FACULTY OF LIFE SCIENCES
UNIVERSITY OF COPENHAGEN

Tomato production

a story of development in PhoThong Phattana village

Interdisciplinary Land Use and Natural Resource Management (ILUNRM)
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Justification of Research

This report was written as part of the Master course Interdisciplinary Land Use and Natural Resource Management at the Life Science Faculty of Copenhagen University. The aim of the course was to get a clear understanding of the uses of the problem-oriented, interdisciplinary and participatory approaches. Data was collected during a field study of two weeks in Thailand. The report was written as a practice in research methodologies and field techniques used in various disciplines, especially in people participation in the processes of natural resource management.

The Danish group consisted of Daniele Barelli, who holds a Bachelor's degree in Ecological Agriculture and Rural Development from Rome, Italy, Quintino Lobo, who holds a Bachelor's degree in Veterinary Medicine from Universidade Eduardo Mondlane, Mozambique, and Karin Persson, who holds a Bachelor's degree in Landscape Architecture from Copenhagen University, Denmark. This course was a part of our different Master's degrees.

Copenhagen 10th of April 2008

Daniele Barelli Quintino Lobo Karin Persson

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Abstract

This report tells the story about the tomato production and land use changes in the Pho Tong Phattana Village in the North eastern Thailand. The aim of the report was to examine why the farmers in this village were producing tomatoes, and which were the necessary inputs in the production as well as the possible outcomes. In order to understand the tomato production in its context, the maize production and the change of land use in the village were examined. The methods used during a 10-days field study were qualitative: semi-structured interviews, informal talk, PRA methods and quantitative data collected through questionnaires conducted in the village. Tomato production is one of the main cash crops in the village since it gives quick money due to its short lifespan (90 days). Today many farmers have decreased the plot size of tomatoes due to the high cost of inputs and high risk connected to the outcome. The main problem found was the low fertility of the soil, the high price of agricultural inputs, illness caused by pest and diseases, and the fluctuation of the market price. Nevertheless, almost all the farmers in the village grow tomatoes on 1 to 4 rais of land, and it is an important source of income together with maize and cassava. The majority of the farmers in the village have sold land to pay back debts on loans taken mainly to purchase necessary material for there farming production. The price is high due to the villages' situation close to the road and recreational areas. Today only 380 of 6000 rais are used for farming activities by the local villagers. Therefore, some farmers have to rent land outside the boundaries of the village to continue their agricultural activities. Also many have changed their livelihood strategy from traditional farming to salary jobs.

Keywords: Tomato production, land use change, rural farming, Tambon Wang Nam Khiao.

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1.Introduction

Karin Persson

During the preparation of our fieldwork, one of the most important pieces of information that we gained about our village was that the farmers were producing more tomatoes there than in the other villages. We wanted to investigate this further. Why was there a higher production of tomatoes? In what way did the tomato production affect the village socially, economically and environmentally? In tomato production, one of the main constraints usually is availability of water. How was this issue solved in our village? Which is the best way to produce tomatoes and how high are the economical benefits that the farmers can gain from the production? We wanted to get an idea of the necessary input and output in the production and see if tomato production was a sustainable coping strategy for the farmers in the village.

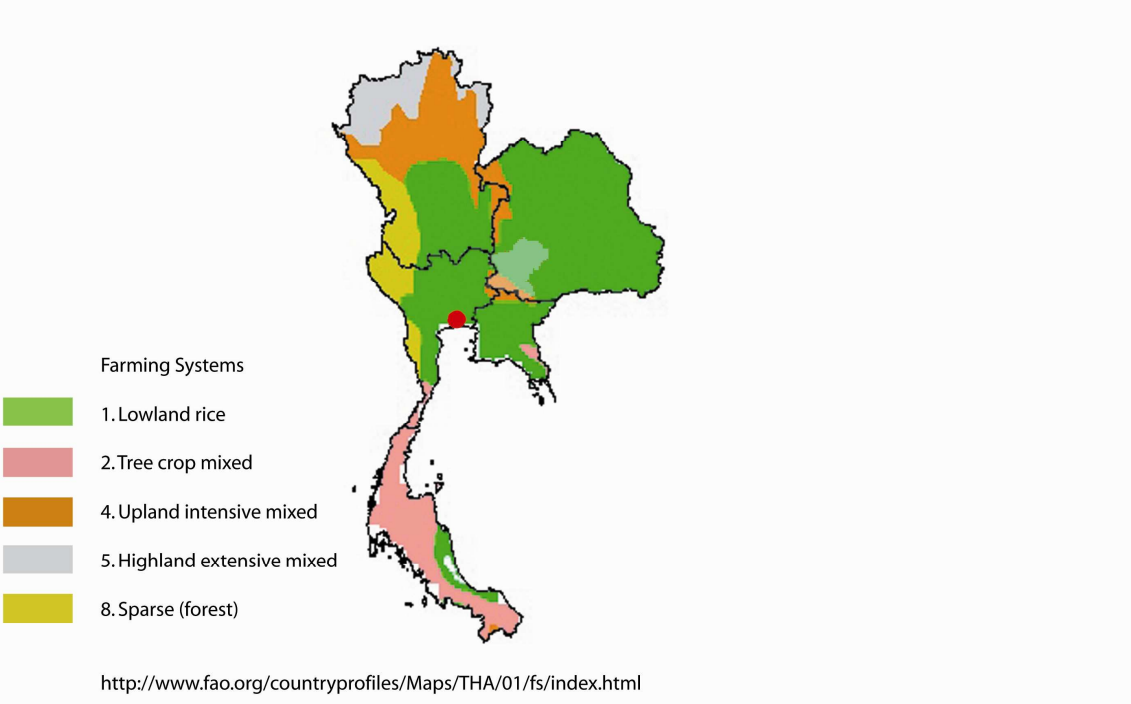
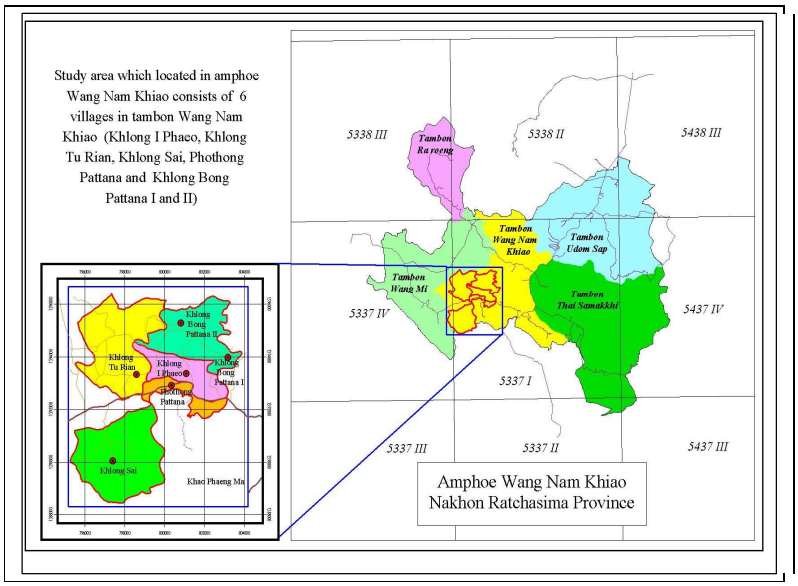


Figure 1 Map of Thailand with general farming systems and location of district.



Fifure 2 Map of Tambon area with representation of the six villages.

The village Pho Tong Phattana is situated in Tambon Nam Khiao in the Nakhon Ratchasima province, the North-eastern region of Thailand. In this region the farmers operate under harsh environmental constraints and rapid economical development. Declining soil fertility and low water availability are identified as major constraints to crop production in the northeast (Tipraqsa et al. 2007). Farm wise the region produces mostly lowland rice (FAO, 2007) but in Tambon Nam Khiao the terrain is hilly and the soil is arid and most farmers survive on mixed farming systems where maize is the main crop.

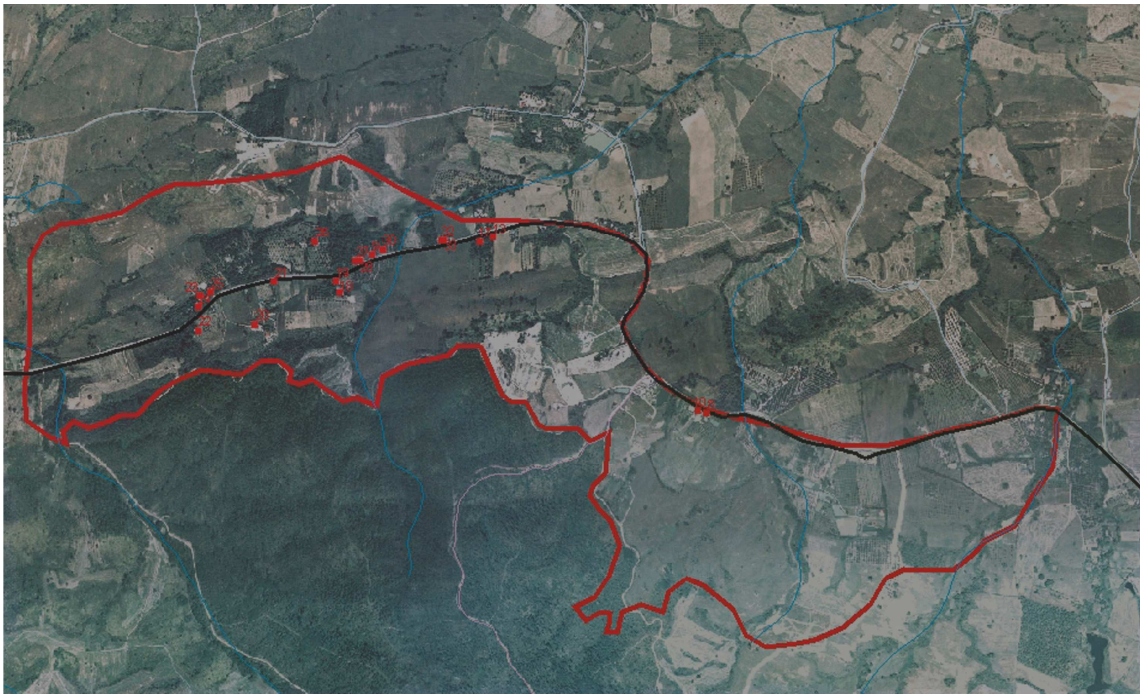


Figure 3 Boundaries and location of household in Pho Ton Phattana village

The Wang Nam Khia sub-province is placed in an area called ”Thailand's Switzerland”, known for its fresh clear air and beautiful undulating landscape. What differs our village from the others is also its central position with good access to the main road Pak Thong Chai-Kabin Buri Road where the commercial centre of the area is placed, called Km 79.

Three years ago the road through Pho Tong Phattana was renovated and now there is an increase in investors buying the attractive farmland along the road and turning the land into fruit orchards, restaurants and resorts. This tourism development plays an important part in the change of land use and livelihood strategies in the village. Today there are 30 households and five resorts in the village. Eighteen household are full-time farmers, five are working with the resorts and the rest are doing other paid jobs. The village is on 6000 rais[1] but only 380 rais are farmland owned and used by the local villagers, which indicates that there is a major change in the ownership of the land.

[1] 1 rais equals 40 x 40 m = 1600 m2=1,6ha

2. Methodology

Quintino Lobo and Karin Persson

In order to gather information on our topic, tomato production and land use change, a combination of diverse methods have been used to triangulate the data. The methods used have been qualitative and quantitative such as: semi-structure interviews, questionnaires, informal talks, direct observation, participatory rural appraisal (PRA) exercise (seasonal calendar, problem ranking, transect walk), GIS to map the area, and finally soil analysis.

Soil analysis kit

Since this village is one of the biggest producer of tomatoes in the area out of all six villages in the district, we wanted to know how many household were growing tomato and their reasons for producing this crop. A general questionnaire (appendix IIA) as well as an additional questionnaire (appendix IIB) with focus on social and land tenure issue was conducted with nearly all the households of the village (28 out of 30). While we were conducting the surveys, the farmers who were growing tomatoes were immediately interviewed about their tomato production as we conducted a semi-structure interview about the tomato production (appendix IID). In-field informal talking as well as direct observation were also important and useful methods, to gather information about the complexity of the agriculture and land use issues in the village. Furthermore, a transect walk was carried out to understand the landscape situation in the area.

From the previous literature review we knew that the farmers were using a lot of fertilizer in the crop production systems. In order to understand how this use affects the quality of soil and if different ownership can affect the soil conservation, we made a soil sample and analysis. The principal idea furthermore was to understand if the owned land was more fertile than the rented one, since we suspected that maybe the farmers owing land were more willing to invest and keep the fertility high, compared to the land which does not belong to the farmer. Seven soil samples were taken in different fields. In each plot we collected six samples in different spots and mixed them into a pool. The pool became the representative sample of the field. The samples were dried during a day and analyses were carried out with a simple kit for field analysis.
To understand the farming systems and the problems the farmers were facing with tomato production and to be able to compare it with maize, PRA exercises were done at two community meetings during the third and last day of the field research. In the first meeting, we selected three farmers with long experience in tomato production to conduct the seasonal calendar of tomato. Another group of farmers with experience in maize production drew the seasonal calendar of maize. Ideally, the two crops should be built into the same seasonal calendar-map, but this method was used due to time limitation. In the second community meeting, we carried out the problem-ranking exercise with three farmers who had experience in maize and tomato production.

In order to understand the distribution of land for the main crops produced in the village, the land use changes and the possible causes, we used mainly the additional questionnaire as well as semi-structure interview and informal talking.

Semi-structure interview with farmer

To comprehend the present situation of the village, it was meaningful to get its historical background, formation and development. During the first village meeting a timeline was made with a farmer and the headman. This information was confirmed and additional data was added by other key informants during the in depth interviews.

Finally, to achieve an idea of the village topography and to be able to discuss some aspects observed in the field with the headman, a transect walk was carried out. The boarder of the village was adjusted from the GIS images provided by the university with new coordinates collected on a tour around the village with the headman, using GPS. We also mapped all the households when we were conducting the questionnaires, as well as the places for the soil samples and the source of water for irrigation with GPS.

2.1 Discussion of methods

It is essential before conducting any questionnaire to carry out a pilot survey. The purpose of the pilot survey is to understand any misunderstanding of questions and when using an interpreter it is a crucial moment for them to be familiarized with the questions and the way to translate. Unfortunately we did not conduct a pilot survey and the interpreters were not briefed in the questions in the semi structured interviews. The general questionnaires were designed according to the basic information, but there was some part of the questionnaire not useful for our village, for example in part V, VII and VIII (appendix IIA). Due to the small number of households in our village only 30 it would have been more practical to use only the semi structure interviews when collecting data since this would give a better picture and establish a better relationship to the villagers. The questionnaires is most efficient when the sample size is bigger. (Carvalho and White, 1997). Due to the characteristic of this questionnaire, the closed-ended response could limit the respondent and we could not explore more information, as all questionnaires were designed in close-ended question style.

In this study we conduct the PRA exercise with the, farmers that were available, before a village meeting and we did not have the possibility to discuss the results with the farmers. Also the second PRA was conducted during a community meeting and that day many farmers had to leave for a funeral ceremony. It would have been interesting to discuss with the farmer the main problem raised during the problem raking exercise, but the fact that the farmers were to leave the in depth discussions about the causes and the consequences of the problems was lost. Better planning of the village meetings with more time for discussion could have solved this problem.

