

ACCESS TO LAND IN BAN PA KA

*- A field study of the interrelated complexities of farming systems,
environmental sustainability and social networks in relation to land access*

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Abstract

This report is an interdisciplinary field study with the aim of understanding access to land and how this interrelates with the farming systems, environmental sustainability and social networks in Ban Pa Ka, Phetchabun, northern Thailand. During 10 days of fieldwork we undertook both quantitative and qualitative approaches are implemented, including questionnaires, interviews, PRA and soil sampling. The findings show that Ban Pa Ka has been changed in recent years by the introduction of resorts and investors who have been buying up a lot of the land. This has led to a complex system of land ownership, divided into owners, caretakers and renters, most of whom are growing cabbage and chili as cash crops. While owners in the village have smaller pieces of land, others rent or look after land for resorts, individuals and companies. The recently introduced resorts provide employment and play a role in the villagers' access to water, with which they are becoming discontented. The Hmong people were unexpectedly absent from our field site, yet their absence tells a lot about the relations between the two ethnic groups, and the Hmong people's limited access to land. We will argue that are some key players influencing the distribution of land between the resorts, companies, other external investors and some villagers. The issue of access to land is highly complicated, and this study makes an attempt to untangle some of the many complexities.

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Introduction

Ban Pa Ka is a small village in the Camp Son sub-district of Khao Kor district, Phetchabun province. The village consists of around 68 households mainly occupied with farming. The villagers are Thai people, but Hmong come from other parts of the district to cultivate fields in the rainy season. Ban Pa Ka is close to a famous Buddhist monastery and temple, Wat Pha Sorn Kaew, and this area is therefore influenced by the development of tourism in particular. We went with the purpose of investigating issues related to land access, as this was presented as an important theme for that region (SLUSE information, 2016). Based on empirical data created through a variety of interdisciplinary methods we will investigate the following problem statement:

Our aim is to investigate the access to land in Ban Pa Ka and how this interrelates with the farming systems, environmental sustainability and social networks of the villagers.

Our first research question is: *What are the characteristics of different farming systems, and what is the relation to access to land, if any?* Insecure land ownership, which often occurs in developing countries, characterises land use patterns and access to land (Wagner, Yap & Yap, 2015). The possible implications of land use changes could affect various agricultural practices, which we investigate.

Our second research question is *Which aspects of farming systems affect environmental sustainability?* This is at the centre of traditional land use decisions, as water access influences how people treat land as well as the selection of the farming plots. Agricultural intensification has affected soil characteristics such as surface runoff, soil erosion, nutrient cycling and water sources (Lindenmayer, Cunningham & Young, 2012). We will therefore study the soil quality, access to water resources and general deforestation in the area.

Finally, our third question is *How are the social networks and the land-ownership interdependent?* We look at how villagers sell and buy land and the influence of investors who descend on the village and buy large amounts of land from farmers to build resorts (SLUSE information 2016). Furthermore we had anticipated the relation between the Hmong

and Thai people to be apparent in relation to land access. Because we did the fieldwork in the dry season the Hmong were not there. Still, this ethnic minority was very present in the Thai villagers stories and we will therefore investigate these *perceptions* of Hmong farming practices and land access (Wittayapak 2008).

We did not change the overall problem statement and research questions from our synopsis because they applied very well to the field. Nonetheless we found that some of our sub-questions needed to be adjusted to relate more accurately to the reality of Ban Pa Ka (see Appendix 6). Throughout the report we will argue that correlation between land access and the agricultural practices, environmental sustainability and social networks are changing, complex and relevant as a case study of land access in the region.

Theoretical framework

Land access is the central concept of this report. It is defined by the *Food and Agriculture Organization of the United Nations* (2002) as a land tenure system between the decision-making powers that a person enjoys, and the quantity and quality of land rights held by that person (FAO, 2002). Land tenure is the relationship, whether legally or customarily defined, among individuals or groups with respect to land, where land is understood as delineable area including natural resources such as water and trees. Another important aspect of access to land is the right to land, which are multiple rights to an object held by several persons, these rights can be divided into: use right, that is the right to use the land; control rights, the right to make decisions on how the land should be used; and transfer rights, the right to sell or mortgage the land (FAO, 2002). Regarding our field, Ban Pa Ka, access and rights to land are articulated through the following emic categories: owners, renters and people that *'take care'* of land, the last one implying that they do not pay rent.

