Land Use Patterns in Ban Pak Huai Oi and Ban Huai Hom:

Sustainable or not?

SLUSE

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Location 3, group 1

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Introduction to Northern Thailand

Thailand has experienced a rapid economic growth since the 1950's. The growth was initially related to the use of natural resources, but has become increasingly dependent on urban-based manufacturing industry. In 1994 agriculture's share of GDP had declined to only 12% despite the fact that it employs 60% of the labour force (Fairclough & Tasker 1994:22).

Thailand once relied heavily on timber as a source of foreign exchange but since the 1970's Thailand has been a net importer of timber. In the period from 1950 to the end of the 1970's the rice production increased by more than two thirds. This increase in production was based on expansion of farmland into the forest areas surrounding the central plains (Hirsch 1993:27-31).

Another factor contributing to the deforestation was the construction of roads to remote and isolated areas, which opened up for clearance of farmland and logging. In 1963 the area covered by forest was estimated to be 53% but in 1986 the official estimation was 25-29% and unofficially 15%. This is the main reason why more than one quarter of the land in Thailand is considered to be heavily affected by soil erosion today (Hirsch 1993:15).

For the ruling elite, the issue of environmental degradation is related to the question of how long the resource base can sustain a continued industrial and commercial development. The environmental degradation has caused concern and resulted in changes within the national environmental policy. An example is the aim of leaving 25% of the land area as commercial forest and 15% as natural forest. This is pursued through different policies as afforestation programs, attempts to stop further encroachment through resettlement programs or granting of usufructuary rights, and not least supporting a change from extensification towards intensification of farming practices as expansion is no longer desirable (Hirsch 1993: 15,16,20).

The building of larger and smaller dams in the northern part of the country is part of this intensification. It has resulted in an increase in the water supply, leading to higher yields in particular areas (Cohen and Pearson 1998). The integration of the farmer into the market through intensification and change from subsistence production to cash production has forced the farmer to be part of a cash economy. This is causing problems for many poor farmers, as there is not equal access to financial support. One factor limiting access to loans is not having title deeds because title deeds are often necessary to obtain loans from banks. Nevertheless there exist other ways of obtaining loans for example the Bank of Agriculture and Agricultural Co-operative (BAAC), agricultural co-operatives (AC) or private moneylenders.

More than 60% of the peasants in Thailand are estimated not to have legal titles to their land. Included in this group are hill tribes like Karen, Yellow Leaf or Hmong. Besides poor land rights they often have limited citizen rights or none at all, which causes these people to be badly treated in conflicts with the Thais. As a result they often live under different conditions than the Thais (Hongladarom, 1999).

Since the 1980's the government has had development programs aiming at improving the living conditions for the poorest sections of the rural population through projects improving basic infrastructure and employment opportunities (Phongpaichit & Baker 1999:64). Also, there have been developmental programs focusing on instruction of farmers on farming practices.

In spite of the goal of a more equal geographically distributed development, most industries remain situated in the area around Bangkok, which in 1991 produced 52% of GDP, though it only contains 15% of the population (Fairclough & Tasker 1994: 22). The income gab between rural and urban Thailand has made hundreds of thousands of rural people migrate on a seasonal or permanent basis in order to support their families at home or leave agriculture behind them for good.

Study area

The above mentioned aspects are reflected in our investigation which was carried out in The Mae Yom Watershed, in between the 19th and the 29th of October 1999.

The Mae Yom Watershed is situated in the Yom River basin in the sub-humid tropical climate zone. There are three seasons, the rainy season, the cold season and a hot season. The rainy season is between the middle of May to the end of October. At the Yom Watershed Research Station, the average annual rainfall was measured to 1216mm in the years 1990-96. Almost 90% of the rain fell in the rainy season with intense rainfall in August and September. The rainy season is followed by the cold period which is also characterised as dry, from November to February, and from March it gets warmer again and there is more rain, but it is still relatively dry (Rungrojwanich, 1998).

In the Northern part of the Mae Yom Watershed, surrounded by forest, the highland villages Na Luang and Tha Wa are situated. The villagers are primary farmers dependent on rainfed maize cultivation. Both villages face the problem of isolation but are affected by different forest classifications; the forest around Na Luang is classified as National Park whereas the part surrounding Tha Wa is classified as National Forest Reserve.

In another part of the highland is Ban Pak Huai Oi situated. Here exist a Thai village and a Hmong village close to each other. Still, their living conditions are very different, which influences their agricultural and livelihood strategies.

In the irrigated lowland three different villages, Ban Klang Thung, Ban Huai Khum and Ban Wang Din, are situated. The cultivation of irrigated rice is the main agricultural activity and the water supply is, or has been, a scarce resource. The water supply in Ban Klang Thung and Ban Huai Khum has been improved due to the building of two medium scale dams. This has led to a larger crop variety and a possibility to grow two or three crops a year. In Ban Wang Din this is not the case, and all the fields lay fallow during the dry season.

Outline of the report

The report is divided in six parts, which correspond to the six villages studied. The first two parts discuss to which extend the livelihood-strategies of the farmers in Ban Tha Wa and Ban Na Luang have been effected by official restrictions on use of natural resources. This question is elaborated from different angles. The Na Luang part focusing broadly on livelihood-strategies and the Tha Wa more specifically on agriculture. The third part discus the possibilities for farmers in Ban Wang Din to increase their income in a sustainable way. Both, on-farm and off-farm income generating activities will be analysed. The fourth part discusses sustainability through the impacts the medium scale Mae Song Reservoir has had on the land use strategies employed by the farmers in Ban Klang Thung. The fifth part discusses how different land use patterns are sustainable, in an area with two different kinds of population groups. The sixth part is an analysis of the effects of the Mae Tang Dam on the agricultural production and of the changes in relation to sustainability.

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ABSTRACT
This study took place in and around the Thai and Hmong villages, Ban Pak Huai Oi and Ban Huai Hom in the Mae Yom Watershed in northern Thailand. The sustainability of the agricultural potential of the soil (in this study defined in terms of the chemical composition of the soil, and erosion) will to a certain degree depend on land use practices, which in turn will be influenced by a number of other socioeconomic factors.

In the study area, erosion is a problem on steep upland slopes. The Thais have some level fields, and are not as concerned about erosion as the Hmong. All the Hmong fields are upland, and they are also more aware of the problem. Protection measures include the planting of orchards and in rare instances planting of sativa grass and digging of drainage ditches, though not enough to prevent serious erosion, of which there was evidence.

Both Hmong and Thai farmers were aware of the need to replenish the nutrient content of the soil, however, low income levels and lack of ready cash at the beginning of the season restricted the use of chemical fertilizers. There was little use of organic sources of nutrients.

Because the area is forest reserve, there are limits to extensification. Nevertheless, this was not the major constraint on agriculture. Shortage of labor and investment capital set limits on how much land could be put into use each season in the Thai fields, and resulted in fields being left fallow.

1 Introduction

This field study takes place in and around the villages of Ban Pak Huai Oi and Ban Huai Hom, in eastern Phrae province. Ban Pak Huai Oi (Plate 1) is a Thai village situated in a valley with wet rice on level areas, and other crops on the slopes surrounding the village. Ban Huai Hom (Plate 2) is a Hmong village further up with cultivation on the hillsides, even on very steep slopes. The villages are in the watershed of Nam Mae Thang River. Three smaller streams feed into the Nam Mae Thang near Ban Pak Huai Oi, but because of the forest reserve the Hmong are only allowed to cultivate along one; Huai Pha Kan. The natural vegetation is dry dipterocarp and mixed deciduous forest (Rungrojwanich et. al.), and besides this there is quite a lot of teak plantation. In the areas along Huai Pha Kan there is no fully-grown natural forest, only scrubs or very low secondary forest on fallow land. The area's geological description on soil maps is a "slope complex", which means slopes are so steep that agriculture is not of interest. According to Rungrojwanich et al. (1998) the

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bedrock in the Nam Mae Thang watershed is sandstone and shale. This was supported by observations of these kinds of rocks, found especially along riverbanks. Weathering of this material results in sandy clay loam soil, which is highly erodible (Rungrojwanich et al.)

The Royal Forestry Department (RFD) classifies a large part of the area as protected forest with permanent forest cover, and agriculture is prohibited. Despite this, there is a lot of agriculture in the area. Almost everybody, both Thai and Hmong, are farmers. Both villages have about 500 inhabitants, and there is a tribe of about 100 Yellow Leaf people further up the mountain. The RFD has tried to implement reforestation and watershed rehabilitation programs, which included resettlement of the villages. Local protests have stopped these schemes.

In other parts of Thailand, there have been conflicts between Thai people and the hilltribes, especially the Hmong. There have been several incidences of violence, with people being evicted from their homes. In rare cases they had their houses burned down while they were out working (Gearing, 1999 & Hongladarom, 1999). This area has not seen these kinds of conflicts, but Thai-Hmong relations are still an interesting topic. Even if they were not in conflict, it could be assumed that the Thais and the Hmong would have different opportunities and goals, and different possibilities, which would result in different farming practices and livelihood strategies. Because of the sensitivity of these issues, it was risky to base a project on the idea of a conflict. There was a risk of not getting any information at all.