Semi-structure interview was conducted with a presence of the headman, even though he was not listening to the interview we assume that his presence might have an affect on the information given and the reliability of the information. The interpretation have also affect a quality of the interview, some data where poorly translated as well as the translators sometimes got personally involved and forgot to translate important parts of the discussions. This could be helped by having more briefings with the interpreters about their role in the research.

3.Results

3.1 History of the Village

Karin Persson

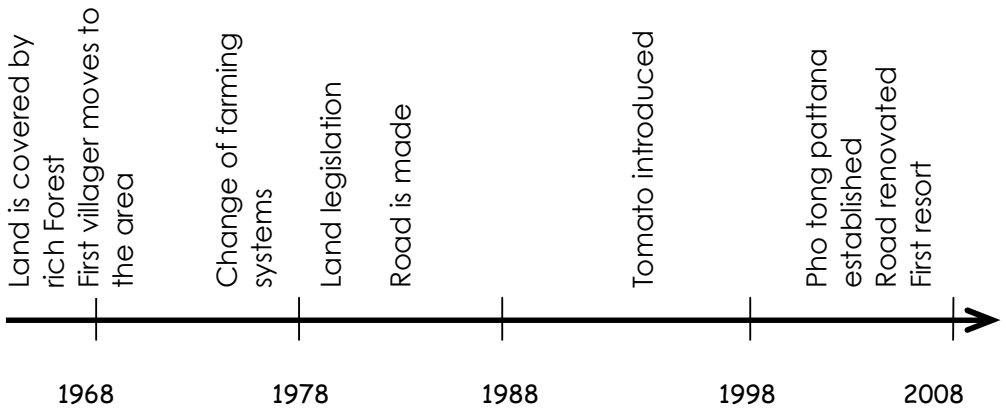


Figure 4 Timeline for the development of land with important events in the history of Ban Pho Tong Phattana village.

The northeast region of Thailand was in the past covered with deep forest that was cut down as a part of the major deforestation in the country. The studied area that was to become Pho Tong Phattana was first divided by a local teacher who made a lucrative business by illegally selling the land. He made plots by marking red crosses on the trees and sold the land for 8baht/rais at start, but after a few years the price went up to 30 baht/rais[2]. The land was impossible to farm since it was full of tree roots and trunks. The first settlers had two options; they could either work themselves or rent labour to clear the fields for 60 baht per rais or burn the land. The later was the most common way. Burning the fields after harvesting was the way to prepare the land and this increased the declined of the forest in the area. Some farmers still use the system of burning the crops after harvest since it's the most quick and cheep way to prepare the fields.

The first farmers grew mainly maize. Where the maize did not grow they planted red beans, chillies and in between the small fields, castor oil trees were growing. The production was mainly for home consumption. Since the end of the 1970's there has been a change in the farming systems. The

[2] Today 50 baht equals to 1 Euro exchange rate 10 April 2008

fertility of the soil started to decrease, before *" there were no problems, you could grow everything"*[3] , the market was changing, the green revolution brought fertilizers and pesticides and the tractor was introduced. All this, changed the farming system from small scale mixing farming systems to monoculture.

In 1978, land rights called Soo Poo Koo (SPK) and Por Bor Tor (PBT) were given to the farmers by the government. SPK is a land right document that entitles the owner to use the land for agricultural purpose only and the land can not be sold but only inherited by relatives who also have to use the land for farming. PBT is a land taxed receipt that entitles the holder to farm on the land[4].

In 1981, the road through the village, which originally was a forest path for dragging out the timber, was built. With the new road came civilization in form of electricity, technology and good access to the local market. By this time all the forest was gone. First in 1986 the deforestation was stopped by law and the year after a foundation for wildlife was established in the village. The Pang Mai mountain was protected and slowly being replanted with trees as part of a national program.

Tomato was introduced as a cash crop in the village in the late 1980's and became very popular ten years after as the farmers who grew tomatoes became rich. But due to the high inputs that were necessary for the modern farming methods, many farmers ended in high debts and had to pay back their loans and they had to sell off their land. The price of land started to increase due to the good situation of the village and in 1993 the land was sold for 2000 baht/rai.

In 2001, a governmental fund under the name of "One Million Baht" was established all over Thailand. It supplies villagers with loan at a lower interest rate than the traders (loan sharks and middle men) that the villagers without land rights could borrow money from.

[3]Quote from Head man at village meeting

In 2003, there was a major dispute in the village about the way the village fund was managed. Some villagers did not want to participate and the village was separated into two. Today, 89 percent of the villagers are participating in the Village Saving Fund (data from additional questionnaire).

In 2005, the road was restored because of this improvement of the area the prices of land have increased rapidly and villagers can today receive 200,000 baht/ rai from investors.

[4]Information gained from Mr Piya Duangpata lecture on A brief perspective of Land tenure , Management and Administrative Structure of Thailand Kasetsart University 18 March 2008

3.1 Land ownership and crop production

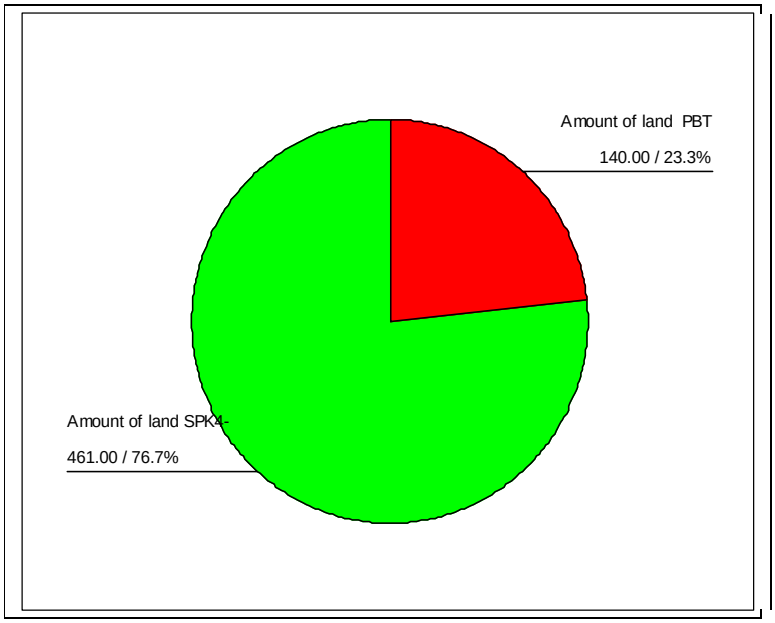
Quintino Lobo

All land in the kingdom of Thailand belongs to the King, as reported by Chirambe 1999, cited by Gine 2003. The land in Thailand was classified in private, public or governmental land which covers 19 million hectares and 23 million hectares respectively. The public land includes the national parks, wildlife sanctuaries and land reform areas. According to the same study, most of the forest area was reduced into farm land. Today 60 percent of land is public land and now under the Royal Forest Department administration. As in many developing countries, Thailand state-owned land has been occupied illegally by a large number of farmers. (Giné, 2003).

To minimise the landless in certain regions of the country, the government introduced the Agricultural Land Reform Act of 1975. The aim of this law is:

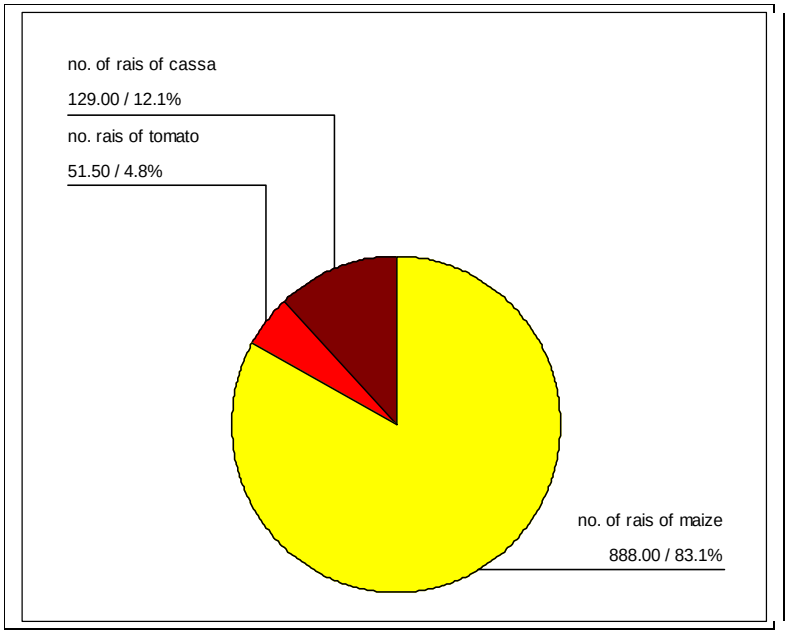
[“*Redistribution of land for farming and residential uses by allocating state land or, land purchased or expropriated from landowners who do not themselves cultivate or who own land in excess of what is stipulated by the Agricultural Land Reform Act of 1975 to farmers who are landless or do not have sufficient land for cultivation, and to farmers' institutions by means of lease and sale”*] (Ibid).

In our village, as in many regions of the country, the occupation of land for agriculture was illegal, as mentioned in the introduction, but from 1975 the land was distributed to the farmers. The titles that ensure the right to the land, SPK and PBT, are very important, since they enable the farmers to get the loan. In our study, 76.7% of the households have SPK-4 title and 23.3% have PBT title see (Graph 1).



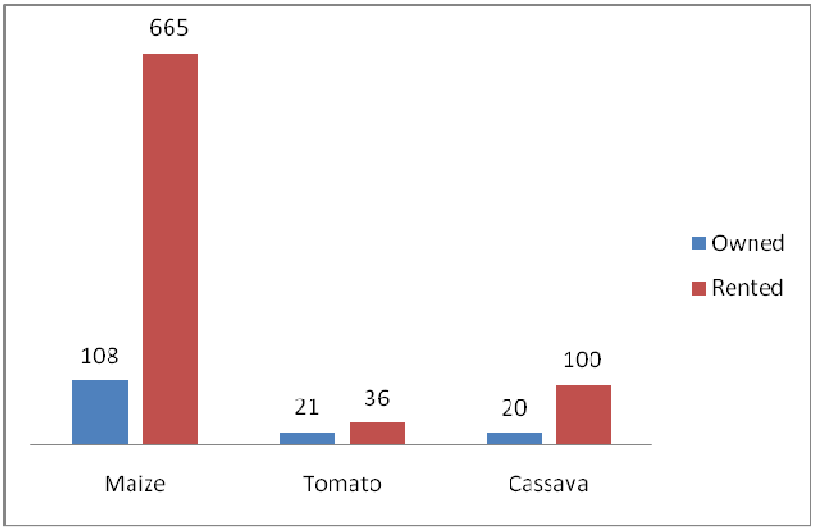
Graph 1 Land ownership distribution in Pho Tong Phattana village in terms of rais

According to our questionnaire survey about 50% of the households have changed their land ownership and the rest have either gained their land ownership by will (27%) or by self- reservation (23%). Most of the farm land in the village (83.1%) is used for maize production followed by cassava (12.1%) and tomato (4.8%), as shown in graph 2.



Graph 2 Total of land used (in rais) for main crops produced in the village.

Due to a lack of land available in the village for agriculture production, most of the households rent land outside the village for agriculture (Graph 3).



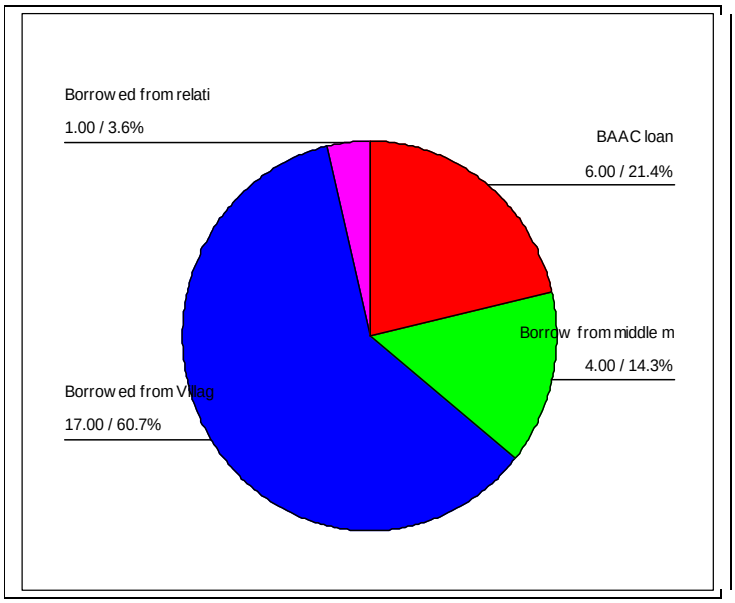
Graph 3 Land used per rais for crop production by the villagers.

These results show that tomato is produced in small scale compared with maize and this will be discussed in the chapter about Agriculture .

3.2 Credit and Loans in Pho Thong Pattana

Daniele Barelli

During our studies, we tried to investigate which were the main sources of credit to accomplish the agricultural activities in the village. As mentioned, the high cost of inputs especially in tomato production, obliged the farmers to ask for loans. Thanks mainly to our questionnaire, we found out the types of credit and loan the farmers were taking in the last year. There are four different ways to borrow money. The most common way is the "One Million Project", also called the village fund, which was established and promoted by the government in 2001. This project consists in giving 1 million bahts for each village in rural areas and from this money each villagers can require a certain amount of loan. The headman of the village, together with some other members, manages the fund. To participate in the village fund the members pay 50 bahts per month. The interest rate is only 1% and this makes this source of loan the most attractive in our village, as shown in the following graph.



Graph 4 Main sources of loans taken from the farmers in Ban Photong Phattana village

The second way, in order of importance, to receive loans is from the BAAC bank. This institution was established in Thailand in 1976 from the government under the jurisdiction of the Ministry of

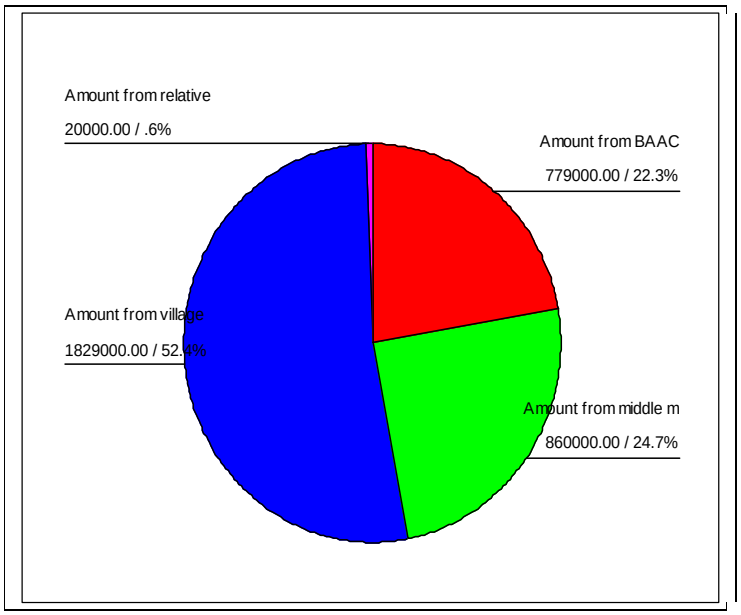
the Treasure to provide loan to the farmers for farming activities [5]. In the village 21.4 percent of the households borrow money from BAAC which has the highest interest rate. It starts around 7.5% and in case the farmers are late to pay back the money, the interest grows slightly. To ask for money from the BAAC institution, the farmers must show some land certificates such as PBT or SPK4, which is the guarantee the bank, require to disburse the loan.