The theoretical grounding of our report is based mainly on Chusak Wittayapak (2008) and Thanyaporn Chankrajang's (2015) work in the region of Northern Thailand. Wittayapak (2008) analyses land resource conflicts and ethnic violence in Northern Thailand, focusing on forest areas. He concludes that there are many and dramatic conflicts that have a long history, which often have ethnic minorities as their victims. Restricted control of land use, cutting off governmental social services, banning development programs, and eviction respectively are

some actions targeting the ethnic minorities, who are used to making their living in the forests of the rural highland (Wittayapak 2008). According to Wittayapak the ethnic group of Thai people has the perception that the livelihood of the ‘highlanders’, referring to Hmong people among others, and their agricultural practice of shifting cultivation causes environmental degradation: *“Highlanders are blamed for everything from flooding to water shortages”* (Wittayapak 2008: 124). These perceptions of the Hmong people among the Thai recur in our data from Ban Pa Ka, and we elaborate on that in our third research question.

Chankrajang (2015) makes an evaluation of the agricultural outcome on three different types of land titles in relation to the agricultural outcome. The titles includes land with full security and alienated rights, partial titles and others. Chankrajang argues that granting partial land rights can lead to various improvements in agricultural outcomes such as: an increase in the productivity of dry season rice, intensification of land use, land related investments, and improvement of soil quality (Chankrajang, 2015). There are studies from other regions of the world underlying this argument. Deininger and Ali (2008) argue that in Uganda there is a positive correlation between land rights and soil conservation. In Gambia the improvement of land rights resulted in higher land investments and soil improvement (Hayes, Roth and Zepeda, 1977). Also there were positive results in China; when formal land assurances were made, there was an increase in rice productivity (Jacoby, Li and Rozelle, 2002).

Finally we will introduce the concept of Self-sufficiency economy (SSE), which the Thai government are supporting and trying to implement through the district offices to the rural areas of Thailand. This is a scheme introduced by the king of Thailand 25 years ago as a base plan for the nation's development (Naipinit et al., 2013). The focus of it is on moderation, reducing expenses and increasing savings. This philosophy steps towards reaching self-reliance, first at the family level and moving up through the community, district, provincial, until reaching the national level (Piboolsravut, 2004). The self-sufficiency philosophy includes a part on sustainable agricultural development call “New Theory Agriculture” in which systematic guidelines for proper land and water management were developed (Piboolsravut, 2004).

With reference to the theory presented here, we hope to investigate how the SSE affects farming practices, and how these are interrelated with land access in Ban Pa Ka. We are interested in exploring firstly whether people with an ownership title will invest more in the land, take care of their resources and improve their soil quality. Secondly, whether villagers taking care of the land may look more for improving their social network and lower investments on land, and finally people renting the land may have farming practices that only look for improvements in the short term, due to the absence of land rights which can lead to inefficient land use (Chankrajang, 2015).

Methodology

This chapter gives a brief overview of the methods used during our field research, how we used them, as well as the benefits and disadvantages of each method and how they changed from our initial expectations. The data is presented in detail in later sections, divided by research question, rather than method. During our 10 days in the field 24 villagers participated in our research. In Appendix 8 you find a table containing names, short personal descriptions and methods they participated in.