Other sources (Oksen et al., 1999) indicated other interesting topics in the study area, like problems with erosion, poverty and land scarcity. It seemed natural to investigate different farming practices or livelihood strategies. Looking at the way these different factors affect the soil gave the field study a focus. The issue of sustainability can be applied to a land use system in many ways, and on many scales and time frames. Looking at how the agricultural potential of the soil is affected by the current land use system narrows down the scope of the field study, and provides a focus for the investigation.

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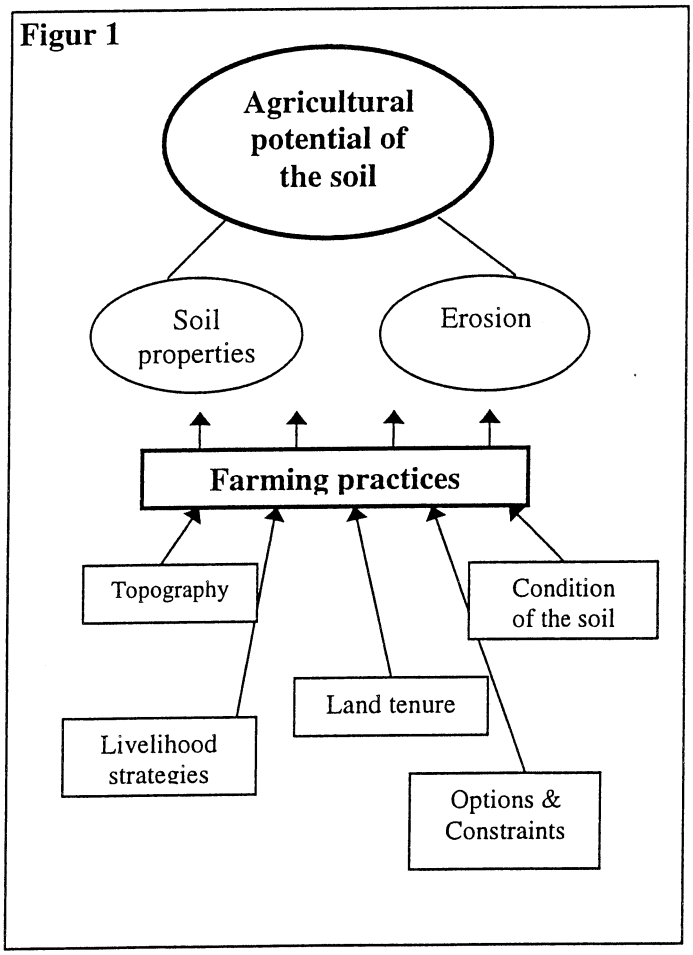
2 Objectives

The central problem in the project is:

How sustainable is land use with respect to the agricultural potential of the soil?

The term "sustainable", in this context, refers to whether the land use practices will degrade or are degrading the agricultural potential of the soil. The agricultural potential of the soil is primarily determined by the chemical/physical properties, i.e. the nutrient content, texture, pH and organic matter content, and the degree to which erosion takes place. Besides this it is influenced by a range of natural and anthropogenic factors such as geology, topography, and climate and of the land use pattern and farming practices adopted by the people who use the land.

Figur 1



We define farming practices as the primary variable (Fig. 1), as the practices adopted by a farmer to a great extent determine how the agricultural potential of the soil will be affected. A farmer's choice of strategy and practices depend on the available resources, i.e. land, labor and capital, on socioeconomic and cultural factors and on the technology available to him. We have chosen to look at the following variables to see how they relate to the farmer's choice of strategy and practices:

- Topography
- Condition of the soil
- Livelihood strategies
- Options and constraints
- Land tenure

These are referred to as secondary variables in Fig. 1. The variables cover a wide range of factors, that might influence a farmer's range of choices such as access to markets, wealth/poverty relations, non-agricultural sources of income, access to loans, credit, information, technology and supporting institutions and organizations.

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Differences between Hmong and Thai land use patterns and their responses to the secondary variables will also be considered with respect to our objective.

3 Methods

Because of the complexity of the issue a number of different methods were chosen, both from the natural and social sciences, and both qualitative and quantitative:

- Interviews
- Soil sampling
- Ranking and scoring
- Direct observation
- Farm mapping
- Crop calendar making

Below is a description of each method and how we planned to use them.

3.1 Interviews

Qualitative interviews can reveal something of the lives and personal experiences of the villagers. This would give details about farming practices, as well as information about how the secondary variables influence their land use choices. We needed to be open and find out the "narrative" behind the different factors we were interested in and for this purpose we chose semi-structured interviews (referred to as " topic-focused interviews" in Casley & Kumar, 1988). This type of interview allows for flexibility in formulating questions and following up interesting leads, thereby increasing the likelihood of uncovering important information. According to Casley & Kumar (1988) the strength of qualitative interviews is that responses are so varied in content and context, although this also makes it difficult to make general estimates. Our interview strategy included two types of semi-structured interviews, one for the key-informants and another for the farmers.

We decided to start with key-informant interviews, first of all with the headman, and ask him to refer us to other relevant key-informants. Our key-informants would give us general information on the village. This would clue us into the most relevant issues relating to land use sustainability, and help us make our selection for the second type of interview, "farmer interviews" as we called them. The selection would reflect factors relevant to land use practices. Based on the

key informant interviews, we would prepare interview guides for the farmer interviews, which would be more detailed and focus on the farmer and his household's farming practices and livelihood strategies. In both cases the interview guide was a list of topics that would help the interviewer cover all the important topics, but allow for flexibility in formulating questions, and following things up. Eight key-informant interviews and twenty two farmer interviews were conducted.

3.2 Soil sampling

Soil samples were taken and tested for pH, salinity and various nutrients, such as potassium, phosphorus and nitrogen using a simple field test kit. This information would not tell us about changes in nutrient content over time, but it would give us an idea of the current soil conditions under which the farmers are cultivating.

To get an indication of how soils might change due to the agricultural systems this sampling strategy was used: taking samples on fields similar in as many ways as possible but with different land use histories. The comparisons to be made were chosen after a field walk: the effects of use of fertilizer on clay soil and on sand soil, a new field vs. an old field, crops vs. trees, the condition of a field abandoned 10 years ago vs. the condition of a field still cultivated, and maize vs. paddy rice.

In order to get the land use history of a field, the presence of the farmer was a very important criterion for choosing the fields on which to do the sampling. Sampling was done in 7 fields, level or with a slope of about 45%, according to the principles described by Landon (1991): for each sample 5 sub-samples were taken with an auger (0-30 cm) in an area of about 25m2. These were mixed and approximately 1kg soil was brought back. The soil was crushed in a mortar and sifted (mesh size 2mm). Testing for plant available P, K, NO3-, NH4+ and pH was done with a field test kit. A laboratory tested the samples for organic matter content.

3.3 Scoring matrix

A scoring matrix was designed to give us an idea of the importance of the different income sources, also in relation to each other. In a scoring, as opposed to a ranking, it is possible to indicate the same value for more than one option with respect to a given criterion. It will also reveal if one option is much more or less important than the others. This would give a more nuanced understanding of the overall picture.

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3.4 Direct observation

Direct observation was to be used parallel with the other methods. Before going to the village we also planned to use the method alone to get an overview, especially of the farming practices. We planned to take a walk with the farmers in their respective fields while having a talk less formal than a regular interview. Seeing the crops and practices discussed should bring up relevant topics and reduce the probability of misunderstandings. Due to long distances to the fields and between the fields we had to give up the field walk as a specific activity.

3.5 Farm mapping

We planned to ask farmers during interviews to make a map of their fields. This was to get information on the kind of crops, the relative amount of each crop and the spatial distribution of crops and farming techniques. However, it turned out that most farmers had fields widely spread, e.g. some in the hills and some in the lowland. This made farm mapping impossible.

3.6 Crop calendar making

We also wanted to ask farmers during interviews to make a crop calendar to get information on crops grown in the space of a year and the succession of tasks in their agriculture. However, some farmers were obviously confused about the months. One farmer stated that transplanting of a crop took place one month after sowing and that the harvest was three months after this. On the other hand he put the harvest in the calendar only two months after the sowing. Due to this problem and the fact that the interview alone took quite a long time we decided to give up the method.

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4 Results

4.1 Soil conditions

Table 1: Results of soil analysis.