The third most utilized way to borrow money is from the middleman. They are owners of shops in the local commercial centre Km 79 and they provide the farmers' agricultural inputs. According to the information we gained from an interview with the director of the local branch of the BAAC bank, the people are used to ask for loans from the middleman especially for situation of emergency (funeral, sickness, school fees and so on) or only to purchase the agricultural inputs. The interest rate in this case is around 3% and depends also on the amount of money borrowed and on the time the farmers needs to payback the loan. The more time they take, the higher the interest rate becomes.

In the previous case of the middleman and One Million Project, the farmers do not need to show any guarantee or land right certificate, but if they can not payback the loan they must sell their land. In our studies, we met some farmers who sold out their land since it was impossible for them to pay back the loans.

[5] Information achieved from semi-structure interview with Mr. Winai Sakdanarong the head of the sub-branches of BAAC in the province.

Only 3.6 percent of the villagers borrow from relatives. In this case there are no interest rates to pay and is up to the borrower to pay back the loan.



Graph 5 Mean of the money (bahts) borrowed the in the last year in the whole village.

3.4 Agriculture focus on tomato production in Pho Tong Phattana village

Daniele Barelli

The main agricultural activities in Ban Photong Phattana village are focused on maize, tomato and cassava production, with the addition of some cultivation of chillies, mainly used as cash crop. Furthermore, there are also several orchards with a variety of tress such as mango, banana, papaya, tamarind etc., mainly for home consumption. From the informal talking we discovered that there is an increasing request of corn for bio diesel production which has made maize more attractive to produce and many farmers increased their maize cultivation. However, maize has always been an important crop in the village.

Tomato is grown mostly to be sold as a fresh product. In the following chapters we will focus mainly on this product since the village was one of the biggest producer of the area. To get a broader picture of the agricultural activities used and to be able to understand the pros and cons of the tomato production, maize production will also be described briefly. Tomato most of the time is grown in rotation in different fields during the years. In same cases after maize, is planted tomato and vice-versa. This strategy allows the farmers to overcome problems in tomato production such as pest and diseases, soil depletion, weeds and soil erosion.

Tomato is a high demanding crop which to yield properly needs many inputs like fertilizer, pesticide as well as good soil composition, water availability and labour. Whereas maize is not as demanding. It is more exigent in terms of space, in fact is a big plant but can even be cultivate without water and still yielding a good production. The tactic of rotate the crop has been utilized since the farmers start to do agriculture in the village, this strategy is one of the oldest adopted and the farmers are perfectly aware about the positive benefit generated by crop rotation.

Maize is produced once a year from the end of April until the harvest in December and January, while tomato is cultivated generally twice a year with the exception of few farmers who grow this crop three times a year.

3.4.1 Description of tomato production

In the area of our studies all the farmers grow a variety of tomato called "*Sida*", which is one of the smallest in terms of size. Some farmers are also growing a bigger variety called "Plum tomato". Both are used for fresh consumption.

Plantation of tomato in Pho Tong Phattana village illustrating irrigation scheme

There are two main seasons for tomato production: the dry and the wet season. During the wet season wich last from mid April to mid October there are 85 percent of the rain falls, Ekasingh et al 2004.The dry tomato season starts in January with the preparation of the soil by ploughing the land using a tractor, first with three blades plough and after with seven blades to break the clods of soil. The land is always ploughed using mechanical machines. In the village there are 3 tractors and the cost to rent a tractor is around 300-350bahts/rai.

After the preparation of the land, the farmers start short daily irrigation to prepare the soil for the planting phase, with the addition of some application of fertilizers. Generally, the fertilizers used before the planting are gritty or pellets which are added directly on the surface of the soil. The liquid fertilizers are instead spread straight on the tomato plant while it is still in vegetative phase.

The main products used are chemicals with a composition in Nitrogen, Phosphorus and Potassium (NPK) of 15-15-15. Some farmers also mix these chemical fertilizers with bio fertilizers which are

cheaper, 400 bahts for 1 litre which can be used for one rais for all the season. Instead the conventional costs between 700 bahts up to 1000 bahts for 50 kg and the amount utilized vary among 50 kg/rai to 500 kg/rai according to the condition of the soil and knowledge of the farmer. In the village there are also some farmers using animal manure, but only one of them has cattle and if other farmers want to use manure they must buy it outside the village. Nonetheless, manure is mainly used as fertilizer in the orchards.

However, many farmers state that the chemical products are better and stronger than biological. Some have tried with the bio fertilizers but according to the villagers they were not giving good yield. "*My friend has used organic fertilizers and he told me it gave slow results"*[6].

At the end of February starts the phase of planting or transferring seedlings on the plots. Seedlings are more expensive (10 baht per plant), compared to the seeds which costs 100 baht per 1 kg. For each rai, an average of 400-450 grams of seeds are spread. Furthermore, the seedlings require more labour to be planted so it is up to the economic possibilities of the farmers to choose between the two strategies.

Juvenile plants of tomato

[6] Quote from Mr Kamron Plangklang tomato producer

Once the tomato seeds have been sown the farmers continue to irrigate the field once a day, if the temperature is not too high, otherwise they irrigate twice a day. The most used irrigation schemes are net sprinkler systems, which are fixed position mechanical tools spreading the water in the field to a certain amount of distance depending on the size of the sprinkler and the pressure of the water (Keller and Bliesner 1990). The water is pumped from small natural streams or ponds, generated from rainy water.

According to the farmers, the main constrain in tomato production were the strong attack from pest and disease such as fungus, parasites, virus in the fields and according to their knowledge the major problematic pest is a fungus which survive in the soil. To control the pest the farmers apply pesticides a couple of days before they plant the seed and continue through the production by adding pesticide once each 7-10 days according to the percentage of attacks. The cost of pesticide is really high and one of the informants told us that sometime she has to spend up to 5000 bahts/rai. But the amount used depends on the gravity of the attack.

In the middle of the development of the tomato around the beginning of April the farmers also spend several days in building the support for the tomato plants using bamboo sticks which help to hold the weight of the tomato on the plants.

At least 20 days before the harvest the farmer starts the common operation of manual pruning of the plants from small branches and old leaves to guarantee more light exposition to the tomatoes.

During the dry season there are three harvest times. The first one starts at the beginning of May, followed by another one at the end of the month and to terminate the picking the last period is from the middle of June until the end of the month. All this data is supported by our PRA exercise which has been done for tomato cropping calendar.

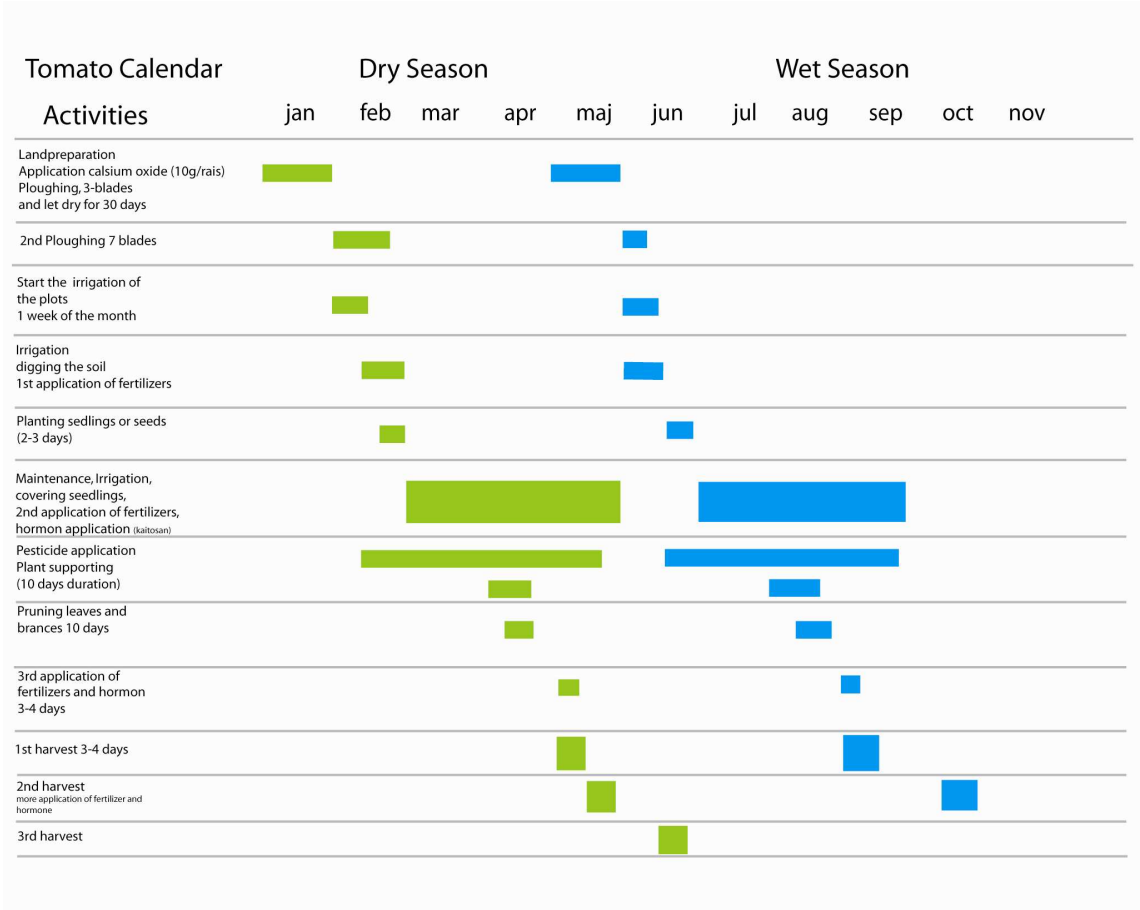


Figure 5 Seasonal crop calendar of tomato in PRA exercise

Before starting the harvest and in the middle of this operation some additional amount of fertilizers and hormones are added to the field, to increase the productivity in terms of quantity and quality. In the wet season which start at the beginning of May and finish in October all the agricultural operations are the same.

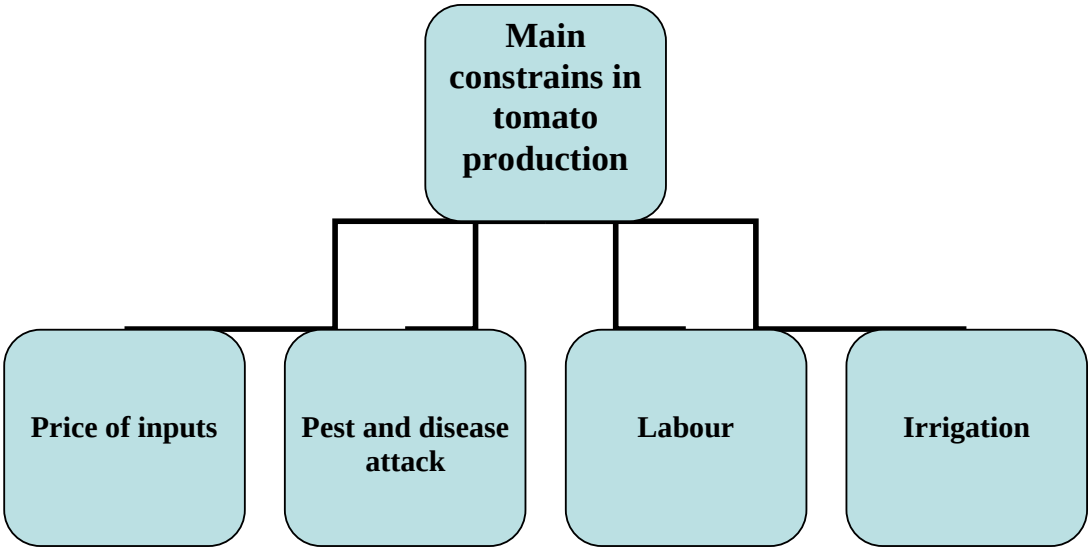


Diagram 1 The main constrains in tomato production according to the idea of the farmers.

3.4.2 Costs and benefits of tomato production

In the above description of tomato production we mentioned some costs which the farmers must sustain to develop their cultivation. The following tables show the range of the total costs and benefits per rai achieved from all the farmers in the village during last season of maize and tomato production. As we can see from the tables in both the cases, own land and rented land, the costs in tomato production are higher compare to maize and this fact is due from the bigger utilization of agricultural inputs and labour in the cultivation of tomato.
The amounts of money (bahts) which are show in the table are not comparable because they just represent the minimum and maximum average of the costs and benefits gained from all the farmers.

For example in tomato production own land is just one farmer which is getting 120.000 bahts for income, but the average of the income of the other farmers is smaller compare to him and we saw that by analyzing each survey singularly.
To understand better the benefits of both the cultivation we have to remember that the price in the market of maize is around 8 bahts/kg while for tomato is change steadily between 3 bahts/kg to 15 bahts/kg as we will see in the chapter of the marketing of tomato.

Table 1 Range of the total costs and benefits to sustain tomato production per rai, for all the farmers in Pho Thong Phattana village

	TOMATO			
	Owned land		**Rented Land**	
	Cost(Bahts/rai)	**Income(Bahts/rai)**	**Cost(Bahts/rai)**	**Income(Bahts/rai)**
Maximum	14,700	120,000	15,200	50,000
Minimum	4,800	5,000	4,050	5,000

Table 2 Range of the total costs and benefits to sustain maize production per rai, for all the farmers in Pho Thong Phattana village

MAIZE				
	Own land		**Rented land**	
	Cost (bahts/rai)	**Income (baht/rai)**	**Cost (bahts/rai)**	**Income (baht/rais)**
Maximum	5,950	8,000	2,700	50,000
Minimum	1,629	2,800	2,200	3,900

3.4.3 Yield, labour and experience in tomato production

The amount of tomato obtainable from the production varies steadily during the season. According to our research, interviews and informal talks if the season is good the farmers can get 5-8 tons/rai of tomatoes, if it is bad only 1-3 tons/rai. To accomplish the operations required in all the agricultural productions (planting, weeding, harvesting and so on), the farmers in most of the cases rent workers from the village. The salary for a worker varies according to the task of the job but the normal price is between 50 and 200 bahts per day with an average of 6-8 hours. During the harvest period one person can collect around 150/kg of tomatoes per day. Sometimes the workers are paid by quantity and receive 1 baht per kg they harvest, but this is up to the deal they do with the owner of the plot.

Hired ploughmen working in plantation of tomato in Ban Pho Tong Phattana village

All the farmers who do agriculture in the village are self-taught. Only once the agricultural extension office came to the village to give some advice to the farmers. They periodically speak among each other to improve their knowledge and capabilities but according to them, they know how to do agriculture and just a few of them complained about the lack of assistance from governmental institutions.

3.4.4 Water supply and availability in Ban Phothong Phattana village

Through excursions in the area and by talking with the farmers, we found out that water supply and availability was not one of the biggest problems for the village. One of the major problems is the cost of the irrigation system, which costs 10.000 bahts /rai. With good maintenance this system can be used for up to 10 years. The only thing which must be done is to change the peak of the sprinklers once a year.

During the wet season there is enough water for all the agricultural activities as well as for own consumption of the villagers. The villagers mainly use rain water for all usages because according to them rain water is free of charge and cleaner than the underground water. In the wet season the rain water is stored in big plastic or cement container with capacity around 200 litres and in the dry season they can use this reserve of water.