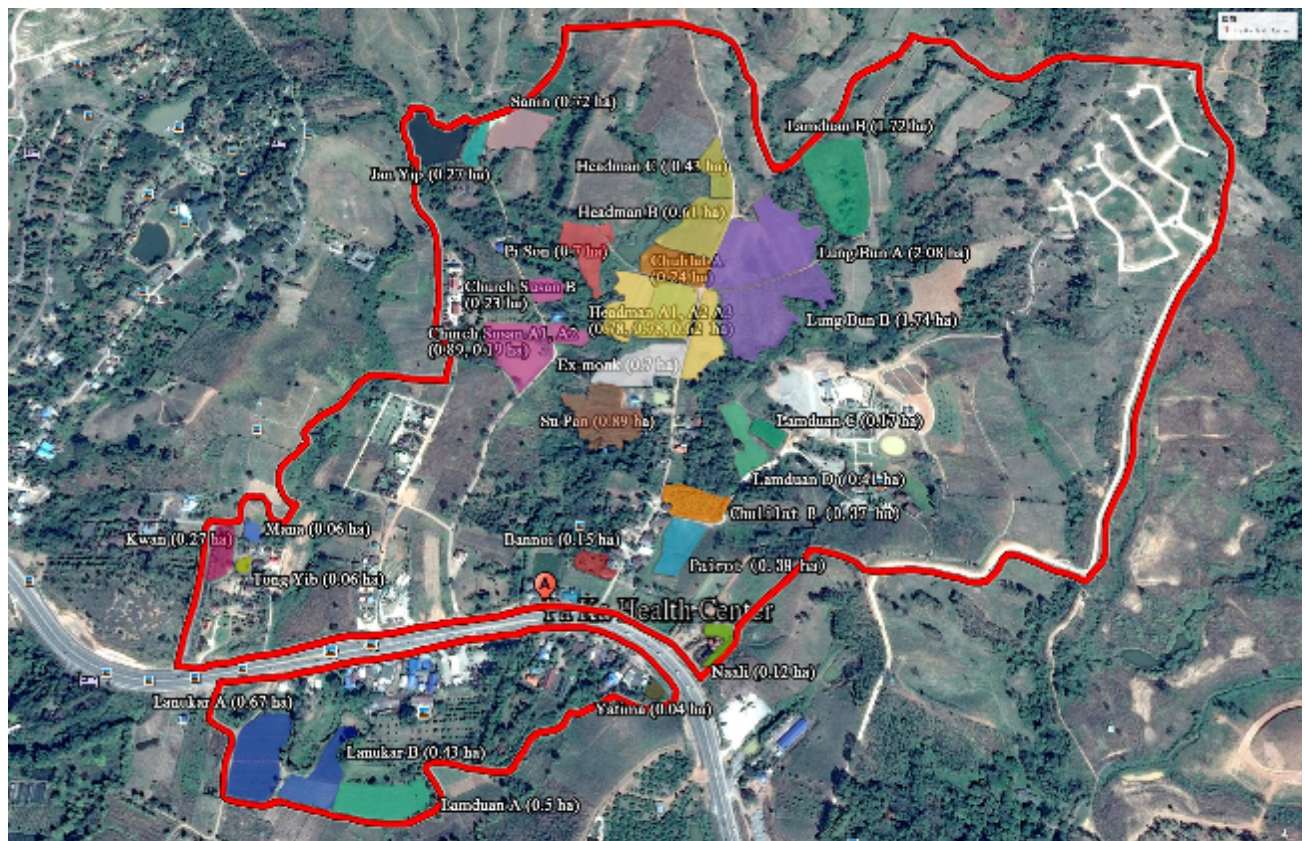


Figure 1. Map of Ban Pa Ka with the border and all the places of our informants.

In table 1 we synthesise the range of methods applied. See Appendix 10 for a timetable of planned methods, while Appendix 7 is a Logbook with the completed methods .

Table 1: List of methods

	No. of respondents	Duration	No. of facilitators
Welcome meeting	6	Day 1	5
Village tour	1	Day 2	5
Questionnaires	19	Day 1-5	1 facilitator, 1 note taker
Key Informant Interviews	5	Day 1, 2, 3 & 5	1 facilitator, 1 note taker
PRA: community mapping	8-10	Day 6	1 facilitators, 4 observers (and note takers)
Semi-structured Interviews	8	Day 7-9	1 facilitator, 1 note taker
Soil sampling	10	Day 7-9	2
Participant Observation	-	Day 1-10	5
Community Meeting	27	Day 10	5

Welcome meeting and village tour

Despite intending to begin the study by touring the village before meeting the headman, our driver Song, the headman's son, had other ideas. He had already invited a few neighbours, and the headman's family, to welcome us and answer our questions. Song was very friendly and wanted to help us. The unexpected first meeting allowed us an easy route into the village, and we began our research right away with a pilot questionnaire with one of the farmers present; however it meant that from the beginning our study was coloured by the influence of the headman and his son, giving us leads or contacts. This

later gave us problems in our sampling strategies and in finding respondents who were not connected with the headman. This bias continued on day two, when we had to interrupt our village tour with Song the driver because he was telling us so much about all the neighbours



Our driver, son of the headman, mapping the village.

and we felt it was giving us too biased a view of the neighbourhood. The headman's lack of time to be involved in our study also became apparent at this time.

Questionnaires

Before we began our fieldwork, the plan was to use the questionnaires to get a broad picture of the farmers living in Ban Pa Ka and their farming practices. Out of the 68 households, we wanted 20 respondents, who represented Thai and Hmong farmers. The reality that we met challenged these criteria, as Hmong people did not farm in the dry season.

