant varieties; (3) avoid end-of-cropping moisture stress of more than 20 days; (4) avoid damage to the pods either mechanically or by insects at harvest; (5) harvest at the right maturity; (6) thresh and dry immediately to 12% moisture content; and (7) observe storage.

From the economic aspect, aflatoxins contamination will drastically reduce soybean price. High aflatoxin levels will render it unfit for human consumption. Thus, it will be priced as animal feed grade which is usually much lower than “human food grade”. A farmer may be able to produce high yields and expect good income but this can be easily negated by high aflatoxin presence. Farmers who do not sell immediately after harvest to wait for better prices may end up losing income due to aflatoxins contamination from improper storage.

Relevant policies and institutional support are important in minimizing aflatoxins in soybeans. Providing farmers some training, technological and market information is necessary. Providing drying and storage facilities and efficient transport systems are investments that government and the private sector can focus on. For example, Vilaykhoun has invested in a drying machine for soybean and other crops. This adds to the company's fixed costs which needs to be recovered as soon as possible. However, due to low soybean volume this year, it is not able to run the machine efficiently enough. This means recovery of investments is delayed.

On socio-cultural aspects, the women who prepare soybean and soy products for their families should be made aware of the health hazards caused by aflatoxins. While soybean consumption is being promoted to improve family nutrition, it can end up causing health problems like liver cancers if women are not adequately informed. In Africa, aflatoxin from various foods impairs growth among children while in India it causes childhood cirrhosis.

10. Conclusion

Commercial production of soybean is a potential source of income to farmers, traders and government. Stakeholders, market factors and communication structures are some of the major determinants to successful promotion of soybean as a cash crop in Northern Laos. However, being a new cash crop, soybean production faces many challenges. Rapid large-scale monoculture promotion should be done with caution. Policy guidelines that encourage integrated farming systems plus supportive market information can help promote sustainable soybean production. Likewise a review of existing trading policies needs to be done to motivate farmers and traders for continued soybean production.

The concerted efforts of government, private sector, donor agencies and farmers will maximize positive impacts from agro-ecological, economic, socio-cultural or policy-institutional aspects. By being aware of possible negative impacts, stakeholders can be better prepared to put in place the crucial safeguards to cushion such impacts.

The experiences derived from this study show that providing sufficient technical know-how to both farmers and DAFEO staff in growing a new cash crop will ensure improved yields. Establishing a regular monitoring and feedback system can provide timely support and solution to production problems encountered in the field. It is important that LSUAFRP initiates establishing a market information system that links producers with markets and the private sector but taking care to balance the interests of all stakeholders. Open communication among stakeholders should be encouraged. As a kind of action research, documentation of the processes being undertaken by the program to promote soybean cash cropping is needed. The socio-cultural aspects related to farmers' adoption behavior is necessary to study and document.

It should be noted that conclusions presented here are true only for the case of Xiengoun District particularly the case study villages. Other districts may have similar or different experiences. It maybe of interest to document those experiences for comparative analysis.

References:

- ARPRODUC 2005. Argentina Commodities Exporters and Mercosur Trading Operators
<http://webs.satlink.com/usuarios/a/arproduc/soybeanmeal.htm>
- Debruyne I. (undated paper for the American Soybean Association) Soybean.
<http://oilseeds.org>
- ICRISAT. International Crops Research Institute for the Semi- Arid Tropics. www.icrisat.org
 and www.aflatoxin.info
- IITA. International Institute of Tropical Agriculture. 2000. <http://www.iita.org/crop/soybean.htm>.
- Monahan J 2005. Soybean fever transforms Paraguay.
<http://news.bbc.co.uk/2/hi/business/4603729.stn>
- Pandey RK. 1987. A Farmers' primer on growing soybean on riceland. International Rice Research Institute (IRRI) and International Institute of Tropical Agriculture (IITA). Laguna, Philippines. 216p.
- Sisavath O, V Navongsay, X Soukhy and K Inta. 2005. On-farm research on corn and legume intercropping in selected villages in Luang Prabang and Oudomxay. Annual Technical Report. Lao-Swedish Upland Agriculture and Forestry Research Program. Lao PDR.
- Shurtleff W and Aoyagi A. 2004. History of World Soybean Production and Trade. Soyfoods Center, Lafayette, California. <http://www.thesoydailyclub.com/SFC/historysp&t202.asp>
- Truelsen S. 2003. Brazil's Developing Soybean Production.
http://www.gfb.org/focusag/Brazil_bean.htm
- USDA (United States Department of Agriculture) 2003. Soybean production growing 5x ours. "Oilseeds: World Markets and Trade" / FOP 07-03. July 2003.
www.ifbf.org/programs/commodity/pdf/200309_brazil/tsld028.htm