0: Nothing, VL: very low, L: low, M: medium, H: high, VH: very high

no	pH,H_2O	NO_3^-	NH_4^+	P	K	org. matter	description
1	5,5	L	L	L	H	5,35%	slope, rice, new
2	5,0-5,5	0	L	VL	L	4,82%	(slope,15%), rice
3	6,0	M	VL	H	H	4,22%	slope, maize
4	5,5	VL	VL	L	M	3,91%	slope, abandoned
5	5,5	VL	L	VH	H	3,98%	slope, teak
6	5,5	VL	L	L	H	3,43%	level, clay, fertilizer
7	6,0	L	L	VH	M	3,99%	level, clay
8	6,0	VL	L	H	H	3,18%	level, sand, fertilizer
9	6,5	L	VL	VH	L	3,98%	level, sand
10	5,0	VL	VL	L	H	3,37%	level, paddy rice

Erosion is difficult to measure and being a process rather than a condition it requires measurements during a period in time. Due to this it was not measured, but a rough estimate is given from direct observation.

Erosion was observed in a sloping rice field, and the erosion was especially bad in the lower part. Rills with holes were everywhere in the field. Rice grew at the edges of the holes and the roots of the rice were visible, as the soil had disappeared around them (Plate 3). Further up the erosion was less severe. In a teak plantation some erosion was observed, though not bad compared to the level in the rice field. There were rills, but not as deep as the rills in the rice field. On two level maize fields severe human induced erosion was observed: At least 5 cm of topsoil was removed during preparation of the fields. In the Thai fields sightings were also made in cotton fields, with rills every 2-3 meters, even though this field had only a gentle slope. A big gully was observed in a field with litchis and longan and mungbeans with a lot of rills leading to it (Plate 4). On the rest of the fields no clear signs of erosion were discovered.

The farmers talk about problems on the steep slopes. One farmer said that he has erosion on fields cultivated for several years. Another spoke about fields completely degraded and not useable

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for cultivation. Some farmers actively do something to prevent or slow down erosion. One uses drainage ditches (Plate 10), others use sativa grass, even though one key informant said the slopes were so long and steep that it does not help much. As mentioned, the Hmong cultivate lot of litchis and some says that they think the fields on the top of mountains should be planted with litchi to protect against erosion. We talked to an agricultural officer at the subdistrict, who thought that all the upland area around Ban Pak Huai Oi should be converted to tree crops to combat the problem of erosion, and maybe he has succeeded in influencing the Hmong.

4.2 Farming practices

4.2.1 Hmong farming practices

The Hmong use a fallow system, that is, they cultivate their fields for about four years, and then leave them fallow for about four years. Their major crops are upland rice and cabbage, but they also cultivate litchi, which is of growing importance, and some corn and Chinese cabbage. Almost all of their fields are in the upland hilly area, on slopes that can be very steep (Plate 5). This means that they mostly use hand tools for cultivating. On more level fields they can use rototillers. When preparing a field for the first time, or after a fallow period, the farmer would slash the vegetation and burn it.

Cabbage is the most important cash crop. The farmers prepare the fields for sowing with hoes. Some make rows, and one farmer said this requires less seed. Fertilization is done first during sowing, then when the cabbage has formed heads, and just before the harvest. It seems like there is little variance in this pattern; i.e. they do not compensate for poor soil quality in certain parts of the field. The amount of fertilizer used is often limited by the amount of money the farmer has. Most farmers use herbicides and if necessary, other kinds of pesticides. Money is also a constraint on the amount of pesticides used. Insecticides are only used for severe problems with pests. The cabbages are harvested by hand and are transported by truck (rented or locally owned) to the markets (Plate 11). The cultivation period is from August to November. Some farmers cultivate a second cabbage crop during the dry season, and for this they must use sprinklers to irrigate the fields (Plate 6).

Litchi is growing in importance as a cash crop, and recently many fields have been planted with it. When the trees are small, the farmers intercrop with cabbage, but when the trees mature, they have to find other fields for their cabbage. The farmers fertilize the trees, mostly with chemical fertilizer, but some chicken manure is used as well. Pesticides are also used. Other fruit trees are cultivated, but litchi is the most widely used. Harvest is in June or July.

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The Hmong cultivate upland rice for consumption. As with cabbage, this is done by hand, and using pesticides and fertilizer. However, one Hmong farmer said that he guarded for mice at night and weeded manually. The farmers also cultivate some corn, but because of problems with maintaining fertility in the cornfields, most farmers prefer cabbage, which also requires less land. The cultivation period starts in July and ends in October-November.

The major constraints for Hmong farmers are water, labor and information shortages and to some degree land shortage. Water shortage is a big problem, because a lot of farmers cannot irrigate, and are reliant on rainwater. One farmer explained that cabbage is the only crop that can compete with lowland farming, and this is partly because of lack of water. Labor shortage is a major problem, which is worsened by a lot of young people going to town to study. The farmers have to hire labor to help with the cabbage and rice fields. Not all farmers have enough money to do this. Some farmers are not able to cultivate as large an area as they want or need. Information shortage is a problem as well. The farmers are not offered much agricultural help, and many farmers express wishes about getting new knowledge about other crops and how to cultivate them. However, this shortage of information also means that the Hmong do a lot to collect new knowledge. Compared to Thais, the Hmong use new information more often.

4.4.2 Thai farming practices

The Thai farming system is a little more mixed than the Hmong system, with wet paddy rice, upland dry rice and corn in a fallow system, and recently contract farming (Plate 7).

Lowland wet rice is cultivated for consumption on gravity-irrigated fields near the village. The fields are prepared with rototillers. Seedlings are grown in small areas, and then transplanted to the rest of the field. Trap doors and canals let in stream water, and the surplus drains back into the stream. Some farmers use pesticides and fertilizer, depending on how much they can afford. Some farmers weed manually. Harvesting is done with a sickle, and the residue is collected and burned. Cultivation takes place from July-August to November. In busy periods, the farmers make working teams to help each other. After harvest some farmers grow soybeans in moist patches, if there still is enough water.

Upland dry rice is for consumption as well. Slashing and burning vegetation clears the fields. Preparation for sowing is done with hoes, because of the steep slopes. Dry rice is rainfed. Because weeds are a big problem, farmers can only cultivate fields sprayed with herbicides. It is unclear whether they use pesticides and fertilizer. Mice are a big problem, as they eat the seeds, and mice poison is apparently not very effective. When harvesting, the farmers collect the rice in

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haystacks where it dries for 5 days. Usually after one to two years fields lie fallow for a year, but tenure rights, for example, or lack of money can influence this pattern (explained below). The cultivation period is from May-June until October.

Corn is a cash crop cultivated in much the same way as upland rice. However, if the fields are not too steep, the farmer will plough with a tractor, and fertilizers and pesticides are usually applied. The growing season is from May to August-September: If there is enough water another crop will be grown, like corn, soybean, mungbean or a vegetable, e.g. cucumber. There were also some cotton fields, but no interviews were made with farmers, who grew cotton.

Contract farming is new in the area. The crop is the "Giant" or "Without relatives" soybean (possibly genetically engineered). Seeds, tractor, fertilizer and pesticides is provided by the contracting company, and deducted from the price of the yield. Aside from the high level of inputs provided by the contractor, farming practices are much like usual; preparatory hole digging and sowing are done by hand. The seeds with fungicide coating, and added fertilizers are covered with rice husks to keep the seeds cool and moist. One farmer said that water was carried from the stream to the field in buckets (also observed directly).

The major constraints on agriculture for the Thais are lack of money for inputs and investments, access to loans, and water and land shortage. Weeds and mice are also big problems. Lack of money is a big problem. Many farmers cannot cultivate all their fields, because they do not have money to buy the inputs needed. Problems with weeds on the upland fields are so severe, that if the farmers do not apply herbicides they cannot cultivate there. Lack of money and poor access to loans also means that Thais only have little opportunity for investment. Many farmers therefore do not follow the advice from the agricultural officer because most suggestions require financial input. Mice have been a big problem this year, but it seems like this is not normal. Land shortage is also a problem, and this means that in the upland fields, where the owners have poor tenure rights, farmers are afraid to fallow because other farmers might claim the right to the field if it is not cultivated.

Appendix 1 gives an overview of the major trends and differences in farming practices for the Thai and the Hmongs.

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4.3 Alternatives to agriculture

The forest

Besides agriculture, there were other options in the area that could contribute to gaining a living. Judging from how often they were mentioned, non-timber forest products (NTFP's) are an important source of livelihood (Plate 8). (It may be wrong to speak of forest, because there are wild plants growing near the village and fields, in fallow fields for example, that would not be considered forest.) To varying degrees every household we interviewed used NTFP's. In both Thai and Hmong villages bamboo shoots were the most commonly mentioned, followed by mushrooms. There are other wild fruits and vegetables that are collected, like melons, wild mangoes, banana flowers, and others that we were not familiar with. Forest fruits and vegetables are mostly for private consumption, but if there is a surplus they are also sold. For example, there is a Thai women's group that collects bamboo shoots and sells them at fairs.