Containers for water conservation utilized in the village

Speaking with one of the representative of TAO administration office in the village, we found out that if the community wants to accede to the system of ground water, they must pay a high amount of money.

There is one system which could be provided by private companies that cost around 100.000 bahts and which is more reliable. Another system provided by the government costs 60.000 bahts, but it is less reliable and it is possible that the access to the water is not guaranteed every day. Moreover, the price of maintenance in both the systems is not included in the price of the establishment.

In the village of Ban Phothong Phattana, the TAO has been created as a ground water system, but it is not used since the quality of the water is really bad with a lot of tracks of rust inside.

For crop irrigation the farmers use to pump water mainly from artificial ponds where sometime the farmers also make a kind of aquaculture system with fish production.

Water pond in Ban Pho Phattana Village utilized for irrigation and fish culture

The farmers use several hydraulic pumps which run with gasoline and transport water from the pond to the field. Some farmers also use the water of small streams coming from the close mountain but only if their field borders the stream.

Fuel pump uses for the transportation of the water from the pond to the field

During our research we also made a water sampling and analysis with our counterpart to check its composition for the follow parameters: nitrate, phosphates, temperature, salinity, conductivity and concentration of oxygen utilizing a normal water analysis kit. We sampled several ponds, one of the main streams in the village and the stored water from the household of the headman. However, after a discussion and analysis of the data we found out that all the parameters were in the normal average and that the water was cleaned and drinkable.

3.4.5 The marketing of tomato

Nowadays, the price of tomato in the market is fluctuating steadily. There is not any fix price for this crop and its cost can vary from 3 bahts/kg to 15 bahts/kg. This cost depend from the amount of the production of tomatoes in the province, the more tomatoes produced the lower the price in the market. Also the aspect of seasonality is something which affects the cost of tomatoes, for example if there are any natural disasters, like flooding or drought, the price of tomatoes in the market can increase quickly.

Another factor which influences the price of tomato is the middleman. In fact, especially in our village the farmers borrow the agricultural inputs they need from him and afterwards they pay back the loan with a part of their production. In this case the middleman sets the price to buy the tomatoes from the farmers and can gain when he sell the tomato to the market. According to our interviews with the farmers in the village, in the last past ten years many people started to produce tomato in the area and the price reduced dramatically. Some farmers prefer to not harvest the crop if the price in market for tomato is low because the cost of the labour is higher than the income.

The main markets where the farmers of Ban Phothong Phattana village sell their production of tomato are the Korat market city and the Bangkok market. In both the cases there are trucks coming to pick the production and transporting it to the cities. From January 2008 three farmers started to rent a truck and transport the production themselves. In this case they can earn more money and lead their business directly.

Truck for transportation of crops production

3.5 Soil sample and analysis in Ban Photong Phattana village

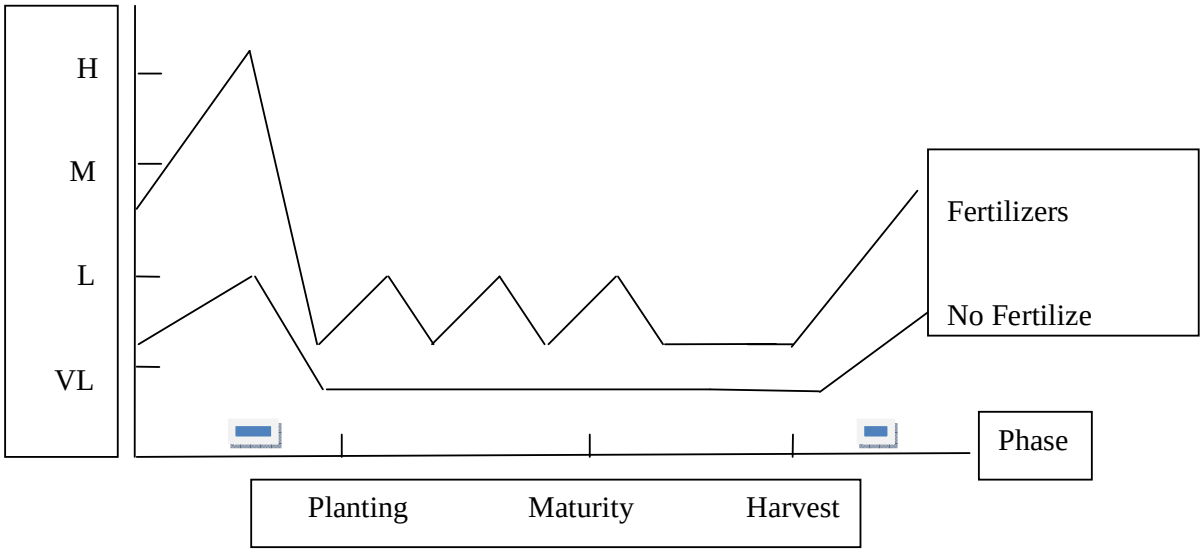
In the studies of our district the soil characteristic were mainly belonging to Li series (Li) and Muak Lek series (Li) in combination with Wang Saphung series (Ws). The first two types of soil (Li) can be found in erosion areas (Basic information IFS 2006). The topography of the zone is a mixture between hills with a slope range among 2-35% and level lands. The composition of the surface soil is loam or silt loam texture with a dark brown colour. Whereas the subsoil horizons are very gravelly clay loam or gravely silty clay loam texture mainly in red colours (Basic information IFS 2006). These types of soil are well drained, with reasonable percolation and pH between slightly acid which tends to neutral (pH 5.5-6.5) (Basic information IFS 2006).
The Wang Saphung series (Ws) is also found in erosion areas. Also the topography is the same but the slope range is among 2-20 %. The surface in this type of soil is similar to Li series, as well as the subsoil horizons. The pH of Ws differ slightly compared to Li especially in the surface part which is moderately acid to neutral (pH 6.0-7.0) (Basic information IFS 2006). To summarize this discussion, we can conclude that the two types of soil (Li and Ws) do not differ significantly between each other.

Tools utilized for soil sample

Before starting the description of our results we must specify that our soil samples were too small and not statistically representative to be considered as reliable results. We solely took in consideration the type of soil (owned land and rented land) and the crops grown inside.

During our analysis the criteria we tested were: the soil contents of ammonia (NH^{+4} – N), nitrate (NO^{-3} – N), phosphors (P) and potassium (K) as well as pH.

Before beginning the presentation of the data we found, we would like to show this general scheme. Each line represents the availability of nutrients in the soil during the development of any crop from the planting phase to the harvest.



Scheme 1 Shows the how the availability of nutrients in the soil change according to phase of the development of the crops. Concentration of nutrients, H= high, M= medium, L= low, VL= very low

The scheme above illustrates the hypothetic dynamic of nutrient in soil during the production cycle. Our intention with this scheme is to remark how important it is to consider the period chosen for the soil samples for analysis. In our case for example, all the soil samples were taken in the dry season after the harvesting period for some fields and before the planting phase for others (highlighted in blue colours). The scheme shows that after the harvest the land is in the phase of rehabilitation and maybe the concentration of nutrients is low due to the previous cultivations, but before seeding some application of fertilizer should already be done and looking to the soil analysis result we can see that especially in tomato own land which was almost ready for the planting phase the concentration of nitrogen is medium.

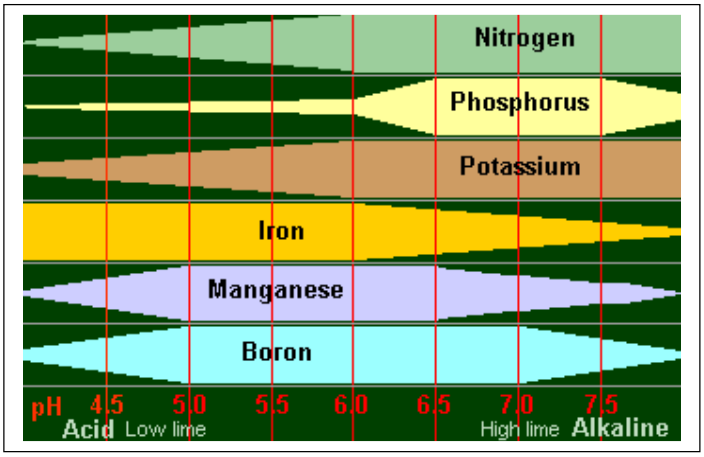
The result of the soil analysis (table no.) shows that for all the crops produced in the owned land, the soil seems lightly more fertile than the rented one, even if the difference is extremely low. Only in the plantation of cassava in rented land, we found that the availability of nitrate is slightly bigger compared to the owned land. The level of ammonia, nitrate and phosphorous in all the analysis made were between extremely low and low. Just in cassava and tomato owned land, the ammonia content is medium.

The potassium resulted the highest nutrient in our analysis. Its percentage is always elevated in all the fields analyzed, except for one rented field of maize where it is low and maybe it rely mainly from the composition of the soil. The explanation that K is always high could depend from the fact that the maximum uptake of this element is during the peak of vegetative development of the plants (*Johnston* et al. 1998), in favour of its motor function to cycling nutrients for growth. Instead for N and P the maximum uptake is during the final harvest and our samples as we said were taken after a couple of weeks of this phase (Ibid).

Table 3 Result soil analysis. EL= extremely low, VL= very low, L= low, M= medium, H= high, VH= very high

Crop Type	**pH**	**Ammonia (NH^+_4 – N)**	**Nitrate (NO^-_3 – N)**	**Phosphorous (P)**	**Potassium (K)**	**Soil Type and slope**
Maize Own land	6.5	L	VL	L	H	Li-D slope 18%
Maize Rented land	6	L	VL	VL	H	Li/Ws-C slope 18%
Maize Rented land	6.0	L	EL	L	L	Li/Ws-D slope 5-20%
Cassava Own land	6.5	M	EL	VL	M	Li-D slope 12-20%
Cassava Rented land	6.0	L	VL	L	M	Li/Ws-C slope 31%
Tomato Own land	6.5	M	VL	H	H	Li-C slope 4-6%
Tomato Rented land	6.5	L	EL	L	H	Li/Ws-D slope 8-14%

Besides, if we take a look at the pH results, we can see that all samples analyzed were inside the right parameters. The pH is an important factor to consider because soil solution transport in it nutrients like N, P, K which the plant needs in specific amount to grow, develop and fight off pest and disease. The pH scale is between 0 to14. Below 7.0 the soil can be considerate acid while above 7.0 basic. When the ph is 7.0 it is called neutral. If the soil solution is too acid plants can not utilize nutrients and also the addition of pesticide or herbicide with acid does not allow their uptake and these products could held in the soil. This is why the best range of pH can be among 6.5 to 7.5 but these parameters depend also from the type of crop and soil.



Source: web.ukonline.co.uk

Figure 6 The availability in the soil of the most important macronutrients and micronutrients for the plant at different level of pH.

In the owned land samples, the pH was 6.5 for all the crops and this number is quoted as being the best general pH level for most soils (web.ukonline.co.uk). In the rented land however the pH is around 6 which is still optimal. Despite that, we must remember that the farmers in the village do not use any corrector for pH.

4. Conclusion and Perspectives

Pho Tong Phattana village represents one of the main producers of tomato in the area. During the past years, the amount of plot size used for the cultivation of tomato decreased and today most of the farmers produce tomatoes on 1-4 rais of land. The crop has been the ”red gold” of the village for the last 10 years, also due to the good availability of water although many farmers stated that they were considering quitting growing tomatoes due to the hard cost of the inputs and high requirement of labour.

Nonetheless, maize has always been the main crop of the area. Today the income generated from maize is increasing. This crop is less demanding in production and more safe in outcome. The rise of income from maize production makes it more profitable, although tomato production is an important complementary crop that may give high payoff, but to be on the safe side villagers stick to the small-scale production.

Furthermore the ongoing arrival of investors and increasing establishment of resorts could influence the livelihood strategy of the local farmers in the forthcoming future.
There are already some people in the village who have sold their land for the high offers received from the outsiders or for the elevated debt they contracted in taking loan. These situations according to some of the voices, we have heard in the village, is changing the mentality of the people and maybe encourage them to give up agriculture and start working in other business or activities which might involve also the employment in the resorts. In fact, some people in the village and especially the young, already work there as paid workers without following the tradition of their families to do agriculture.

One solution for the village could be to create a link between the increased number of resorts and the farmers of the area. For example the farmers could provide the resorts with agricultural crop vegetables and fruits. This strategy could allow the farmers to keep doing agriculture without changing their life-style and in the same time, the resorts might utilize the local resources of the area, in this case the farmers, to create a sustainable and harmonious arrangement between the parties.

To conclude, we can say that agriculture has always been the main force for developing countries to be autonomous and self–sufficient. People like us, who are studying how to face these countries, should always take into consideration this point and try to support the idea that business intended for tourism is important, but not more than the tradition of the people to do agriculture and guarantee food and future for their children.

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Appendix I Synopsis

Interdisciplinary Land Use and Natural Resource Management.

Synopsis

The social, economic, environmental causes and consequences of tomatoes production in Ban Photang Phanttana Village,

Tambon Wang Nam Khiao Nakhon Ratchasima Province, North eastern Thailand.

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Date: 27/02/07

List of abbreviations

Household (HH)

Agricultural Land Reform Office (ALRO)

Royal Forestry Department (RFD)

Water Management Office (WMO)

Bank for Agricultural and Cooperatives (BAAC)

Participatory Rural Appraisal (PRA)

Semi-structure Interview (SI)

Global Positioning System (GPS)

Focus Group Discussion (FGD)

Index

Appendix

Justification of research

The synopsis is written in the master course Interdisciplinary Land Use and Natural Resource Management, Life Science Faculty of Copenhagen University. The aim of the course is to get a clear understanding on the uses of the problem-oriented, interdisciplinary, and participatory approaches. The report will be written as training in research methodologies and field techniques used in various disciplines, especially in people participation in the processes of natural resource management.

The Danish group consist of Daniele Barelli with a bachelor degree in Ecological Agriculture and Rural Development, from Rom, Italy, Quintino Lobo with a bachelor degree in veterinary medicine from Universidade Eduardo Mondlane, Mozambique and Karin Persson bachelor of landscape architecture from Copenhagen University Denmark. This course is a part of our master degree. The field work in this course will be carried out together with Thai counterparts Mr. Kamphachanh Vongsana (Laos), with a degree in Civil Engineering, Water Resources Engineering, Mr. Kavee Krairavee with a degree in Civil engineering, structural engineering, Mr. Pataiwut Menakanist, Environmental sciences and Mr. Tragool Namloma with a degree in Crop production technology.