Our pilot questionnaire on day 1 was well received, so we did not have to change the questionnaire as much as we had anticipated. We went through the questionnaires with our interpreters at the beginning, and we got the impression that they had a good understanding of the terms. However our mistake was not taking sufficient time to talk about the meaning of the subject specific words, some of which were misunderstood. Two examples that we learned was "*lime*" and "*planters*", that got interpreted as respectively the citrus fruit and workers who *plant* the seeds. See Appendix 1 for the final questionnaire.

We wanted to do a random sample, based on a list from the headman; however he could not provide this. Song was often overly helpful, and always had an idea on which people would be interesting to talk to; for example he said not to do questionnaires on one side of the village because they are '*just workers*'. Moreover, Song affected the questionnaire outcome by helping and commenting on our questions, while we talked to the villagers. Especially when we asked villagers to draw their houses, Song took over when the farmers expressed doubt. He thereby affected our data, directly with his comments but also just by being present. We had a hard time getting around this issue, because we did not want to offend him. We split up in two so he could only go with one group, but finding respondents without him as gatekeeper also proved difficult. In the end most of the 18 respondents were acquaintances of the Headman's family.

Semi-structured Interviews

In total we carried out 8 interviews of 45 to 90 minutes, over the three last days. The sample was selected from the questionnaire respondents, but due to our time limitations, we selected

only those who we wanted to take a soil sample from, representing the three types of land access identified in the questionnaires: 3 owners, 4 care-takers, and 3 renters. We rotated the roles between us; 1 conducting the interview with help from an interpreter and the other made observations, took notes and contributed with extra questions. On the basis of the interview guide we let the conversation take detours to include the themes most important to the respondents (Appendix 3). Based on the questionnaires, we had reconfigured our interview questions so they were more appropriate to the farmers. Therefore we decided that a pilot interview would not be necessary.

The questions began with ‘easy’ questions about crops, and built up gradually towards more intrusive questions discussing social relations. The respondents tended to be more relaxed by the end, opening up to us. Furthermore, although we intended to combine interviews with walkabouts, in reality many of the farmers preferred to meet in their homes or had far away fields, and it felt more comfortable to follow the lead of the farmer in order to stay on good terms with them. However in hindsight we could have been more pushy and insisted on seeing their fields. Therefore only half of the interviews included this ‘walkabout’ aspect, which was intended to prompt our questions and to help us to visualise the farming system better. In the cases where we did do the interview on the field, it was very effective. We discovered that many farmers in the questionnaire did not give us the full description of crops and practices, which we would not have found out without an interview and seeing their fields. Originally we had planned for the interviews to be representative of the people of the village; however in practise it was more useful to represent the types of land use, which is the focus of the study.

PRA community mapping

As our project was about access to land, we decided to gather people to draw and talk about the places and spaces of Ban Pa Ka. We invited five people representing four areas of the village and choose an outdoor restaurant as the location, because it was open and inviting. After an hour of concerned waiting, all the invited parties came followed by villagers stopping by more or less randomly.



The PRA session – Community Mapping

Photo of the community mapping in appendix 11.

We designated one facilitator and two notetakers; one observing behaviour and the other noting conversations. We tried to give as few instructions as possible, eg: “*We would like you to show us how you see Ban Pa Ka*”. The facilitator mainly guided the process when it seemed that some people withdrew themselves or did not know what to draw. We had decided to focus on the following themes:

Table 2: Themes for the PRA

1	Settlement (who owns the different areas of houses and fields)
2	Kinship (family ties)
3	Resources (water and forest)
4	Common or public spaces
5	External ownership (resorts and companies)
6	The boundaries of Ban Pa Ka

We managed to touch upon most of the topics without forcing the conversation and drawing too much. The meeting ended with questions and comments about us and the project and a nice group photo.

Soil Sampling

We decided that in order for the soil samples to be comparable, the respondents should follow the common cabbage/chili system, so that we could identify the differences in how they cultivate and look at the effects of this on their soil. We took soil from the same sampling frame as the semi-structured interviews, with a few extras, giving a total of ten fields. Figure 2 shows a map with all ten field fields marked. The colour indicates the soil texture. The field itself was the sample, so that in the case where farmers had multiple fields, we could select those which filled our requirements. In each field we took a composite sample of five replicates, using an auger for time effectiveness. See table 3 to see what the soil is tested for.



The equipment used for the soil samples



Figure 2. Geographic location of the land where soil samples were taken and the soil texture marked with colours.