Game was frequently mentioned, mainly wild boar and squirrel, but also other animals like monkeys and some kind of deer or antelope. It seems that hunting is more important to the Hmong than to the Thais. Of the 10 interviews with the Hmong in which NTFP's were discussed, 8 mentioned hunting. In the interviews with Thais, only 4 of the 12 discussions of NTFP's included mention of hunting. The Hmong have a reputation for being good hunters. They hunt together in groups, and go into the deep forest on 3-4 day trips. Game is getting scarce and certain animals that were hunted 20 years ago are no longer found. Again, game is mostly for private consumption, and is only rarely sold.

Livestock

Both Hmong and Thai families raise animals (pigs and chickens) mostly for private consumption. This last year there was some kind of chicken epidemic that wiped out most of the chicken population. A few Thai families have oxen, which are sold for slaughter. Some Hmong have horses for labor. Two or three Thai families have elephants for labor - they work for the government forest industry organization in Nan.

Wage labor away from the village

Getting a job away from the village is not a sure way of contributing to the household economy. Not every one who gets a job is able to send money back; one key informant placed the rate at 50%.

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Seasonal migration seems to be most common. People go after the harvest, or even after planting. Others are away year round, like the farmer's wife who went to Chiang Mai to work on a bee farm.

Income sources in the area

In both Thai and Hmong villages, there are a number of families who do not have their own land, but who do farm work for wages. The Hmong hire each other as well as Thai and Yellow Leaf People to work in their fields in planting and harvesting season. Wages seem to vary from 70 to 100 baht per day, though some are paid by the parcel. Farmers who own trucks or farming equipment can rent them out (usually along with themselves as driver or tiller) for extra income.

Logging

Both Thai and Hmong carry on illegal logging. According to our informants this is only done for private use, not for sale. The schoolteacher in the Hmong village said that the Hmong are not able to cut down trees for timber themselves, as they lack the equipment, but they are able to hire people from the other villages to do this. We did not crosscheck this.

4.4 Tenure rights

Thailand has a complicated system of land rights with several degrees of ownership. NS-4 is a title deed, which means that the farmer has full ownership to the land. NS-3 is a certificate of use, a lesser land right, but still with good security. The farmer can borrow money with the land as security, and sell the land, and has the possibility of obtaining a title deed. However, NS-3 can be challenged if the field is left fallow for more than five years. STK is a temporary cultivation right in forest reserves granted by the RFD. The user may not sell the land and upgrading to better land rights is not possible. PBT-5 is the lowest form of land right. It is a tax certificate, which shows that the farmer has used the land for several years, so he can not be accused of encroaching on new areas. One informant also mentioned a PBT-6.

There are other kinds of land rights than those mentioned above, but we did not hear about them in Ban Pak Huai Oi. No one had title deeds to their land. The Thais have better land rights than the Hmong, as most Thais have STK and a few have NS-3, whereas the Hmong all have PBT-5 or PBT-6 or no land rights at all. We were told that Thai farmers, who currently hold STK, want NS-3, but they do not know how to upgrade. It does not seem like they know that the law restricts this. The Thais, who have PBT-5 on upland fields, fear losing this right and therefore they will

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cultivate the fields continuously even though the fertility is low. The poor land rights do not seem to be a problem for the Hmong. Representatives from the government or the headman from the Thai village rarely visit the Hmong village, which means they are not afraid that they will loose the land. The Hmong also have their own perception of ownership, and sell the land among themselves. Typically 10 rai will cost 5-10.000bath.

4.5 Support and options

A number of institutions and organisations are available to help the people in the area. Prominent among them, for the Thai village, is the agricultural co-operative in Rong Kwan, a good option for borrowing money. Members can borrow up to 30,000 bt. at a better interest rate (around 10% annually) than at the agricultural bank. All the informants who mentioned the co-op had taken loans there. It seems that these loans are used to buy seeds, fertilizers and pesticides at the beginning of the season, and not for long-term investments. The co-op also bought agricultural products (corn and soy), but its prices were not as good as the prices to be had in the center of Phrae. The co-op officer had also come to teach agricultural techniques, but the informant who told us this did not feel the information was useful, because the farmers were more in need of investment capital. The co-op was only mentioned by one Hmong farmer, who said that he had heard of it, but that he never sold his cabbage there.

The Hmong spoke more of the Hilltribe Development and Public Welfare Center. There is a center in the village itself, which has been there for 20 years. The department of welfare is trying to help the Hmong plant orchards by providing them with saplings, and teaching them how to grow the trees. It also helped with education, and other kinds of information, like how to use grasses to fight soil erosion.

Both the Thais and the Hmong mentioned the government agricultural officers as a source of information. However, two of the Thai farmers who told us what the officer had taught them or suggested, explained that they did not actually use this information. Another one said that he got a sample of seeds from the officer, but after that, he had to buy the seeds himself, which apparently was a grave impediment to the continued use. We had mixed information from the Hmong farmers. Two spoke of a Thai agricultural officer who lives elsewhere, and never comes to teach things. Another mentioned a list of things that the villagers had learned from the agricultural officer, and then passed on to each other: use of grass against erosion in fields, tree growing, reforestation,

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fishery and poultry keeping. There has also been forest-related intervention in the area. Both Hmong and Thai villagers have received saplings; fruit trees and teak, from forest officers to encourage tree planting.

The villages had systems of helping each other. For example the Thai village had a tradition of the farmers cooperating during the harvest. In both the Thai and especially the Hmong village, family, neighbors and friends were mentioned as a source of information and loans. One informant also said that the Hmong use silver dowry bars as security for loans at the market.

5 Discussion of results

5.1 Soil properties and erosion

5.1.1 Erosion

Farming practices are the interface between the soil and the people that use it and they directly influence erosion and the chemical conditions of the soil. As it turned out, it was difficult to determine the extent to which the different farming practices affected the agricultural potential of the soil. For erosion, it would be impossible to quantify what each type of farming practice meant, or to say whether Hmong practices were better or worse than Thai practices. It was very clear, however that erosion is occurring; we found lots of evidence and examples.

Clearly, erosion is mainly a problem that relates to up-land fields. However, we found the odd example of man-made erosion in the level fields; scraping off weeds and some topsoil with a tractor. They did not have any plans to move the topsoil they had scraped off back onto the field later. In fact did not seem like they had given any consideration to the effects of this technique at all. If this practice continues and maybe spreads to similar fields (level, non-irrigated land) the result could be detrimental to many farmers (Plate 9).

Many crops found in the area leave a lot of bare soil in between them. The rice plants are a good cover for rain, but because they stand in clumps with empty space in between them, run-off water can pick up greater speed and ability to erode. Cotton is planted in widely spaced rows, leaving a lot of soil bare. We saw the cabbage fields during the harvest, when the heads were as big as they would get, and even then there were spaces between the plants where the soil would be exposed to erosion. When the heads of cabbage were harvested, the root and some of the larger leaves would be left behind. This is surely better than leaving the ground bare, but harvest also

marks the beginning of the dry season, when there is less threat of rain-erosion anyway. On sloping rice fields farmers burn the residues when preparing the field. This practice leaves the ground bare for some time and does not maintain soil organic matter.

It was observed in a sloping rice field, that erosion was worse at the lower part, even though this was less steep and a drainage canal above this part led some of the water off the field. It could be because the upper part of the field contains more soil organic matter (see Table 1, samples 1 & 2), which increases soil resistance to erosion (Young, A. 1989). It could also simply be because water collects from the top of the field, and more water washes over the lower part of the field in spite of the drainage canal, at higher speeds.

Other slopes were covered with dense vegetation and were well protected from erosion. Unfortunately they were probably not very productive. One was cultivated with a maize-fallow system: Cropping 3-4 years and fallow for 2 years. The observation was made during the unproductive fallow period. It is not possible to know the erosion rate during the cropping period. Another was cultivated until 10 years ago. By then it was given up due to low yields. It is now officially a community forest in reality a shrubbery.

The trend in the Hmong area of combining cabbage with new orchards and then moving to new cabbage fields as the orchards grew could have a good effect on erosion. Trees could protect against erosion by stabilizing the soil structure with their roots, maintaining soil organic matter and contributing to ground cover by litter. On the other hand the competition, e.g. shade, might substantially reduce herbal and shrub vegetation matter. The trees themselves make up a permanent cover, but once they have reached a certain height they do not substantially reduce the impact of the precipitation on the ground, and might even make it worse (Stocking, 1996). They do not reduce the runoff either, and can even channel the runoff and thereby promote the formation of rills or gullies. In any case, we observed erosion both in a teak plantation and in an orchard.

In the teak plantation the ground cover of shrubs and herbs was very scarce. According to the Watershed Research Station (Judge et al., 1998) scarce herbal ground cover in forests and plantations is caused by uncontrollable fires originating from the burning of residues after harvest. These fires kill the undergrowth but do not harm trees seriously. However, the plantation area we looked at was not near fields and there were no signs of fire on the stems. This leads to the conclusion, that the scarcity of herbs is due to competition and is not related to neighboring land use systems.

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The gully that we found in an orchard, near the Thai village, containing litchi, longan and mung bean, probably originated from drainage pipe that emptied out where the gully started. It actually went in a half circle around the trees, which might show the protective ability of the trees. The mung bean was still quite young, so their protective ability was absolutely minimal, and a lot of rills leading to the gully were observed too.