Background

Written by Daniele and Karin

Ban Phothong Phattana Village is situated in amphoe Wang Nam Khiao in the north-east part of Thailand, in Nakhon Ratchasima province. The village includes about 60 household (HH) spread in an undulating landscape. The village is 40 years old but eight years ago it was divided from the neighbour village. The area Wang Nam Khiao have within the last 15 years changed from traditional small scale farming for sustenance agriculture to agribusiness by rich farmers who have bought the land as investment. The village consist of 6000 rais of land (1 rais ecuauls 40 x 40 m = 1600 m2) today only 1000 rais is used for traditional farming. In Photong Phattana Village 67% of the house holds are indigenous whereas the rest are new comers who has bought land. (IFS 2006)

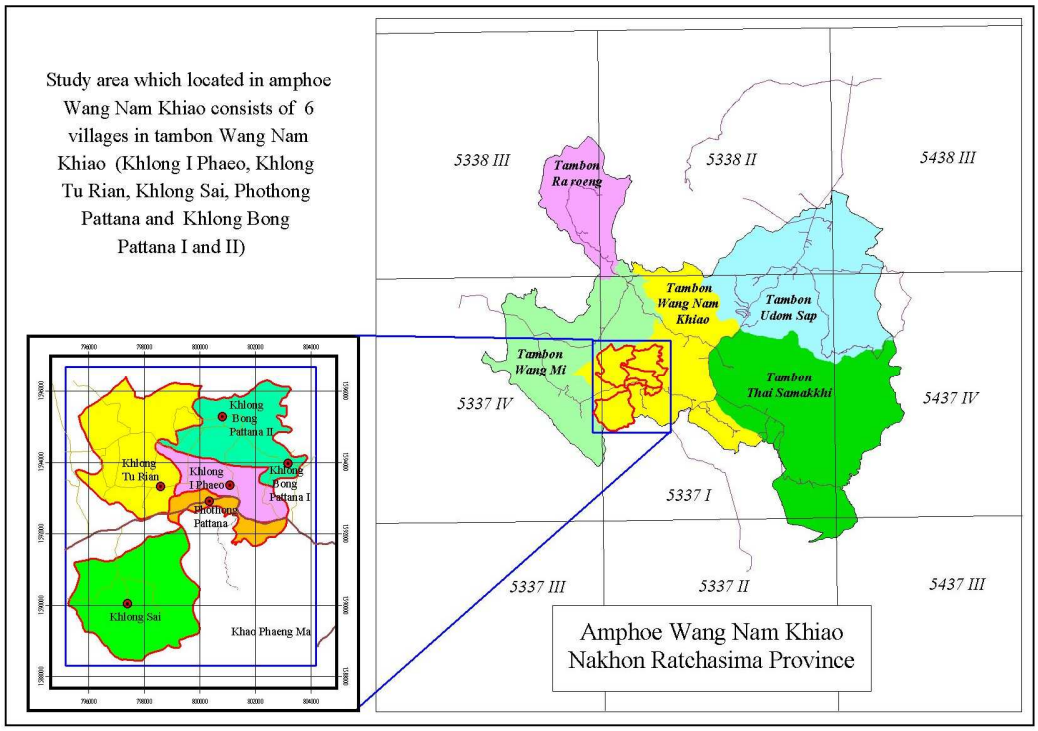

Figure 1 The Relative Location of the Study Areas in Tambon Wang Nam Khiao illustration from IFS 2006

Ban Phothong Phattana is located 9 km from the main Pak Thong Chai-Kabin Buri Road the convenience to the road makes it an attractive location with good access to the market for selling products and other business such as the growing tourism industry that have created new job opportunities in the area.

The village is in the Agricultural Land Reform Area, known in Thai as *Sor Por Kor*, and can only be used for agricultural purpose and land can only be transferred to the land owners' descendants (ibid). The agriculture sector covers the most important part of the activities of the village and involves the majority of the people. Today 30 HH are mainly involved in cultivation, 20 HH in salaried jobs both within tourism and farming and 10 HH in trading (ibid.) The main cultivated crop is maize, and 4-5 HH also grow cassava. Ten years ago farmers started to plant vegetables such as cucumbers, pumpkin, chilli and tomatoes as offseason crops (ibid.) Today horticulture is the main source of income, although the highest part of the land is dedicated to maize cultivation. The major constrains in vegetable production and specifically in tomatoes production is the availability of water supply, especially in the dry period. Some farmers have therefore started to rent land outside the village border close to water reservoir, to cultivate tomatoes (ibid).In order to secure water for dry seasons crops and household consumption TAO and the agricultural Land Reform Office (ALRO) have developed a system were underground water is used.

In Amphoe Wang Nam Khiao, the farmers adopt both conventional and organic farming systems. According to Falvey, 2000, several studies report that in the north-east part of Thailand the amount of fertilizers used for agricultural activities have risen 400% from 1992 to 1996 but we do not know if this problem nowaday is also embracing our village. The Thai government have strongly promoted the use of organic cropping techniques in some areas in order to reduce the application of chemical products, which have caused several problems in term of reduction in soil fertility, pollution of the environment and sickness of the villagers due to improper use of chemicals. Despite that, still a lot of farmers are adopting conventional systems particularly in intensive cropping such as horticulture. However the sub-district Wang Nam Khiao have been well known for its organic crooping technique (IFS, 2006.) In Ban Phothong Phattana bio-chemicals are used in horticulture for pest control since they are cheaper than the chemical-based pesticides.

In addition 70% of HH borrow agricultural input from investors while the other 30% obtain loan (Credit in Kinds) from Bank for Agricultural and Cooperatives (BAAC) or self-investment (IFS 2006). BAAC is an important source of credit for Thai agriculture. It was founded in 1966, it has provided credit for 12 billions baht to about half of all Thai farm families (Falvey, 2000). This organization in addition starts to provide from the 1998 the distribution of 20% of all fertilizer in Thailand, and almost 70% of the public sector's fertiliser distribution (ibid). The village have a very active saving group that lend money at an interest rate for 1% per month compared with the

investors in the village that lends to 3% per month. The 1 million project gives loans of 20-50, 000 bahts per HH.

In the area there have been several problems related to soil erosion and its deterioration and this has been caused partly due to the farming system of burning the plots to prepare for next cultivation (ibid.) In Pho Tong Phattana village there are mainly three types of soil (ibid.) which are Li series (Li), Muak Lek series (Li) and Wang Saphung series (Ws) situated in slope land between 2% and 35 % of exposure. The first 2 types of soil are really similar in composition and characteristics and they are fundable both in dissected erosion areas. They are shallow profile, well drained, with moderate percolation and rapid surface run off. They are loam or silt loam texture with dark brown colours. Also, Wang Saphung series soil have some similar characteristics, the only difference is that the slope range of this soil is between 2-25% and also the surface soils have a thickness of about 10-20 cm whereas in the (Li) is about 5-20 cm.

We have decided to focus on tomato production in Ban Phothong Phattana village since it is one of the main source of income for the farmers in the village. We are interested in trying to understand how this coping strategy influences the daily organisation of the village and its natural resources.

Objective

To find out how the tomato production influence the daily organisation of the farmers and their HH in the village and its natural resources.

Sub-objectives

We would therefore like to understand:

-why this village is producing tomatoes

-the farming system of tomatoes production

-the availability of inputs (fertilizers, seeds, pesticides, labour, etc) and its cost for the farmers

-the influence of tomato production on the surrounding environment, in terms of soil, land use and water management

-how the production of tomatoes influence the organization within the households and between the households

-the market demand for tomatoes in the area

Research Questions

Which are the causes and consequences of tomato production in Ban Phothong Phattana in terms of Environmental, Social and Economical Issues?

Sub research question

In order to answer our research question we have divided it into sub questions focusing on how tomato production is affecting these three main topics in the village.

- **Environmental and agricultural**

What are the impacts on soil and water quality due to the farming system used in the village?

How is the tomato production influencing the land use and its conservation in the village?

- **Social**

How is tomato production influencing the household life, community-organisation and village life?

- **Economical**

Which are the necessary inputs (fertilizers, water, seeds, pesticides etc.) and how are these inputs available for the farmers?

What are the demands for tomatoes in the area?

Methodology

Written by Quintino

In order to gather information in this study, quantitative and qualitative data collection methods will be conducted using structured interview, semi-structured key-informant interviews, Participatory Rural Appraisal (PRA), informal talks, direct observation and literature review. Also water and soil sampling will be collected and analysed.

Methods

1.Structured interview (Questionnaire)

A list of structured questions will be prepared and carryout with farmer's household member (Appendix 1.). The tomato producers of the village will be found through the headman of the village the first day and at least 20 respondents will be selected by random sampling. This sampling strategy will permit to a generalization to the whole village's population (Patton, 1980).

With the questionnaire we will gather information related to agricultural input and output; prices, interest rate conditions, land tenure, food security, time investment, labour and technology related to tomato production.

2. Semi-structured interview (SI)

SI will be conducted with different key informants (Appendix 2a-f.)

Key-informants will be selected on the basis of their special knowledge and experience in the relevant topic (environmental/agricultural, social/legal and economic) related with the tomato production process. In this study we plan to carryout interviews with headman of village(Appendix 2a), representatives of Agricultural Land Reform Office (ALRO) (Appendix 2b), Royal Forest Department (RFD) (Appendix 2c) and Water Management Office (WMO) (Appendix 2d), in addition interview will be conducted with buyers (Appendix 2e) and sellers (Appendix 2f) of tomatoes in the local market.

1. SI with headman of village will be carried out in order to gather information related to village's life dynamic, social differentiation, wealth status, interactions within farmers, market, land tenure, infrastructure, farming system, erosion and other environmental impacts. In addition SI with the headman will help us to identify possible HH to be selected to take part in our questionnaire.

2. SI with ALRO and RFD representatives will be carried out in order to gather further information related to legislation within; land tenure, land conservation, infrastructure, erosion and other environmental impacts. As well as new technologies and information provided to the farmers.

3. SI with WMO representative will be carried out in order to collect information related to water availability, water supply management and water quality.

4. SI with sellers and buyer will be carried out in order to achieve information related to market dynamic, prices, motivations and constraints of tomatoes production and its consumption.

3. Participatory Rural Appraisal (PRA)

PRA, defined by Chamber, 1997, as "*a set of tools and techniques for gathering, sharing and analysing information for planning and action*". Will be used to collect socio-economic information. Therefore a farming calendar, community and farm transects will be conducted with a focus group discussion (FGD) of 5-8 farmers. The group will be identified during and invited after carrying out the questionnaires. We will use these PRA tools to gather information and to describe:

1. The social and economical impacts of tomatoes production in the village by using an economic information tool (Selener et. al. 1999) called: Income and expenditure calendar.

2. In order to identify, describe and analyse the different land use, potentials and problems related to tomato production in the village we will use a community and farm transects tool (Ibid).

3. To find out and characterize the annual agricultural activities of the villagers related to crop production we will use a farming calendar tool (Ibid).

4. Informal talks and direct observation

To help us to understand the village's life dynamic and to improve our contact with the local farmers informal talks and direct observation will be an important part of our field studies.

5. Water and soil analyses

1. Water sample in river basin and other source of water consumption will be collected and analyzed in order to identify if there is water contamination due to fertilizer used in tomato production and the bacteria *Escherichia coli* contamination that can affect the health of the farmer and the productivity of tomatoes farming system.

2. Soil sample will be collected from two different tomato plots, one cultivated with organic system and the other in conventional way, in order to compare the level of nutrient (N, K, P), pH and conductivity.

6. Global Positioning System (GPS)

GPS will be used in this study as a valuable tool to identify and measure the distances in the village from the HH to the tomatoes plots and from these plots to the source of water used for irrigation. This information will help us to understand how the tomatoes production is influenced by the distance to different resources in terms of access and time consumed to transport inputs and outputs.

Overall Objective	Specific Objective	Data Required	Data collection methods	Informant
To find out how the tomato production influence the daily organisation of the farmers and their HH in the village and its natural resources.	To understand why this village is producing tomatoes.	Crop production history	SI,Q LR	Headman, ALRO, Farmers
	To understand the farming system of tomatoes production	Types farming system	O, Q, IT	Farmers, ALRO
		Which type and accessibility of technologies,	Q, IT, PRA (transect), SI, O	Farmers, headman, ALRO
	To understand the availability of inputs (fertilizers, seeds, pesticides, labour, etc) and its cost for the farmers	Input, output prices/kg availability and amount,	Q, SI, PRA	Farmers, buyers, sellers
		Credit and interest rate conditions of the loan	Q, SI, IT	Farmers, buyers, sellers, headman, local credit institutions
	To understand the influence of tomato production on the surrounding environment, in terms of soil, land use and water management.	Land Title and its use	Q, SI, LR	Farmer, headman, ALRO, RFD
		Impact on land and soil composition	O, Q, PRA, IT, Soil analysis	Farmers, ALRO, RFD
		Water quality and availability	O, Q, SI, water analysis	Farmers, headman, WMO
	To understand how the production of tomatoes influence the organization within the households and between the households	Seasonality	PRA (Seasonal calendar), Q, IT	Farmers
		Location of infrastructure, plots and other resources	PRA(maps, transect), GPS	Farmers
		Labour hours per ha, distance to the plot, who and when is involved	Q, IT, O, GPS	Farmers
		Organizations and changes within HH and within village	IT, Q, SI	Farmers, head man
	To understand the market demand for tomatoes	Price/kg, seasonality	Q, IT, SI	Farmers, buyers, sellers

Table 1:Research framework table. Questionnaires (Q.), semi-structure interview (S.I.), and Participatory Rural Approach (PRA), Informal talking (I.T.), observation (O) mapping with GPS (GPS) and literature review (L.R.) Agricultural land reform office (ALRO) and the Royal Forestry Department (RFD)

Flow chart for research on tomato production i Ban Photong Phattana

Tomatoes as an agriculture crop, could combine all the livelihood strategies such as human, natural, financial, physical and social capital. The relationship between these strategies can explain the possible causes and consequences of tomatoes production in Ban Pho Tong Phattana village.

In the flow chart, ill.2 the existence of market, water, infrastructure, labour, need of income and farming system are the main factors driving the tomato production, however this factor are influenced by several factors such as, credit, rain, infrastructures etc.