Table 3: List of what the soil is tested for

	Soil Test	What it shows
1	pH	Indication of which nutrients would be available at that acidity.
2	C:N	Gives the ratio of total carbon and nitrogen, this indicates the availability of nitrogen in the soil.
3	Pox-C	This shows the oxidising carbon, which is an indicator of soil organic matter.
4	Soil Classification	Shows the texture of the soil.

Participant Observation

We had experiences ranging from merely observation to direct participation, and below we will present some few examples. We paid special attention to the impressions we got the first days in Ban Pa Ka, to note down the curiosities before village life became normalised everyday activities to us.



Visit at the Blue Sky Resort

In the observational end of the continuum we did a village tour with Song to sense the everyday life of the farmers. That day we also visited the Bluesky Resort as guests of the assistant headman, which helped to understand local perspectives about the resorts. Another example was observing the daily life of the monks at the small village temple, visualised in the monks walking daily through Ban Pa Ka in the early morning hours to collect alms.

If we then turn to the more participatory activities we also took part in the planting of cabbage with



Helping planting cabbage

one of the farmers. The last example is that Banoi invited us to sleep at her house and we accepted the invitation. The walls were covered of pictures of the king and his family and a big Buddhist altar. When Banoi sensed our interest she came upstairs and prayed with us.

Key Informant Interviews

Originally our key informants consisted of only the headman and assistant headman. However we soon realised that the headman was not available, therefore other members of the village became more important. We kept the structure of the interviews quite loose in order to allow the discussion to develop more freely, and in many of the interviews we were trying to find some kind of lead to talk to Hmong people in the village.

Table 4: List of key informants interviews

Informants	Day	Theme of interview
Neighbour of headman (Banoi)	1	History of the village; farming; Hmong people
Driver/guide	2	Tour of village and Hmong people;
Headman	3	The village and his role
Owner of fertiliser shop	5	Chemical inputs; Hmong people; mapping
National Park fire representative	5	Fire and agricultural practices; Hmong people

Community Meeting

The last day we invited all the villagers to a community meeting at the headman's house. We thought about selecting a more "neutral" place to have the event, but we could not find an alternative that suited the purpose. Also it was a way to respect the headman's position in Ban Pa Ka, and this was the place where community meetings were generally held. Almost all our informants came and the atmosphere was relaxed and cosy and it seemed that all the respondents knew each other well.



The community meeting at the last day of our fieldwork

In the synopsis we had planned to do a focus group discussion in the end of our fieldwork to “test” some of our findings, and also to observe the differing opinions on certain subjects that the villagers found important. Last minute we decided to include some group discussion questions into the community meeting; however looking back on the situation we should maybe have reconsidered. Approximately 26 people came, and it was difficult to facilitate a talk that was engaging, and our questions did not lead to any discussion. One man took charge as the “representative of the village” and began to question our project (in english), expressing uncertainty about the use of our data and the purpose of our visit. Instead of trying to implement an extra method in the community meeting, we should have done the group interview separately with fewer people.

At the meeting we had an informal talk about our work and findings followed by gifts and thanks to all the participants. It was a good conclusion of our time in the village.

Overall reflections

We did not get to use all the methods we had planned, due to limited time in the village as our group member Kwaku got hospitalised one of the first days. The wealth ranking and seasonal calendar were dropped as we decided that the community mapping would be the most worthwhile PRA method to establish social relations in the village; we replaced the

seasonal calendar by asking farmers in detail about their fields in the interviews. However we had many informal discussions which were beneficial to our study, also allowing for more social interactions with the village. Farmers were beginning to plant their cabbage crops during our study, therefore it was a busy time and people who had agreed to talk to us were often tired or busy, which meant they could be impatient and we felt uncomfortable taking their time.

The bias of our driver, Song, was hard to escape and seemed to be a recurring problem in many of our methods, as he was around all the time, and enjoyed hanging out with us. That experience was in stark contrast to our encounters with his father, the headman, a quiet and busy man.

Working with interpreters is another concern. We developed a common understanding of the project with our interpreters, for example, we began to talk more directly to our informants, creating more rapport, and this behavior got reflected in the informants answers. Another issue about working with interpreters was how to approach people and introduce ourselves, as it was often easier to let the interpreters catch their attention in Thai. Furthermore as we had the formal introduction printed on the questionnaire, they went through it on their own with us standing passively on the side line, which was a bit unfortunate when we wanted to guide the questions afterwards. When we became aware of this, it changed, so we facilitated the approach and introduction more actively towards the end of the fieldwork.