Interview data also revealed that erosion is a problem. A general trend is that the Hmong know more about erosion and are more concerned about it than the Thais. When we asked Hmong farmers about the issue they did not have trouble understanding the question. It was more difficult to ask the Thai farmers the same question. Often, they were still were unsure what we meant. The Hmong had considered erosion, but had problems recognizing it in their own fields; they often said that it was the other farmers who had big problems. A few of them had made efforts to combat it in their fields. In fact, they way they spoke of it, matched our own understanding of the problem very well, and one farmer who used sativa grass said he had learned about it from the agricultural officer. This might indicate that they recognize erosion as a problem, not as a result of their own experiences, but rather due to convincing information from the agricultural officer. If it were something they had experienced themselves, we would expect them to point it out on their own fields, rather than agree that it was a problem, but only for other farmers.

5.1.2 Soil conditions

Widespread deficiency of nitrogen, phosphorus and potassium was observed in a study of the effects of two or three crops pr. year in northern Thailand (Rerkasem, B. 1988). The results in this project neither support nor contradict these data, as the amount of P varies from very low to very high and the amount of K varies from low to high. Until now, some farmers have cultivated more than one crop pr. year, and the praxis will probably spread, being a part of the contract farming system. The farms under double and triple cropping systems will remain productive only if the fertilizer management technology is handled correctly by farmers. The interviews indicated that lack of knowledge is a constraint to this.

Based on other studies, organic matter depletion in the area might be about 0.6% per cropping cycle. To maintain soil organic matter content on an adequate level a yearly return of about 10 t/ha of legume and cereal plant residues is necessary (Boonchee, S. and Anecksamphant, C., 1991). In our study area plant residues are burned by some farmers and left on the field by

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others. Based on estimates of the economic yield[1] (Appendix 1) the amount of residues can be calculated for the major crops. The amount for maize is 6.6-21.6 ton/ha of residues (harvest index=0.4 (Franklin, 1984)). For rice the amount is 1-2.8 ton/ha of residues (harvest index=0.5 (Franklin, 1984)) and for cabbage, 2.0-5.2 ton/ha of residues (estimate of harvest index=0.8). This means that even if farmers leave residues, it will not usually be enough to maintain soil organic matter. A solution would be to apply manure or mulch. Applied to the surface this would reduce the erosive impact of rain as well as maintaining soil organic matter.

Regularly fertilized fields are expected to contain more of the applied nutrients than unfertilized fields. On the field represented by samples 6 and 8 (Table 1) fertilizer was used but only with nitrogen (46:0:0). The NO_3^- content was lower in the fertilized field. However, this analysis can only tell about the level of NO_3^- at the time the sample was taken. The result is in token of the turnover rate of nitrogen, not the general level of nitrogen. The level of pH and P was lower in the fertilized field. Differences in soil type or other factors could cause this. If N is usually the growth limiting factor, the reason could also be increased consumption of other nutrients in the fertilized field due to the increase in growth made possible by N application. The use of fertilizer is a way of sustaining yields, but in the long run it will probably be necessary to add other nutrients besides N. On other fields different kinds of fertilizer were used, in some places NPK fertilizer, in some places only urea.

The part of a sloping field, which was recently taken into cultivation, was expected to contain more nutrients than the (not fertilized) similar field, which has been cultivated for years. This assumption is based on the fact that nutrient content in a shifting cultivation system falls after clearing a piece of land and starting to cultivate it. However, the pH, and NO_3^- and P content are lower than in a maize field (Table 1, sample 3). Many variables other than the age of the field can have influenced the results. For example, soil type could be different. The comparison of the new part of the field with the old part reveals that the levels of nutrients are clearly higher in the new part. This shows that clearing new land is a way of securing sufficient nutrients for a sustained yield, but not an option in this area. Fallow was used, but only for 4 years by the Hmong while Thai have even shorter fallow periods, often only at parts of the field and as a result of lack of money or labor to cultivate these parts. According to a study by Tanaka et al. (1998), this is not enough in the long run: the total soil organic matter content decreased in the first years of fallow due to decomposition. It was only after a long period of fallow (8-15 years), that the organic pools were

[1] The estimates of yield are based on very few sources and the calculations are to be considered as examples only.

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compensated through input from forest vegetation. The cropping period was 1-5 years. This means that it is essential to apply organic matter to soils used more intensively. As mentioned above, this only happened to a certain extent.

According to Young (1989), "Swamp rice cultivation possesses natural methods of fertility renewal, as well as responding well to inputs". On this background, high nutrient levels would be expected, but only the K content was high. The amounts of other nutrients were low or very low. Compared to other level fields pH and P content in the wet rice field were low and K content was high, so it is not clear whether wet rice production is better or worse than maize for maintaining nutrient levels.

A higher nutrient content could be expected in the soil under the teak plantation than under the annual crops not fertilized. This is because of the cycling of nutrients from deep soil layers to the topsoil by the trees. The P content is higher in the plantation than in a maize field, the K content is the same, and pH is slightly lower. This weakly supports our expectation. The amount of plant available P is very high and the amount of K is high, suggesting a favorable nutrient level. It can be established that this plantation is not a means of avoiding erosion totally. However, erosion might be at a rate that does not affect plant growth. If this is the case, teak plantations are a sustainable land use.

One field in our study (Table 1, sample 4) was abandoned 10 years ago due to low yields. The content of K, P, NO_3^- and pH in this field is lower than in a similar field (Table 1, sample 3), which is still cultivated. NH_4^+content is the same. No fertilizer is/was used on these fields. The situation could have been the reverse as sample 4 has had time to restore its nutrient content during the 10 years of fallow, while sample 3 is cultivated for a 3-4 year-period with only 2 years fallow. The explanation for the test results must be differences in soil type.

5.3 Livelihood strategies

We were interested in looking at the villagers' use of the forest and non-agricultural income because we thought that these livelihood options, as alternatives to agriculture, might be a way of decreasing pressures on the soil. It is difficult to judge their importance relative to each other. As described in Section 4.3, everyone we asked used the forest (actually, mostly the wild areas near the village). They used a variety of NTFP's, mostly for household consumption. Only if there were a surplus, would forest product be sold. This information was often quickly volunteered. For some reason it was important to make it clear that use of the forest was almost entirely for household consumption.

Besides this, it may be difficult to find markets for NTFP's (all nearby have equal access) and prices may not be very high compared to the labor and time involved in collection (for example, mushrooms got 70bt/kg, and bamboo shoots only got 2 bt/kg.)

As long as NTFP's are only collected in small amounts and mostly for private use, they are not likely to relieve pressures on the soil, or play an important role in determining land use. This is because NTFP's serve a different purpose than the majority of the agriculture. Most crops grown were for cash, with the important exception of rice. We are assuming that cash earned from the cash crops was used to buy things other than food, and this does seem to be the case. Very few villagers spoke of buying foodstuffs, and the market was far from the village. Rice is a staple food, which is supplemented, but cannot be replaced, by vegetables grown in small plots, meat from home-raised livestock, and plant and animal products from the forest. NTFP's could conceivably be used as a replacement for vegetables and meat produced at home, but as vegetable plots and chicken coops only represent a small proportion of land use, this would not have much importance for pressures on the soil.

To be able to relieve pressures on the soil, a non-agricultural livelihood source must be cash generating. Selling timber from the forest could be a source of cash income, but while it was pretty clear that people illegally cut down trees for construction in the village, we did not find any reason to believe that there were any illegal logging enterprises in the area. Handicrafts and manufacturing in the village were not a viable source of cash income.

Wage labor in the village is not a good alternative to agriculture, only a supplement, because the work is seasonal, and does not pay well. It is not likely that someone with a piece of land would abandon it to work as a laborer in the village.

Wage labor out side the village, is more likely to reduce pressure on the soil. Though risky, it can be a viable source of income. Besides this, some jobs require extended absence from the village, including during important planting and harvesting seasons. People who went to work in other areas, were not able always able to send money home, so migration included an element of risk, especially if it meant the loss of needed labor.

5.4 Options and constraints

The availability of wage laborers in the area might mean something for how much a farmer would plant in a season. Laborers were used both for planting and harvesting. Only a few families in the Hmong and Thai villages were reported as not having any land of their own to cultivate, but others

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who did own land, supplemented their income with wage labor. The Yellow Leaf People, did almost no cultivation of their own, and were employed especially by the Hmong as wage laborers. Even though the wages were low, hiring labor was apparently not an option for all farmers, because older and poorer farmers often explained the fact that they had upland fields lying unused by saying that they could not plant them themselves. These fields would not be rented out either. This indicates that scarcity of land was not the most important constraint, at least not upland fields. This probably does not apply to wet lowland rice fields and other level fields.