As a consequence (see appendix 3) tomatoes production, can generate high income for the farmer and establish cooperatives organization for them, however it could bring some problem such as water and soil depletion, due to pollution by pesticide and fertilize used, land use and its value; migration, social differentiation etc

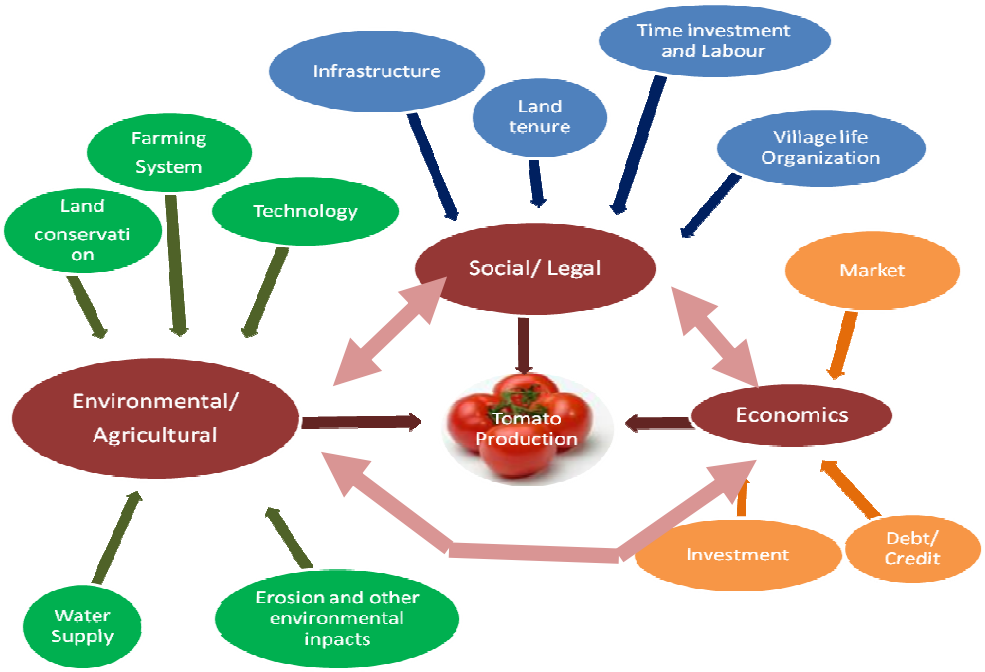

Illustration 2. Flow chart for research on tomato production i Ban Photong Phattana

Timetable Field Studies

Day	Time	Assignment, *discussion and analysis of data will be done all days in the evening*	Responsible	NB!
Tue 5th	14-16	Special Lecture for danish students. Background for land tenure ship, land management and administrative structures in Thailand.		
Thu 6th	9-12 13-16	Welcoming address Ice- breaking etc group-work Summarizing research proposal and planning of field activities		
Fri 7th	9-12 13-16	-Group work, make appointments for interviews -Presentation for research proposal -Test questionnaire		
Sat. 8th	8.00 13.30-14.15 14.30-16	Leave for field Welcoming address by Chief of RTRS -Recognise the area- Village -Informal Talk -Make appointments with headman of village and tomato growers for SI and Q	All	
Sun 9	a) all day b) all day	a)Transect and GPS b)Soil Sample and informal talking on tomato field, make appointment and start questionnaires (Taking appointment to institution, better to do it in Bangkok)	a)Quintino and Karin b)Daniele	
Mo 10	a)All day b)1 1/2 hours	a) To Continue with questionnaires b) Talk with leader, SI	a)Daniele Karin b) Quintino	
Tu 11	All day	a) Questioner, PRA and informal talking b) Field and Village excursion	All	
We 12		Midterm Evaluation		

Th 13	All day	a) Questionnaire and informal talking b) Field and water analysis	a)Karin b) Quintino and Daniele	
Fri 14	All day	a) Questionnaire and informal talking b) Field and WMO for SI	a) Karin b) Quintino and Daniele	
sat15	All day	a) Visit to the Royal forest office and Agricultural Land resources for SI b)Visit to the credit institution	All	
16 sun	All day	a)Go to Market for tomatoes interview sellers-buyers and also to market where they sell agricultural input b) review data (open on Sunday?)	a) Quintino and Daniele b) All	
17 Mo	Morning	Last chance for collection of information Community meeting Farwell Party		

NB: This time table is made for our field research and will be modify after discussion with our Thai contra part.

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Appendix 1.Questionary for Tomatoes Production Survey

Village:
Number of questionnaire:
Name of informant:

1)Household

Gender of farmer	
Age	
Education of farmer	
Ethnicity/Language	
How many adults are there in your household?	
How many children/minors do you have?	
Year of establishment in the village	

2) Salaried work:

How many members of your household have salaried employment?	
Type of salaried work	a. off-farm □ b. on-farm □ c. mix of both types □

3) Credit, loans

a) Do you take any loan? (If yes, specify from whom)

-
Yes……
…
-No □

Questions	**Amount of money**	**Interest rate**
b) Did you borrow money from a middleman last year (for contract farming)?		
c) Did you borrow money from a village association last year?		

d) Why do you take a loan? (Tick your choice)
-Agricultural inputs (seeds, fertilizers, pesticides ect.) □
-Facilities (TV, mobile phone ect.) □

-Food security □
-Education □
Other…….

e) Have you any problems to pay back the loan?

-Yes □
-No □

e) If yes, which causes influence your inability to pay it?

-Flooding □
-Drought □
-Pest and Disease attacks □
-Others……..

4) Land rights (number of rais owned, rented, sold)

a) Amount of land owned with a PBT5 title?	
b)Amount of land owned with a SPK4-01	
c) Amount of land rented last year?	
d) Amount of land "sold" in the past 5 years?	

5) Livestock production

a) How many heads of cattle do you own?	
b) How many pigs?	
c) How many chicken?	
d) How many sheep?	
e) How many goats?	
f) Do you have a fish pond?	

6) Agricultural production

Crops or fruits trees	**Production (last year)**	**Produced mainly for home consumption (H) or for cash (C)?**
Maize		
Cassava		
Rice		
Groundnut		
Tomato		
Chili		
Sugar cane		
Soya bean		

Agar wood		
Coconut		
Banana		
Papayas		
Thai apple		
Tamarind		
Leechees		
Longan		
Mango		
Mushrooms		
Rattan		
Bamboo shoots		
Firewood		
Other please specify		

7) From how long are you producing tomatoes?

……

8) Why did you start to produce tomatoes?

-Good availability of market □
-Own consumption □
-Others ……

9) How long time do you need to reach your fields? (Please specify the time and constrains)

…….

10) Have you got any training in tomatoes production? (If yes, please specify from whom)

-Yes…….
-No □

11) Which kind of varieties of tomatoes do you grow?

a)…….
b)…….
c)……..

12) Which are the main constrains in tomatoes production?

-Pest and disease □
-Weed □
-Drought □
-Flooding □

Others……

13) How many boxes/kg of tomatoes can you get from your cultivation for rais? (Please, specify the number)

……

14) During the last past years your production is decreased or increased?

-Increase □
-Decrease □

15) Do you use extra workers to maintain the tomato production and for harvest? (If yes, please specify how much earn a workers for hours/day/month)

-Yes……..
-No □

16) Where are you are selling your production?

-Local market □
-International market □
-Others…….

17) Which transport do you use to rich the market?

……..

18) Do you own a tractor? (If not, please specify how much you pay to rent it)

-Yes □
-No……

19) Do you use to buy certified seeds? (if yes, please specify where)

-Yes.....
-No □

20) Are you using organic or chemical farming system for your production?

-Chemical □
-Organic □

21) Where do you buy fertilizers?

……

22) Who advise you how to use them?

-Personal experience □
-Other farmers □
-Extension expertise □
-Others……..

23) Do you have any problem in affording these fertilizers? (If yes, please specify why)

-Yes □
-No □
-High cost □
-Distance to the city □
-Others…….

24) Do you have any problems with pest and diseases in your tomatoes cultivation? (If yes, Could you please mention which are the most common?)

-Yes □
-No □

a)
b)
c)
d)
e)

25) Do you use any kind of pesticide?

-Yes □
-No □

26) Do you have problems with weeds? (If yes, you weed manually or herbicide)

-Yes……
-No □

27) Do you do any soil analysis?

-Yes □
-No □

28) Do you have easy access to water? (If yes, ground or surface?)

-Yes…….
-No □

29) Do you pay any taxes to access to the water? (if yes, how much?)

-Yes……..
-No □

30) Do you irrigate your tomatoes production? (If yes specify the system)

-Yes □
-No □
-Sprinkling □
-Drop irrigation □
-Others…….

Appendix 2a. Interview guide – Headman of Village

Introduction

We are an interdisciplinary group of students from a danish and thai university, taking our research study in this village. We are so glad you can attend our interview and we'll try to do not take too much of your time. Our research focus on tomatoes production, we are trying to find out how much this activity influence the life of the people in your village.

1. ***Profile of headman of the village.***
   a) Name and age,
   b) For how log have been as headman of village
2. ***Responsibilities***
   a) Main activity of the headman
   b) Relations with public intuitions located in the area or province.
3. ***Social/Legal aspect of the village***
   a) Relation between village people and head man or vice-versa
   b) Relationship within village people
   c) Land tenure/lend right (process to access land in the village)
   d) Type of organizations present in the village and their activities
   e) Relations of these organization with villages people
   f) Infrastructures present in the village and their importance
   g) Importance of tomato production for the households and for the village
4. ***Environmental/Agricultural***
   a) Farming systems of tomato production in village
   b) Water supply management, taxes, responsibilities
   c) Activities related with soil conservation and erosion
5. ***Economic***
   a) Availability of input for crop production in general and tomato production in particular
   b) Credit system (loan) and its importance for the village

Appendix 2b Interview guide with ALRO representative

Introduction

We are a group of interdisciplinary students from danish and thai university, taking our research study in this province or village. We are so glad you could attend our interview and we'll try to do not take too much of your time. Our research focus on tomatoes production, we are trying to find out how much this activity influence the life of the people in your village and your office interact in this process.

1. *Profile ALRO of representative*
    a) Name
    b) Background
    c) Actual responsibility on ALRO

2. *Social/Legal*
    a) Land tenure, basic legislation to get land title
    b) Right on land use
    c) Relationship with village authority
    d) Area of competency

3. *Environmental/Agricultural*
    a) Farming system of tomato production used in village
    b) Inputs of tomato production, their availability, types and prices
    c) Technologies related to tomato production developed and adopted in villages
    d) Land conservation
    e) Soil erosion situation
    f) Soil analyses
    g) Assistance provided to the farmers

Appendix 2c Interview guide with RFD representative

Introduction

We are a group of students from a danish university and taking our research study in this province or village. We are so glad you could attend our interview and we'll try to do not take too much of your time. Our research focus on tomatoes production, we are trying to find out how much this activity influence the life of the people in your village and your office interact in this process.

4. *Profile of representative of RFD*
    d) Name
    e) Background
    f) Actual responsibility on RFD

5. *Social/Legal*
    e) Land tenure, basic legislation to get land title
    f) Right on land use
    g) Relationship with village authority
    h) Area of competency

Appendix 2d Interview guide with WMO representative

Introduction

We are a group of interdisciplinary students from a danish and thai university, taking our research study in this province. We are so glad you could attend our interview and we'll try to do not take too much of your time. Our research focus on tomatoes production, we are trying to find out how much this activity influence the life of the people in your village and your office interact in this process.

6. *Profile of WMO representative*
    g) Name
    h) Background
    i) Actual responsibility on WMO
7. *Environmental/Agricultural*
    a) Water legislation in the area
    b) Water management system
    c) Water supply for agriculture use and consumption system
    d) Water properties and analysis
    e) Water availability during the year

Appendix 2e Interview guide with buyers

We are an interdisciplinary group of students from a danish and thay university, taking our research study in this area. We are so glad you can attend our interview and we'll try to not take too much of your time. Our research focus on tomatoes production, we are trying to find out the importance of this product for the people in your area.

Respondent Profile:

a) Name ---------
b) Age
c) Gender

Motivation

How many tomatoes do you buy usually?

Do you change sellers or is always the same?

In this area it has been always possible buy tomatoes?

Does the price increase or decrease during the years?

How do you use tomato? (Fresh in salad, you coke it with rise and so on)

It is an important vegetable for your alimentation?

NB. Remember the level of satisfaction of the buyers

Appendix 2f Interview guide with Seller

We are an interdisciplinary group of students from a danish and thai university, taking our research study in this area. We are so glad you can attend our interview and we'll try to not take too much of your time. Our research focus on tomatoes production, we are trying to find out the importance of this product for the people in your area.

Respondent Profile:

a) Name ---------
b) Age
c) Gender

Motivation

- What is the reason for selling tomato?
- When did you get involved in tomato trade activity?
- From which province the tomatoes comes?
- Do you sale only tomatoes during the year?
- Do you buy tomatoes from the producers or from dealer?
- Can we ask you if the price of the tomatoes you pay from farmers increase or decrease or is always the same during the years?
- Does the people like tomatoes in this area?
- How many kg of tomatoes you can sell for day?

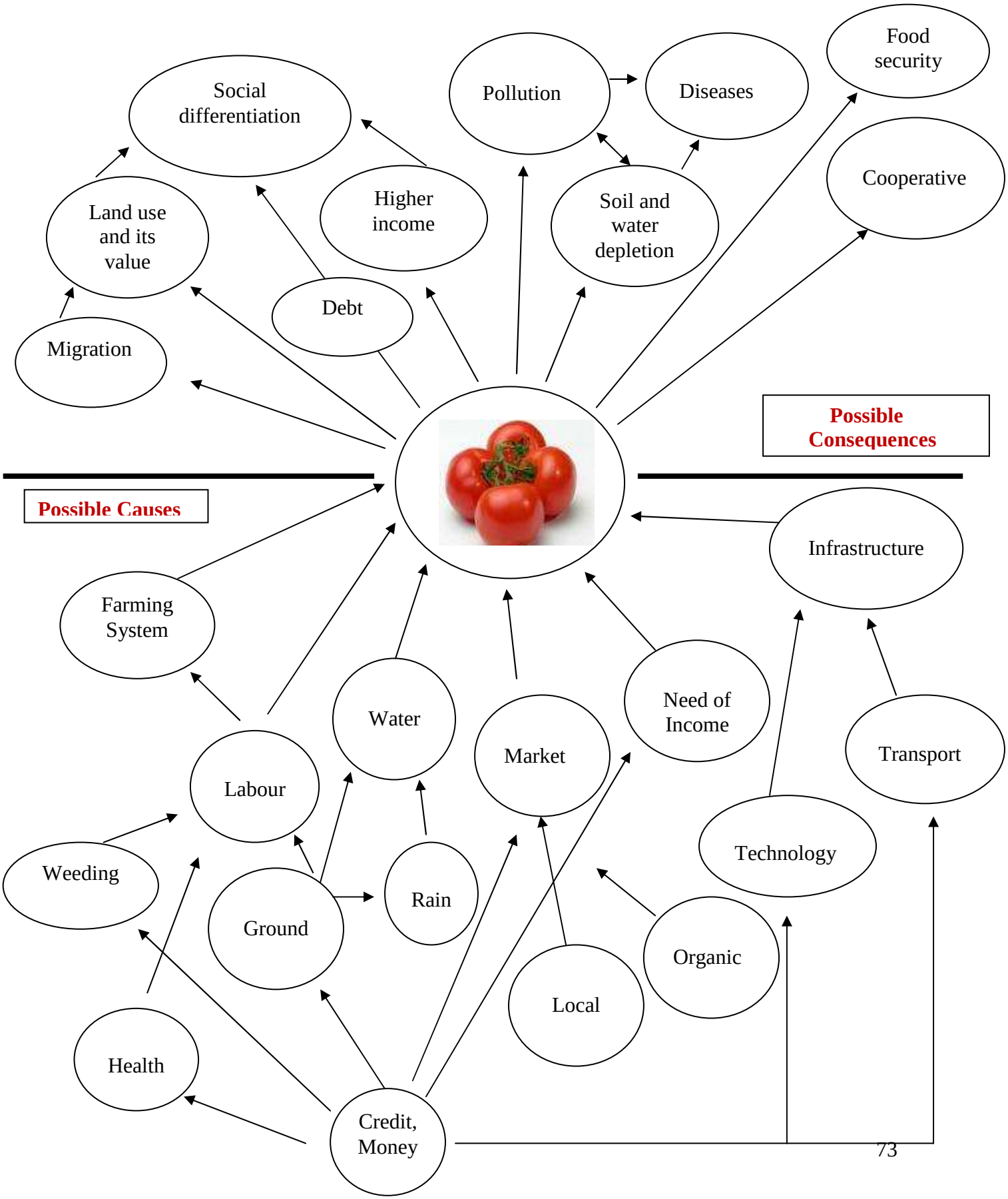
Constraints and Suggestions

- What is the main problems that you face in this activity?
- How is the fluctuation of the price through the year?
- What do you think that can be done to solve this problem?

N.B. Remember to check the level of satisfactions in the sellers of tomatoes

Appendix 3

Flowchart possible causes and consequences of tomatoes production



Appendix II A: General Questionnaire

Questionnaire Survey

Village:
Number of questionnaire:

We are a group of student from University of Copenhagen, Faculty of Life Science, Denmark, studying Agricultural development. We have cooperation with a group of Thai student from Kasetsart University. We kindly ask you to participate in my questionnaire survey. Your answers will be kept anonymous and the results will be used to analyze the *coping strategy of the Livelihoods if is suitable fore the village* to fill the requirement of our academic study. Thank you for your participation.