Besides labor, there were several other constraints on agriculture in the area. Some of these constraints may contribute to sustainability. For example constraints on labor sometimes meant that fields would be allowed to lie fallow. But this could be a double-edged sword, because labor intensive conservation methods would be difficult to implement. Financial limitations were also a constraint. Lack of cash to invest in inputs at the beginning of the season sometimes meant that farmers would let fields lie fallow. However, it often meant that a farmer would use less fertilizer on his crop than he believed it needed. There were other ways that financial limitations would determine land use practices, as cash was needed in a variety of instances; to hire a tractor or rototiller for less steep fields, to buy seed, and pesticides, to hire labor for planting, weeding, harvesting, and to transport the produce to market.

If a farmer did not have ready cash at the beginning of and during the season, he or she would be dependent on credit. The agricultural cooperative was an important source of credit to the Thai farmers, and it seemed that loans were mainly used as inputs into the season's crop. The Hmong farmers did not seem to be as likely to take credit, and certainly not from the agricultural co-op, but more likely from private sources. This may be due to the general higher income level in the Hmong village, which was attributed to their cabbage farming. We also received the impression that they were better at saving and long term planning than the Thais, for example one farmer told that he had grown cabbages for 2-3 years before he could buy a truck, and another said that his greatest worry was whether he would be able to pay to educate his children.

Besides credit, the agricultural cooperative also provided information to the villagers, as did the government agricultural officers. Even though information was available to the Thai villagers, it seemed that financial constraints prevented them from using the information. The Hmong seemed to be better able to use the information they received. Both groups were supported by various agencies with respect to growing trees. In the Hmong village especially orchards that started in an intercropping system with cabbages were becoming a trend. They have been encouraged to do this

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by the Hilltribe Development and Welfare Center, which in this and other ways has encouraged them to fight erosion.

5.5 Land tenure

It is difficult to say what effect land tenure had on farming practices. It would seem logical that more secure tenure would give people incentives to use conservation practices. There is some indication in our data, that in the Thai village, BPT-5, a very uncertain form of tenure gives farmers disincentive to use fallow, because they were afraid of losing their fields to other farmers. But the opposite, that secure tenure leads to better practices is harder to support. In any case, there were very few farmers who had NS3, the most secure form of tenure found in the area, and it was difficult to get it. The Hmong had even more tenuous rights to the land the cultivated, but paradoxically were far less limited in their land use by tenure. They often had far larger farms than the Thais, used longer fallow, and described their farming practices saying, for example that they would grow cabbage together with litchis until the trees became big, and would then move the cabbage cultivation to another field. They did not seem to be in competition with each other for fields either, perhaps because they felt there was an abundance of land, or perhaps, as the school teacher suggested, because of solidarity towards each other.

6 Discussion of methods

Many sources of biases could influence our project work, and subsequently, the data gathered in the field. Some of the biases are closely connected with the methods applied whereas others are more general.

In itself, the definition of our research objective contains biases. Our choice was based on a limited amount of information, and might not reflect the most important issues in the area. Our preconceptions about which variables influence farming practices might have made us blind to other determining factors, and the fact that no new variables turned up during our study might be a reflection of this.

Choice of methods is second source of biases. Other methods would give us other information about our research objective. For example, an alternative option would have been to do a survey in the village, which might have revealed patterns not thought of beforehand. The methods

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themselves each have strengths and weaknesses, besides which there is always the human element in the use of research methods. Other sources of bias are related to conditions beyond our control, like the time of year a study is undertaken, or language barriers.

6.1 Soil sampling

Our original plan was to take soil samples in Hmong and Thai fields to make a comparison between the effects of different farming practices. We settled on a simple selection method (mentioned in the Methods section). However, the distances to and between the Hmong fields were so great and difficult to travel, that we were not able to apply the selection technique as we had done in the Thai fields (Table 1). It was not possible to find suitable fields where the farmer was present. Instead we ended up only taking soil samples in various Thai fields. Due to shortage of time only few soil samples were taken. It is therefore not possible to calculate a mean and extrapolate.

The results of the tests made with the field soil test kit are not very precise. Tests are done by adding indicators to a mixture of soil and salt dilution and afterwards comparing the color with a color chart. It is difficult to compare the brownish soil mixture with the bright colors on the color chart. The decision about whether a color is number n or n+1 on the color chart depends on the person doing the test. Therefore too much attention should not be given to small differences between test results for different crops.

It is not clear how the testing of soil organic matter was done and therefore the results are used only as relative, and not absolute, values.

6.2 Qualitative methods

Qualitative methods are useful when it is necessary to establish the relationships between different factors in a situation, to uncover a "narrative". Due to the type of information typically gained from qualitative methods, i.e. opinions, perceptions and explanations, the data is less easily standardized. The validity of the data is dependent on the researcher's understanding of the study area, and can be weakened by preconceptions, like cultural biases.

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6.2.1 Interviews

For interviews, the reliability of the information depends to a great extent on the integrity, honesty and experience of the researcher and of the translator, and consistency is difficult to achieve when several people are doing the same job. The accuracy of the note-taking depends on skills, biases and perceptions of answers, and this also influences the reliability of data, as do many other factors like the informant's credibility, ability or willingness to respond, and motive for participating, and of the context of the interview.

The selection of informants is also a source of bias. Are all strata within the society, i.e. rich, poor, men, women etc., represented equally within the sample, and are the criteria they have been selected by, relevant for the research objective? "By definition, key-informants are a biased selection from the general population" (Casley & Kumar, 1988). Key-informants are often drawn from the elite in a society, and their views might not be representative for the population as a whole.

The fact that all group members in our group conducted interviews and took notes on turn, influences the reliability of our data. It also meant that we do not have entirely comparable data for each of our informants. The necessity of using a translator probably means that the information we got was incomplete or simplified, and that the interviewer had less control over the phrasing of questions.

Interview technique

Our first interview was with the headman for the Thai, Hmong and Yellow Leaf villages. We prepared for the interview by splitting the group in two, discussing what we wanted to talk about and then pooling our ideas. After the interview, it was clear that we had not had a shared idea of what was to happen. This was besides the fact that it was unwise for the whole group of 8, as well as 3 interpreters and 3-4 teachers to all be present at the interview (Plate 12). It was chaos. The biggest problem was that many people interjected questions instead of letting one person lead the interview. Translation was also unsystematic. Despite the miserable interview setting, we did get some useful information about the area, and made very good contact with the headman, who was most friendly and helpful during our stay.

After that, we did interviews in groups of 2, 3 or 4, including the translator. We decided to one have person leading the interview, i.e. asking most of the questions, and another person recording it and supplementing the interviewer's questions, and the interpreter. We did not,

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however, do a very good job of recording the interviews. We returned to Denmark with only our notes, not having written up the interviews soon after they took place, which would have been a good idea, and not having gotten the notes taken by the Thai students.

After the first day of interviewing, we held a meeting where each group summarized their interviews for each other. This was very good, but unfortunately, it was the only time we did this. This was a mistake. Besides losing the opportunity to follow up and crosscheck interesting information, we also lost track of where the groups were heading, and did not coordinate and plan our activities very well.

Selection criteria

The headman referred us to (and made appointments with) other key-informants, such as his assistants in the Thai and the Hmong villages, some village committee members and the administrative officer of the subdistrict. During our first stay in Ban Pak Huai Oi, we did mostly key informant interviews. The key-informants in our study were mainly Thai, and the information gained from them need not reflect the views of the Hmong.

We had discussed wealth as a stratification criteria for the farmer interviews, because it was a relatively simple way of identifying people as well as being a probable factor influencing land use practices. On request, the headman had given us names, five each in the categories rich, poor and middle-income farmer. We were not entirely satisfied with this selection method, as we did not know how the headman decided who belonged to which category, or how he decided whom to choose from each category. During our first visit to Ban Pak Huai Oi we did one interview from each category.

During the last stay in Ban Pak Huai Oi we focused on farmer interviews. We spent a whole day revising the interview guide. We also discussed selection criteria, and settled on farm size, because it was simple, would be easier to identify than income level, and because we suspected it was important for land use choices. However, after looking at some secondary data from the Subdistrict agricultural office, we could see that farm size as a criterion would only allow us to compare Hmong and Thai farmers internally, because the biggest Thai farms were about the same size as the smallest Hmong farms. At this point, we were running out of time, so we decided to adopt the soil-sample group's opportunistic technique of wandering out in the fields and around the village looking for farmers to interview, planning to check the selection at some point, and fill in

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any gaps. A quick check of the distribution revealed that it was more or less even with respect to farm size, although Hmong farmers with large farms were underrepresented.

Interpreters

After the first set of key-informant interviews, the Danish half of the group held a meeting with the interpreters to discuss the translation technique. The interpreters were all interested in the project, and very engaged in helping provide us with the information we wanted. Trying their best to get good information, they would sometimes discuss something at length with the respondent, and then present us with a summary. We asked them to translate more directly, because we wanted to know what was going on, and, for example, be able to see when our questions were put badly. On the other hand, we realized that some of their own initiatives were very valuable to us, like apologizing and saving the situation when we made a mistake and insulted someone. It was a difficult meeting, as we did not want to insult the translaters and therefore had to phrase the critique very delicately.

6.2.2 Ranking and scoring

The result of a ranking/scoring matrix is very dependent on the explanation of the matrix given to the respondent. Two group members designed a matrix to be used as a scoring of income sources. However, the matrix was used by all the group members, and some did it as a ranking. This of course makes it difficult to compare the data.

Our matrix has two sets of criteria: the constraints for the income sources (e.g. area, investment or labor) and the benefits from the income sources (e.g. money, security of income etc.). The assignment of values for the subjects, however, was ambiguous. What does "good" or "not good" mean for the subject "farming" in relation to investment? Does "good" (a value of 5) mean that the investments needed for this are high or low? In connection with an interview, this could of course be clarified, but the matrix is meaningless by it self. Unfortunately only very few of the filled-in matrices have names of respondents noted down (in English anyway), so we are not able to compare the matrix with the interview. Due to these problems of design and application of the matrix we have been unable to deduce anything from this method. If it had been applied correctly, we could have used them as a supplement to the interviews. They could have been a way of simplifying the information to get a grasp of the general picture of, for example, how important NTFP's were for the different family.

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6.2.3 Direct observation

This method was used to give an estimate of erosion. We observed many instances of erosion in the Thai fields, but because of lack of time, and difficulties getting to and around in the Hmong fields, we did not get any good observations of erosion there.

Sources of error were:

a) Two of the three level fields were just prepared for the second crop this year so visible signs of possible erosion would have been removed.

b) Two of the four slopes were covered with dense vegetation, which means that signs of erosion could be overlooked.

Direct observation also gave us some general information on the area and a better understanding of the farming practices. We did not do the originally planned stroll around the villages to get to know how the fields looked before talking to the farmers, as this was unrealistic. The area was simply too large. Nevertheless, we did do some interviews out in the fields, and this enabled us to visualize what was being discussed, as well as ask questions that may not have arisen in the village. Doing interviews in the fields was also a lot of fun.

6.3 Group work

Working in a group with people from various disciplines and cultural backgrounds on a common problem is here discussed as a method in its own right. The cooperation will certainly affect the way field methods are planned and carried out, as compromise is an inherent part of working in a group.

Three "levels" of cooperation can be distinguished within the framework of this project:

- Interdisciplinary group work
- Intercultural group work
- Working in big vs. small groups

6.3.1 Interdisciplinary group work

The objective of working across disciplines is to apply our different backgrounds to a common subject or problem, as a method of triangulation. The aim is to get a deeper understanding of the subject by combining several approaches. Our experience, however, has been that it is difficult to

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design a project that allows all disciplines to participate on equal terms. Our own project design did not incorporate all the group members' specific interests, or use their specific knowledge optimally. Some group members did tasks they were not trained for and in which they might not have had a specific interest.

One way to alleviate this problem could be to design the project so it incorporates all the different disciplinary fields of interests and approaches. The disciplines represented in our group were geography, forestry, biology, economy and development studies. In order to incorporate all the specific interests for the different disciplines, the project design would have to be very broad. The time available for this project would not allow for such a broad design. However, this brings up the issue of the relevance of a project designed to accommodate the participants, and not the community being researched.

It is difficult to say if we would have learned more about the area had we been on our own, working alone in our separate disciplines. There is no doubt, though that we have learned from each other through the joint approach, and that gaining a better understanding of the approaches taken by other disciplines is useful for us all. Working across disciplines is also very likely an aquired skill, and can not be judged purely on the basis of a first attempt.

6.3.2 Intercultural group work

The objective of the Thai-Danish cooperation was to incorporate our different cultural and educational backgrounds in the design of the project and in carrying out the fieldwork. Through our cooperation with the Thai students, the Danish half of the group learned a great deal about Thai culture, that we would not have learned had we been on our own. It would have been very difficult for us to get as close to the village society without the help of our Thai colleagues.

The cooperation has not been without challenges, however. The main problems have been due to the very different ways that Thai and Danish people communicate, both verbally and non-verbally. The language barrier has meant a great deal for the quality of the cooperation, as it caused many misunderstandings in the group. In our opinion the project would not have worked without the interpreters, as they had a double function of interpreting both in the field during interviews and in the group work between the Thai and the Danish students. Culturally, we have different frames of references; common knowledge in one culture is not necessarily common knowledge in another,

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and misunderstandings are therefore hard to avoid. We have also been confronted with a different educational tradition that has forced us to be more aware of our own approaches.

We were for example left helplessly mute at the prospect of explaining what we were trying to do with our fieldwork and project. This was a methods course, so actually our main purpose was to try out methods to learn about them. It was not our ambition to be able to say anything conclusive about our study areas. However it would be meaningless for us to use methods without thinking about how they related back to our problem. In essence we had to act as if we were trying to gather conclusive data, and that our problem was most important in order for our exercize in methods to be of any use. The difficulties with language certainly did not make the prospects of this discussion any more favorable.

There are no easy solutions to the problems mentioned above, as many of them are inherent to the design of the field trip and to our different cultural backgrounds and approaches. It is our opinion, however, that the design of the field trip should take a form that makes it possible for the Thai and the Danish students to participate on equal terms.

6.3.3 Working in big vs. small groups

A good group work situation would have been to initially work in a big group in order to agree on a common objective, to include all the disciplinary interests and integrate the relevant subjects. Once this is achieved the group should separate into smaller units to focus on specific subjects. Responsibilities should be distributed in order to make the decision-making time efficient and to create continuity as the same people follow up subjects.

In our group, however, we did not separate into subgroups soon enough, rather we tried to do everything in common. As a result people did not apply their specific knowledge constructively, too much time was spent trying to reach consensus, and not enough trust was put into the work of the subgroups, as responsibilities were not distributed in a structured way.

Conclusion

In evaluating the effectiveness of our field methods, we should keep in mind the group work related aspects of the field work. The results of these methods depend not only on the methods themselves but also on how they were planned and applied. The actual course our fieldwork took was very

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much influenced by the cumbersomeness of our communication with the Thai half of our group, the extent of which we were unaware in the beginning. It was based both on language problems, and on the differences in our expectations toward fieldwork and ideas of how to go about it.

7 Conclusion

It can be concluded that the farmers in Ban Pak Huai Oi and Ban Huai Hom are heavily reliant on their farming. There are other sources of income and livelihood, like the forest, and labor, but they cannot replace this dependency on agriculture. The only alternative is migrating, which some people do, a least temporarily.

Though they basically use the same techniques, the Hmong and Thais have different farming practices, partly due to the differences in their circumstances. The steep upland fields are in great danger of erosion, which is a threat to the sustainability of the agricultural system. However, it is hard to say whether one farming system or the other leads to more erosion. The Hmong have started investing in conservation techniques, but apparently not enough to prevent erosion. It remains to be seen if orchards will be able to slow down erosion. In any case, the willingness of the Hmong to adopt conservation practices is a hopeful sign. A disturbing development in lowland is the weeding technique which results in the removal of topsoil.

Erosion is in itself a removal of nutrients from agricultural land. It was beyond the scope of the study to guage the nutrient balance in the area, but the picture of farming practices seems to indicate that even though fallow and fertilizers are used, nutrients may not be replaced in the soil. This is weakly supported by our soil tests. Organic nutrient sources are hardly used, and these might be a more readily available option. However, this is not part of the current land use pattern, and labor is already in short supply, so labor intensive techniques are not likely to be useful.

The Hmong and the Thai have varying access to different kinds of services like credit and agricultural support. Though the Hmong seem to have fewer options than the Thais do, they also seem to actively seek information and use their new knowledge.

Erosion and depletion of nutrients threaten the agricultural potential of the soil in the study area. Farming practices are characterized by constraints: shortages of labor, investment capital,

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water, and so on. However there does seem to be a growing awareness of erosion, and new developments, like the arrival of contract farming.

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First and foremost we must thank Headman Kai Ming Mung and the residents of Ban Pak Huai Oi and Ban Huai Hom and the Yellow Leaf village, including the Long family, for their willingness to help us with our project and answer our questions. Without their help we would not have been able to do the project, and they made us feel welcome.

We are indebted to our Thai collegues and the translators for their part in our eventful cooperation. The field trip would have been less enriching by far without them. For their friendliness and the fun we had together, we would also like to thank them: Yok, Dao, Tui and Wan, Nam, Pi Fah, and Ann. We also felt very well taken care of by our teachers, both Thai and Danish, above and beyond the call of duty: Ajan Sutinee and Ajan Anders. We would like to thank the other Thai and Danish teachers, some of whom visited us on location, or contributed in other ways to our field work and project.

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APPENDIX 1: Overview of data from farmer interviews for Thai and Hmong farmers.