I. Background information

1.1 Name of informant: ……

1.2 Name of head of household (optional):.....

1.2 Gender of head of household : ☐Male ☐Female

1.3 Age of head of household :.....years old

1.4 Highest level of education of any member of household

☐Illiterate ☐ Primary school ☐Secondary ☐High school ☐University

1.5 How many adults in the household (16 and above)?.....person

1.6 How many children in the household (below 16)?.....person

1.7 What generations live in the household?

☐ Grand parents ☐ Parents/Adults ☐ Children

1.8 When did you move in the village?.....

II. Occupation

How many members of your household work on your own farm or plantation?.	……..person
How many members of the household work in factory, trade, service, tourism, etc.	……..person
How many members of the household work on someone else's farm or plantation?.	……..person

III. Credit, loans

	Amount of money	**Interest rate**
Did you borrow money from the bank of agriculture and agricultural cooperative (BAAC) last year (2007)? Yes ☐ No ☐		
Did you borrow money/inputs from a middleman (from km 79) last year? Yes ☐ No ☐		
Did you borrow money from the "one million per village" project or from another village fund? Yes ☐ No ☐		
Did you borrow money from a relative last year? Yes ☐ No ☐		

IV. Land rights (number of rais owned, rented, sold)

Amount of land held with a PBT?	……..Rais
Amount of land held with a SPK4-01?	……..Rais
Amount of land rented/borrowed last year?	……..Rais
Amount of land transferred in the past 5 years?	……..Rais
Amount of land acquired in the past 5 years?	……..Rais

V. Livestock production

How many heads of cattle do you own?	
If you own cattle, is your own land sufficient to graze your cattle?	☐Yes ☐ No
How many pigs?	
How many chickens?	
How many sheep/goat?	
Do you have a fish pond?	☐Yes ☐ No

VI. Agricultural productions

	How many rais planted last year?	How much (tons/kg) did you get per rai last year?
Maize		
Cassava		
Rice		
Tomato		
Chili		
Sugar cane		
Other:……..		

VII. Production from trees

	How many Trees (plants) do you have?	Is it mainly for cash or home consumption
Coconut		☐Cash ☐ Home consumption
Banana		☐Cash ☐ Home consumption
Papayas		☐Cash ☐ Home consumption
Agar wood		☐Cash ☐ Home consumption
Thai apple		☐Cash ☐ Home consumption
Other: ……		

VIII. Non Timber Forest Products

	How many days per year do you collect	Do you sell some of this product?
Mushrooms		☐Yes ☐ No
Rattan		☐Yes ☐ No
Bamboo shoots		☐Yes ☐ No
Agar wood seedlings		☐Yes ☐ No
Other: ……..		

IX. Agricultural inputs

How many rais did you irrigate for vegetable production last year?	……..……Rais
How much fertilizer did you apply in your fields last year?	……..……..kg
How much manure did you apply in your fields last year?	……kg
How did you prepare your field (ploughing) last year?	☐ Own tractor ☐Rented tractor ☐Animal traction

Appendix II B Additional Questionnaire

Additional Questionnaire
Changing of Land Ownership Affects the Community Livelihood
Group 2

Part 1

Population and Economic-social status

A. Population
3. Migration
3.1 Have any household member migrated?
( ) No ( ) Yes

Immigrate					Emigrate				
..... People					..... People				
No.	1	2	3	4	No.	1	2	3	4
From**					From**				
Reason***					Reason***				

Please insert the number in **From** and **Reason** columns
** 1) The same sub-district 2) The same district 3) The same province
4) Another province
*** 1) Agriculture 2) Marriage 3) Education 4)
5) Other.....
3.2 Was the family headman born here or immigrated from another place?
( ) Born here
( ) Not born here. Number of years living in this village .....years.
Reason of coming here?
( ) Economic reason
( ) Marriage family
( ) safety from thief
( ) Other (please specify).....

Part 2

Land ownership/land use earning a living

A. Land ownership/land use

1. How did you get land ownership?
( ) by the will ( ) by self-reservation ( ) by land ownership transference (changing)
2. Have you ever changed anything about your land ownership?
( ) Yes ( ) No

If yes

3. Why did you change land ownership?

( ) expensive ( ) Debts ( ) no uses the land
( ) other.....

4. Are there any livelihood shifts caused by land ownership changes?
   ( ) Yes ( ) No
5. How about changed livelihood strategies after changing land ownership?
   ( ) Economic changes ( ) Better ( ) worse
   ( ) Changes in family ( ) everyone is separated
   ( ) Changes in occupation ( ) other.....
6. What is your occupation after land ownership changes?
   ( ) Agriculture
   ( ) Working for the wages
   ( ) Other (please specify)

B. <u>Agriculture</u>

1. The period of cultivation
   ( ) rain season ( ) drought ( ) both of them
2. How do you and your family cultivate? (On your own land)

Details	Type of crops			
	Maize	Cassava	Tomato	Other
Cultivation area (rais)	.....	.....	.....	.....
Cultivation times/year	.....	.....	.....	.....
Production cost				
- Land preparation (baht)	.....	.....	.....	.....
- Plant seeds (baht)	.....	.....	.....	.....
- Cultivation hire (baht)	.....	.....	.....	.....
- Harvest hire (baht)	.....	.....	.....	.....
- Fertilizer (baht)	.....	.....	.....	.....
- Insecticides (baht)	.....	.....	.....	.....
- Tractor (baht)	.....	.....	.....	.....
- Other (baht)	.....	.....	.....	.....
Total Cost (baht)	.....	.....	.....	.....
Total cost/rai (baht)	.....	.....	.....	.....
Total products/year (unit)	.....	.....	.....	.....
Total products/rai (kg.)	.....	.....	.....	.....
Price/unit (baht)	.....	.....	.....	.....
Price/kg. (baht)	.....	.....	.....	.....
Price/kg. (baht)				
Net income (baht/year)				

3. How do you and your family cultivate? (on rental land)

Details	Type of crops			
	Maize	Cassava	Tomato	Other
Cultivation area (rais)	.....	.....	.....	.....
Cultivation times/year	.....	.....	.....	.....
Production cost				
- Land preparation (baht)	.....	.....	.....	.....
- Plant seeds (baht)	.....	.....	.....	.....
- Cultivation hire (baht)	.....	.....	.....	.....
- Harvest hire (baht)	.....	.....	.....	.....
- Fertilizer (baht)	.....	.....	.....	.....
- Insecticides (baht)	.....	.....	.....	.....
- Tractor (baht)	.....	.....	.....	.....
- Other (baht)	.....	.....	.....	.....
Total Cost (baht)	.....	.....	.....	.....
Total cost/rai (baht)	.....	.....	.....	.....
Total products/year (unit)	.....	.....	.....	.....
Total products/rai (kg.)	.....	.....	.....	.....
Price/unit (baht)	.....	.....	.....	.....
Price/kg. (baht)	.....	.....	.....	.....
Price/kg. (baht)				
Net income (baht/year)				

Part 3

Public health and sanitation

1. Where is your drinking water from? (You can choose more than 1 answer).
   Rain water
   ( ) Water supply
   ( ) Water from shallow pond (depths)..... (Metre)
   ( ) Ground water (depths)..... (Metre)
   ( ) Water from natural water sources like rivers, streams or so on
   ( ) Other (please specify).....

2. Do you purify water before drinking?
   ( ) No ( ) yes
   How do you purify it?
   ( ) To boil it ( ) to use alum ( ) to filter it
   ( ) other (please specify).....

3. Where is your using water from? (You can choose more than 1 answer).
   ( ) Rain water
   ( ) Water supply
   ( ) Water from shallow pond (depths)..... (Metre)
   ( ) Ground water (depths)..... (Metre)
   ( ) Water from natural water sources like rivers, streams or so on
   ( ) Other (please specify).....

4. Is there any problem about your drinking and using water?
   (Both problems of quality and quantity)
   ( ) No problem
   ( ) A lack of water in drought
   ( ) Dirty water
   ( ) Salt water
   ( ) There is rust in water, and the water is stinky
   ( ) Other (please specify)

5. How do you eliminate polluted water from your house?
   ( ) Do nothing (let it be dried)
   ( ) Drain it through a pit
   ( ) Other (please specify)

Garbage elimination
   ( ) Do nothing
   ( ) Burn it
   ( ) Bury it
   ( ) There is a garbage elimination service
   ( ) Other (please specify)

6. Is there any toilet in your house?
   ( ) Yes ( ) No
   What kind of toilet do you use in your house?
   ( ) Pit latrine (toilet)
   ( ) Lavatory with septic tanks
   ( ) Other (please specify)

Part 4

Transportation, Communication, Community Development and Recreation

1. Which the vehicle that your family usually uses for transportation?
   ( ) On foot ( ) bicycle ( ) motorcycle
   ( ) personal car
   ( ) mini-bus ( ) bus
2. What is the source of information you usually get from?
   ( ) Person ( ) newspaper ( ) radio
   ( ) television
   ( ) other (please specify).....

3. Do you and your family members joins in any community group or organization? (you can indicate more than 1 group or organization)
   ( ) Saving group ( ) Funeral organization ( ) Housewife group
   ( ) Youth organization ( ) T.S.P.C
   ( ) Other (please specify).....
4. Do you still helping each other in harvesting the crops or doing any community activity?
   ( ) No
   ( ) Yes ( ) help harvest the crop/transplanting rice seedling
   ( ) Help plough the field
   ( ) Form a group to develop the village
   ( ) Other (please specify).....
5. What are the recreational areas near your residence?

.....

6. Where are they located?

.....

7. How do you use them?

.....

Appendix II C Addictinal question (thai version)

<u>แบบสำรวจการเปลี่ยนแปลงกรรมสิทธิ์การใช้ที่ดินที่มีผลต่อวิถีชีวิตชุมชน</u>

ตอนที่ 1

<u>ข้อมูลประชากระและสภาพทางเศรษฐกิจ-สังคมเบื้องต้น</u>

<u>ก.ประชากร</u>

1. ชื่อ-สกุล.....อายุ.....ปี
   อาศัยอยู่ บ้านเลขที่..... หมู่บ้านโพธิ์ทองพัฒนา
   การศึกษา ( ) ต่ำกว่า ป.4 ( ) ป.4-ป.6 ( ) มัธยมต้น ( ) มัธยมต้น
   ( )ปริญญาตรี ( ) สูงกว่าปริญญาตรี
2. จำนวนสมาชิกที่อาศัยอยู่จริงในครัวเรือน หญิง ..... คน ชาย ..... คน รวม
   .....คน(รวมผู้ให้ข้อมูล)
   อายุน้อยกว่า 14 ปี ..... คน
   อายุ 15 – 30 ปี .....คน
   อายุ 31 – 60 ปี ..... คน
   อายุมากกว่า 60 ปี ..... คน
3. จำนวนคู่สมรสในครัวเรือน (ที่อยู่ครบทั้งสามี – ภรรยา) ( ) ไม่เกิน 1 คู่ ( ) 2 คู่ขึ้นไป
4. การย้ายถิ่นฐาน
   การย้ายถิ่นของสมาชิกในครัวเรือน ในรอบ 1 ปีที่ผ่านมา
   ( ) ไม่มีการย้ายถิ่นเข้าและย้ายถิ่นออก ( ) มีการย้าย เข้า - ออกดังนี้

ย้ายเข้า					ย้ายออก				
จำนวน (คน) ……..					จำนวน (คน) ……..				
คนที่	1	2	3	4	คนที่	1	2	3	4
ย้ายมาจาก*					ย้ายมาจาก*				
สาเหตุ**					สาเหตุ**				

<u>ให้ระบุหมายเลขลงในช่องสถานที่ย้ายและสาเหตุ</u>

* 1) ย้ายภายในตำบล 2) ย้ายภายในอำเภอ 3) ย้ายภายในจังหวัด 4) ย้ายระหว่างจังหวัด

**1) ทำงาน 2) สมรส ครอบครัว 3) การศึกษา4) ย้ายตามหน้าที่ราชการ
5) อื่น ๆ .....

หัวหน้าครัวเรือน ชาย เกิดที่นี่หรือย้ายมาจากที่อื่น
(กรณีไม่มีหัวหน้าครัวเรือนชายให้ถามหัวหน้าครัวเรือนหญิงแทน)
( ) เกิดที่นี่ ( ) ไม่ได้เกิดที่นี่ จำนวนปีที่อาศัยอยู่ในหมู่บ้านนี้ ..... ปี
สาเหตุที่ย้ายมาอยู่ที่นี่
( ) ปัจจัยด้านเศรษฐกิจ ( ) การแต่งงาน ครอบครัว ( )
ปัจจัยด้านความปลอดภัยจากโจรผู้ร้าย

( ) อื่น ๆ (ระบุ) .....

ข. การมีงานทำ

1. จำนวนสมาชิกในครัวเรือนที่มีงานทำ.....คน
   ทำภายในครอบครัว.....คน ทำภายนอกครอบครัว.....คน
2. ความต้องการมีงานทำเพิ่มขึ้นของสมาชิกในครัวเรือน ( ) ต้องการ ( ) ไม่ต้องการ

ค. สภาพเศรษฐกิจ(ก่อนเปลี่ยนแปลงกรรมสิทธิ์ที่ดิน)

1. ครอบครัวท่านมีหนี้สินหรือไม่ ( ) มี ( ) ไม่มี
   ( ) นอกระบบ ร้อยละ..... ( ) ธกศ. ร้อยละ.....
   ( ) กองทุนหมู่บ้าน ร้อยละ..... ( ) อื่นๆ..... ร้อยละ.....

2. ครอบครัวท่านมีการอออมทรัพย์หรือไม่ ( ) มี ( ) ไม่มี

ตอนที่ 2

กรรมสิทธิ์ที่ดิน/การใช้ประโยชน์ที่ดินและการประกอบอาชีพ

ก. กรรมสิทธิ์ที่ดิน/การใช้ประโยชน์ที่ดิน

1. กรรมสิทธิ์ที่ดินที่ท่านครอบครอง

กรรมสิทธิ์ที่ดิน	เป็นเจ้าของกรรมสิทธิ์		เช่า		รับจ้างเฝ้า(ไม่เสียค่าเช่า)	
		ไร่		ไร่		ไร่
สปก. 4-01						
นส.3						
สค. 1						
ภบท.5						
อื่นๆ						

รวมที่ดินที่ท่านครอบครอง .....ไร่

2. ปัจจุบันท่านใช้ประโยชน์ที่ดินเพื่อการเกษตร .....ไร่
3. เป็นกรรมสิทธิ์ที่ดินที่ท่านถือครอง ( ) มรดก ( ) จับจองเอง ( ) โอนกรรมสิทธิ์
4. ท่านมีการเปลี่ยนแปลงกรมสิทธิ์ที่ดินจากที่ดินเดิมของท่านหรือไม่
   ( ) เปลี่ยนแปลง ( ) ไม่เปลี่ยนแปลง
5. ปัจจัยที่ส่งผลกระทบต่อการเปลี่ยนแปลงกรรมสิทธิ์การใช้ที่ดิน
   ( ) ราคาสูง ( ) ภาระหนี้สิน ( ) ไม่มีคนทำต่อ
6. มีการเปลี่ยนวิถีชีวิตที่ไปเนื่องจากการเปลี่ยนแปลงกรรมสิทธิ์การใช้ที่ดิน
   ( ) เปลี่ยน ( ) □□□□□□□□□□
7. วิถีชีวิตที่เปลี่ยนไปเนื่องจากการเปลี่ยนแปลงกรรมสิทธิ์การใช้ที่ดิน
   ( ) เปลี่ยนแปลงสภาพเศรษฐกิจ ( )ดีขึ้น ( ) ลดลง
   ( ) เปลี่ยนแปลงสภาพครอบครัว ( ) แยกย้ายออก

( ) เปลี่ยนแปลงอาชีพ

( ) อื่นๆ.....