	Thai	Hmong
# rai	Small: less than 10 rai Large: > 30 rai Both lowland (mainly rice terraces) and upland.	Small: around 10 rai Large: more than 100 rai All fields are upland, mainly steep slopes
Tenure	PBT-5, STK, NS-3	PBT-5, PBT-6 or else no documents
Crops	Consumption: lowland rice (wet) Cash crops: mainly maize, also some soy and orchards (litchi, tamarind). Some contract farming.	Consumption: upland rice, vegetable gardens. Cash crops: cabbage and orchards (litchi, tamarind, longan), very little maize.
Yield of major crops	Maize: 0,7 ton -2,3 ton/rai* Rice: 170 kg - 450 kg/rai* Yield depends on water and pests	Cabbage: 1,25 ton - 3,3 ton/rai* Rice: around 300 kg/rai* Yield depends on water (and pests)
Tilling	Upland: hand tools Lowland: tractor (rental), rotor tiller or hand tools	Hand tools or rototiller (mainly hand tools, as many fields are too steep for rototiller)
Irrigation	Stream water: System of canals fed from stream with trap door to control inlet. Rainwater	Rainwater mainly. In the dry season some farmers also use pipes to lead water from stream.
Chemical inputs	Most farmers use fertilizers. Amount depends on how much the farmer can afford. Most farmers use pesticides and herbicides. Amount varies according to need (if a lot of grass or insects -> amount increases).	All farmers use fertilizers. Amount depends on how much farmer can afford. Many farmers use pesticides and herbicides, but not consistently it appears. Amount varies according to need.
Major pests	Mice, insects, grass.	Mice, insects, grass.
Major problems	Mice, weeds, access to loans, water shortage.	Water shortage, labor shortage, mice.

*Yield calculations: Yield = Production/Area. Example: farmer told the production was 90 bags of rice (1 bag = 70 kg), area of rice production was 20 rai. Y=(90*70)/20=315 kg/rai. (Casley & Kumar, 1988).

Comments: One of the major problems with our interview data is that it is not consistent. Not all questions have been asked all informants, especially questions about yield. The information on yield comes from very few (2-3) interviews, and the rest of the interviews lacked the information. Some have given the information that the yield of rice was x amount of bags, but not how much a bag weighs, which renders the data useless.

Plate 1: Ban Pak Huai Oi

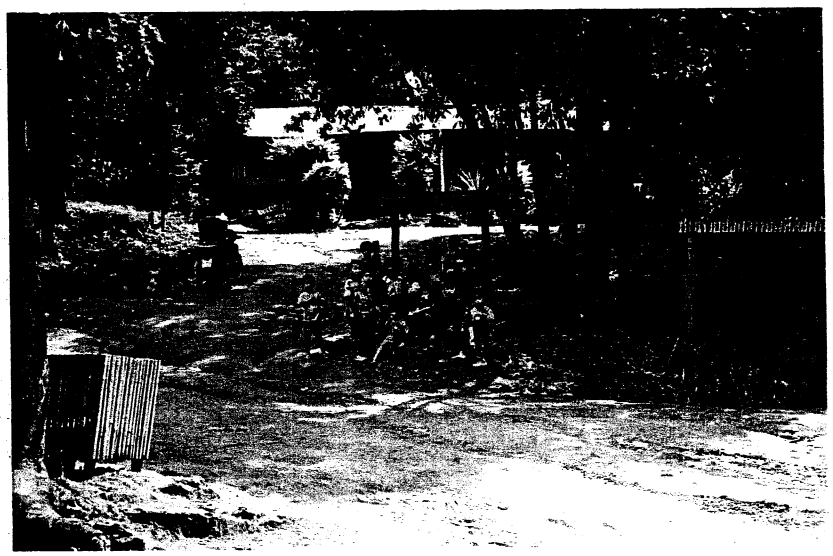

Plate 2: School in Ban Huai Hom

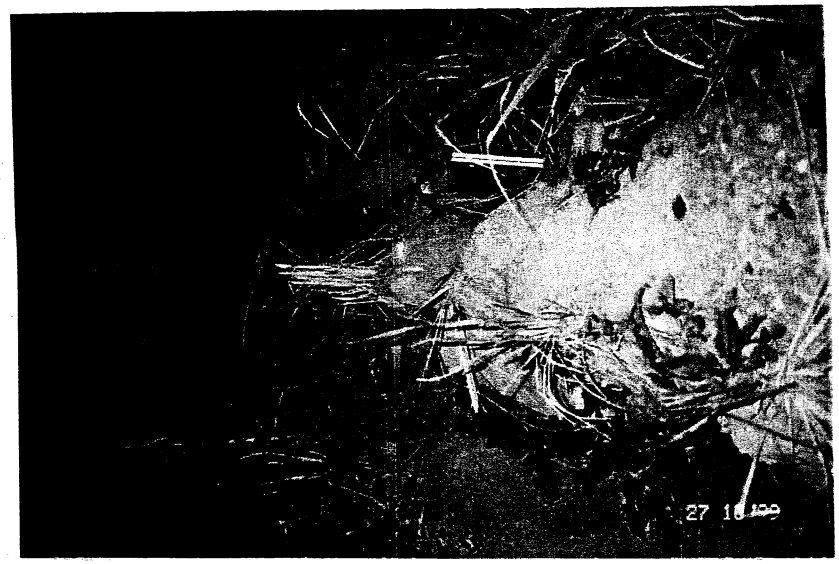

Plate 3: Rill erosion in rice field. The white stick is 15 cm.

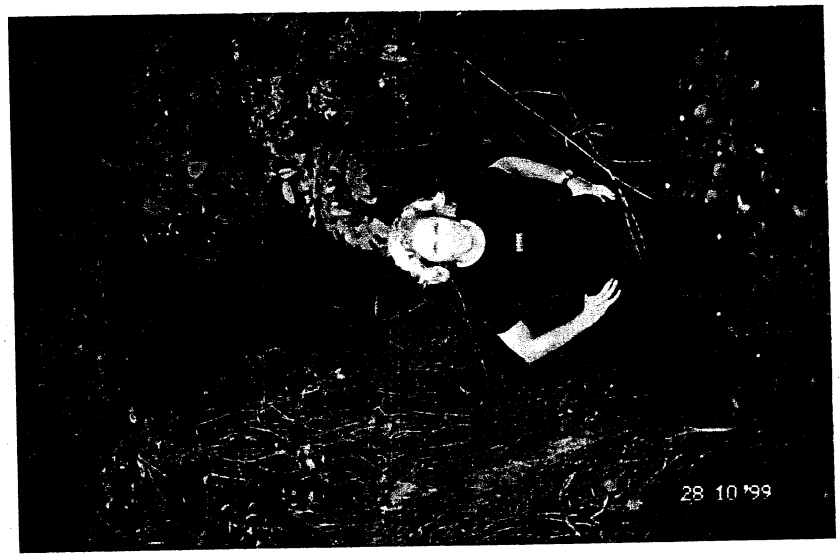

Plate 4: Gully found in orchard

Plate 5: Hmong fields. Cabbage and Rice.

Plate 6: Working in the cabbage field.

Plate 7: Overview of the Thai village, with paddy rice and cleared upland fields. The village is in the group of trees in the middle.

Plate 8: Hmong girls collecting NTFP.

Plate 9: Contract farming. Notice the piles of soil and weeds at the edges.

Plate 10: Drainage ditch in the cabbage field protects against erosion.

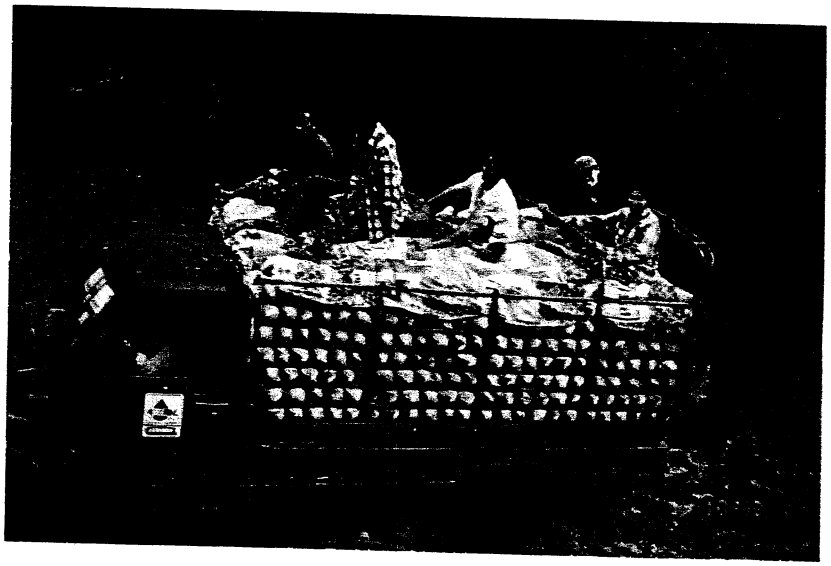

Plate 11: Cabbage going to be sold at the market.

Plate 12: Interview with headman, Kai Ming Mung.

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