8. อาชีพหลังจากการเปลี่ยนแปลงกรรมสิทธิ์ที่ดิน

( ) อาชีพเดิม ( ) เปลี่ยนอาชีพ ระบุ.....

ข. อาชีพเกษตรกรรม

1. ครอบครัวท่านทำการเพาะปลูกอย่างไร

( ) ฤดูฝน ( ) ฤดูแล้ง ( ) ทั้งฤดูฝนและฤดูแล้ง

รายละเอียดระบุชนิดพืชที่ปลูกด้านขวามือ	ชนิดพืชที่ปลูก						
	ข้าวโพด	มัน	มะเขือเทศ	พริก	ฟักทอง	แตงกวา	อื่น ๆ
พื้นที่เพาะปลูก (ไร่)	.....	.....	.....	.....	.....	.....	.....
จำนวนครั้งที่ทำต่อปี							
ค่าเตรียมพื้นที่ (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าเมล็ดพันธุ์ (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าจ้างปลูก (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าจ้างเก็บเกี่ยว (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าปุ๋ย (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าสารฆ่าแมลง (บาท)	.....	.....	.....	.....	.....	.....	.....
ค่าจ้างรถบรรทุก (บาท)	.....	.....	.....	.....	.....	.....	.....
อื่น ๆ (บาท)	.....	.....	.....	.....	.....	.....	.....
รวมลงทุนทั้งหมด (บาท)	.....	.....	.....	.....	.....	.....	.....
รวมลงทุนต่อไร่ (บาท)	.....	.....	.....	.....	.....	.....	.....
ผลผลิตรวมต่อปี (หน่วย)	.....	.....	.....	.....	.....	.....	.....
ผลผลิตต่อไร่ (กก.)	.....	.....	.....	.....	.....	.....	.....
ราคาต่อหน่วย (บาท)	.....	.....	.....	.....	.....	.....	.....
ราคาต่อกิโลกรัม (บาท)	.....	.....	.....	.....	.....	.....	.....
ราคาต่อกิโลกรัม (บาท)	.....	.....	.....	.....	.....	.....	.....
รวมรายได้หักค่าใช้จ่าย/ปี (บาท)	.....	.....	.....	.....	.....	.....	.....

หมายเหตุ ค่าใช้จ่ายในการเพาะปลูกที่ปรากฏในตารางเป็นแนวทางสำหรับการประมาณค่าใช้จ่ายเท่านั้น มิได้นำมาใช้ในการวิเคราะห์ข้อมูล อาจถามเป็นค่าใช้จ่ายรวมก็ได้ อาชีพอื่น ๆ ก็เช่นกันต้องการรายได้สุทธิต่อปี เป็นหลัก

ค. สภาพเศรษฐกิจ(หลังเปลี่ยนแปลงกรรมสิทธิ์ที่ดิน)

1. ครอบครัวท่านมีหนี้สินหรือไม่ ( ) มี ( ) ไม่มี

( ) นอกระบบ ร้อยละ..... ( ) ธกศ. ร้อยละ.....

( ) กองทุนหมู่บ้าน ร้อยละ..... ( ) อื่นๆ..... ร้อยละ.....

2. ครอบครัวท่านมีการอออมทรัพย์หรือไม่ ( ) มี ( ) ไม่มี

ตอนที่ 3
<u>สาธารณสุขและอนามัยสิ่งแวดล้อม</u>

1. แหล่ง<u>น้ำดื่ม</u>ของท่าน (ตอบได้มากกว่า 1 คำตอบ)
   ( ) น้ำฝน ( ) น้ำประปา ( ) น้ำบ่อตื้น ลึก ..... เมตร
   ( ) น้ำบ่อบาดาล ลึก ..... เมตร
   ( ) น้ำจากลำห้วย/แม่น้ำ ( ) อื่น ๆ (ระบุ)
   .....
2. ก่อนดื่มท่านทำน้ำให้สะอาดก่อนหรือไม่
   ( ) ไม่ ( ) ทำให้สะอาดก่อน
   วิธีการทำน้ำให้สะอาดก่อนการบริโภคที่ท่านใช้คือ
   ( ) ต้ม ( ) ใช้สารส้ม ( ) กรอง ( ) อื่น ๆ (ระบุ)
   .....

3. แหล่งน้ำใช้ของท่าน (ตอบได้มากกว่า 1 คำตอบ)
   ( ) น้ำฝน ( ) น้ำประปา ( ) น้ำบ่อตื้น ลึก ..... เมตร
   ( ) น้ำบ่อบาดาล ลึก ..... เมตร
   ( ) น้ำจากลำห้วย/แม่น้ำ ( ) อื่น ๆ (ระบุ)
   .....
4. ปัญหาเกี่ยวกับน้ำดื่มน้ำใช้ (ทั้งด้านปริมาณและคุณภาพ)
   ( ) ไม่มีปัญหา ( ) ขาดแคลนในฤดูแล้ง ( ) น้ำขุ่น ( ) น้ำเค็ม
   ( ) น้ำมีสนิม มีกลิ่นคาว ( ) อื่น ๆ (ระบุ)
   .....
5. น้ำที่ท่านใช้แล้วจากครัวเรือน (น้ำเสีย) ท่านกำจัดโดยวิธีใด
   ( ) ปล่อยให้แห้งไปเอง ( ) ระบายลงบ่อเกรอะ ( ) อื่น ๆ (ระบุ)
   .....
6. การกำจัดขยะมูลฝอย
   ( ) ปล่อยทิ้งไว้เฉย ๆ ( ) เผากลางแจ้ง ( ) ฝัง ( )
   มีบริการกำจัดขยะมารับไปจำกัด
   ( ) อื่น ๆ (ระบุ) .....
7. การมีส้วมใช้ในบ้าน ( ) ไม่มี ( ) มี
   ถ้ามีส้วมเป็นส้วมประเภทใด ( ) ส้วมหลุม ( ) ส้วมซึม ( ) อื่น ๆ (ระบุ)
   .....

ตอนที่ 4

<u>การคมนาคม การติดต่อสื่อสาร การพัฒนาชุมชน การพักผ่อนหย่อนใจ</u>

1. ยานพาหนะที่ท่านหรือสมาชิกในครัวเรือนใช้บ่อยที่สุดในการเดินทาง
   ( ) เดิน ( ) จักรยาน ( ) จักรยานยนต์ ( ) รถยนต์ส่วนตัว
   ( ) รถโดยสารประจำทางขนาดเล็ก ( ) รถโดยสารประจำทางขนาดใหญ่
2. โดยทั่วไปท่านได้รับข่าวสารเรื่องราวต่าง ๆ จากแหล่งใด
   ( ) บุคคล ( ) หนังสือพิมพ์ ( ) วิทยุ ( ) โทรทัศน์
   ( ) อื่น ๆ (ระบุ) .....
3. ท่านและสมาชิกในครัวเรือนเป็นสมาชิกกลุ่มหรือองค์กรใดบ้าง (ระบุได้มากกว่า 1 องค์กรหรือกลุ่ม)
   ( ) กลุ่มออมทรัพย์ ( ) กลุ่มฌาปนกิจ ( ) กลุ่มแม่บ้าน
   ( ) กลุ่มเยาวชน
   ( ) ทสปช. ( ) อื่น ๆ (ระบุ)
   .....

การเอาแรง/การลงแขกเกี่ยวข้าวหรือกิจกรรมกลุ่มช่วยเหลือกันในชุมชนยังมีหรือไม่

( ) ไม่มี
( ) มี ( ) การลงแขกเกี่ยวข้าว/การดำนา ( ) ไถพรวน
( ) รวมกลุ่มพัฒนาหมู่บ้าน
( ) อื่น ๆ (ระบุ).....

สถานที่สวยงามที่อยู่ใกล้เคียงที่อยู่อาศัยของท่านได้แก่..
.... อยู่ที่
( ) ภายในหมู่บ้าน ( ) ภายในตำบลนี้ ( ) ภายในอำเภอนี้ ( ) ภายในจังหวัดนี้

Appendix II D

Semi structured interview conducted immediately after questionnaire when the Household was producing tomatoes

Could you please tell me about your tomato production....

For how long have you produced tomatoes?

Why did you start to produce tomatoes?

Have you got any training in tomatoes production? (If yes, please specify from whom)

Which kind of varieties of tomatoes do you grow?

During the last past years your production is decreased or increased?

Which are the main constrains in tomatoes production?

What are the necessary inputs for the tomato production?

Are you using organic or chemical farming system for your production?

Where do you buy fertilizers?

Who advise you how to use them?

Do you use any kind of pesticide?

Do you irrigate your tomatoes production? (If yes specify the system)

Do you have problems with weeds? (If yes, you weed manually or herbicide)

Do you use extra workers to maintain the tomato production and for harvest? (If yes, please specify how much earn a workers for hours/day/month)

Where are you are selling your production?

Which transport do you use to reach the market?

Day	Daniele Barelli field diary **APPENDIX III A**
Sat 8	**Morning** Arrival at camp **Afternoon** Meeting with headman Informal talk and reconnaissance of area
Sun 9	**Morning** Questionnaires and interviews in tomato field Lunch at local resort **Afternoon** Questionnaires and excursion in the village area Informal talk with rangers **Evening** Review of first data gained during the day and preparation for the next day
Mon 10	**Morning** Questionnaires and interviews with tomato farmers Visit at private Orchard with informal talk and lunch **Afternoon** First Village meeting PRA (tomato and maize crop calendar)
Tue 11	**Morning** Compile data Lunch in the village **Afternoon** Questionnaires- informal talk Interview with headman **Evening** Discussion data and preparation for the follow day
Wen 12	**Morning** Compile Data Preparation of the presentation Lunch at camp **Afternoon** Midweek presentation for the other groups **Evening** Relax after long day presentation
Thu 13	**Morning** Soil sample Lunch in a resort **Afternoon** Back to camp to dry the soil sample and continue the analysis of data **Evening** Preparation for the next day
Fri 14	**Morning** Water sampling and analysis Lunch in resort **Afternoon** Compile and analyse data **Evening** Preparation activities for the follow day
Sat 15	**Morning** Soil analysis Lunch at camp **Afternoon** Transcription data from soil analyses **Evening** Preparation for next day

Appendix III B: Diary of fieldwork March 2008

Karin Persson

Day	Activities
Sat 8	Arriving at camp Afternoon; Meeting with headman Informal talk and reconnaissance of the local area
Sun 9	Questionnaires and interviews in tomato field Lunch at local resort Questionnaires and walk Informal talk with rangers Evening compile data and prepare for the next day
Mon 10	Questionnaires and interview with tomato farmers Visit at private Orchard with informal talk and lunch Village meeting PRA- History Evening compile data and prepare for the next day
Tue 11	Morning compile data Afternoon questionnaires- informal talk Interview with headman Evening GIS data from Thai counterparts put into maps Evening compile data and prepare for the next day
Wend 12	Compile Data Make presentation Midweek presentation for the other groups Evening compile data and prepare for the next day
Thu 13	Interview with key person and last questionnaires Interview with key person Transect walk with Headman History –Interview with Mrs Evening compile data and prepare for the next day
Fri 14	Meeting at local TAO office Interview Afternoon compile and Analyse data
Sat 15	Problems with swollen legs Went to local hospital in KM 79 then to Korat all day Evening Briefing with the group and plan next day
Sun 16	Compile data in the morning Community meeting with collection of missing data through semi structured interviews Presentation of findings and catching the response from the villagers Evening compile data and exchange last data with Thai counterparts
Mon 17	In-depth interview with old lady Afternoon free and in the evening Goodbye party
Tue 18	Left for Bangkok Evaluation of field study and goodbye Danish students

Appendix III C: Diary of fieldwork March 2008

Quintino Lobo

Day	Activities Developed
Sat 8	- Arriving at JICA Home hotel **Afternoon** - Presentation of the group to Headman of the village - Informal talk and reconnaissance of area
Sun 9	- Questionnaires and interviews in tomato field Lunch at local resort - Questionnaires - Informal talk with rangers Evening - Notes computer entering and group discussion of the next day activities
Mon 10	- Questionnaires and interview with tomato farmers - Visit at private Orchard with informal talk and lunch - Village meeting - PRA- Tomato and Maize seasonal calendar
Tue 11	Morning- compile data Afternoon - Questionnaires & informal talk Evening compile data and discussion for next day activities.
Wend 12	Compile Data Preparation for presentation Midterm review presentation with other groups
Thu 13	Soil sampling Afternoon back to the JICA to dry the soil and compile data Evening- compile information and discussion for next day activity
Fri 14	Water sampling and analysis Interview Afternoon compile and Analyse data
Sat 15	Soil analysis Interview
Sun 16	Compile data in the morning Community meeting with collection of missing data through semi-structured interviews Presentation of findings and catching the response from the villagers
Mon 17	Compile data and translation of Afternoon free Evening firework party
Tue 18	Back to Bangkok

Appendix IV A PRA exercise Problem ranking for maize production

		A	B	C	D	E	F	G	H	I		
	Problems	Land	Fertilizer	Disease	Irrigation	Varieties	Prices	labour	Pesticides	Herbicides	Score	Rank
A	Land		B	A	A	E	F	G	A	A	4	**5**
B	Fertilizer			B	B	B	F	G	B	B	6	**3**
C	Disease				D	E	F	G	H	I	0	**9**
D	Irrigation					E	F	G	D	I	2	**7**
E	Varieties						F	G	E	E	5	**4**
F	Prices							G	F	F	7	**2**
G	Labour								G	G	8	**1**
H	Pesticides									I	1	**8**
I	Herbicides										3	**6**

Participants: Mrs. Vanphone Songdang; Mr. Sanae Sida and Mr Thonglow Saart

Appendix IV B Problem ranking for tomato production

		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	
	Problems	Land	Fertilizer	Disease	Irrigation	Varieties	Prices	labour	Pesticides	Herbicides	Bull	Score
A	Land		B	C	D	E	F	G	H	A	A	2
B	Fertilizer			C	D	E	F	G	H	B	B	3
C	Disease				D	E	F	G	C	C	C	5
D	Irrigation					D	D	G	D	D	D	8
E	Varieties						F	G	H	E	E	5
F	Prices							F	F	F	F	8
G	Labour								G	G	G	8
H	Pesticides									H	H	5
I	Herbicides										I	1
J	Bull											0

Participants: Mrs. Vanphone Songdang; Mr. Sanae Sida and Mr Thonglow Saart

Appendix V

Methods used in field

Questionnaires	28 out of 30 households
Semi structured interviews	10 with tomato producers
	1 with headman of Village
	1 with headman, TAO
	1 with headman, BAAC
Informal talking	several in field
Indebt interview	Tomato producers
	Old lady
Soil sampling	6 samples of soil
Water sampling	6 samples of water
PRA	
Transect walk	one with headman
Problem ranking exercise	of tomato and maize production
Crop calendar exercise	one for maize on for tomato
Village history	with headman and several farmers