Finally, we had expected the Hmong people to feature prominently in our report. We heard from Song and others that the Hmong people worked a significant amount of the land, and were often seen in the village, yet but nobody could put us in contact with them. We spent a lot of time trying to establish contact through many channels, especially our key informants, to no avail. Had we known it would be such an issue, we might



Interviewing one of the farmer at her field

have focussed on finding Hmong respondents in the very beginning.

Research question 1: What are the characteristics of different farming systems, and what is the relation to access to land, if any?

1.1 What types of access to land exist in the village?

The land access in the village is very complex. Due to the recent opening of many resorts, the land has been bought up by ‘*capitalists*’¹ in the last 10-20 years. The headman told us with great certainty that 80 percent of the villagers rent their land and 20 percent own. Based on the questionnaire sample however, we found that of the 18 areas of land we investigated, 10 were owned and 6 rented, and 2 ‘take care’ of land; see figure 3 below.

We had expected to find the farmers to be engaged in contract farming, but that was not what we experienced (Appendix 6); none of our respondents had a contract. In general we saw that owners have use, control and transfer rights, while renters may only have use and control rights and people taking care may only use the land. These differences in land rights can interrelate with how people use their land, their natural resources as well as their social relation to key persons, such as the headman or the Blue Sky Resort owner.

Ownership status of each arable plot

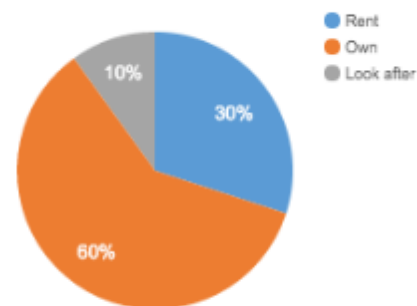


Figure 3. Diagram that shows the ownership status of each farmer (data from the questionnaire).

For a full list of all participants, see appendix 8.

The ownership of land in Ban Pa Ka turned out to be very complex. For example the farmer Pairot rents land from a man who looks after land for his father, who works at Thai Wa company. Blue Sky Resort, a resort in the village, also rents out a lot of land in the village. Some have to pay rent, others pay in crops and others take care of the land for these investors. Rented land makes up the majority of the village, according to our questionnaires and key informant interviews. The renters in general are happy with their contracts, many of which were renewed annually. Sanit, for example, is very happy with his one year contract because of the soil quality, as he likes to move around and not plant in the same field every year.

¹ see section 3.3 for an explanation of *capitalist*.

Banoi, a neighbour of the headman said that people used to own 20-50 rai, yet now having 2 rai is considered to be a lot. She considers herself *“lucky to have land. Some people rent all their lives”*.

Finally there were also villagers ‘taking care of’ land. This was something we had not anticipated, assuming that all land would be rented or owned. ‘Taking care’ of the land involves the farmer using the land as their own, similarly to renting, but they do not pay any rent. This seems to be the result of a huge amount of speculation and investment in the land; as the owners of the land in both cases were investors, *“capitalists”*, from outside the village. The villagers who use the land are looking after it until the investors are ready to use it. The agreements with the landowners differ a lot. In some cases the contract is very clear; one of the caretakers we interviewed was the headman, and he said that Thai Wa would give him 2 months’ notice if they wanted to use the land. If they do not give him notice then they would pay him for any crops in the field. Others have loose verbal agreements without knowing when the owner wants their fields back, but this it did not seem to worry the caretakers very much.

All of the renters we asked said that they were not worried about land security, whereas the opposite was true for the owners we talked to. We had expected that renters would be more worried about being able to rent the land in future but it did not seem to be the case.

1.2 What are the different farming systems in the village?

The majority of the farms we encountered in the village depend on a mixed system of cabbage or chinese cabbage with chillies. 8 out of the 18 farmers who responded to our questionnaires have a chilli and cabbage rotation or intercrop, and 11 have at least cabbage *or* chili. Furthermore all questionnaire respondents who rent land have chili and cabbage. The headman explained that the advantage of cabbage is that it can all be harvested at once; therefore it requires less workers and costs less. Chillies, on the other hand, require harvesting every ten days throughout the season and this is why some of our respondents do not grow chilli any more. One typical system that we observed in many fields was an intercrop of one row of cabbage and one row of chilli; two rows per bed. The cabbage seedlings are generally planted out in march and harvested two months later.



Chili and cabbage are typically cultivated at the farms in Ban Pa Ka. The picture to the right shows intercropping of these two crops in the early stage.

Other important crops in the village are: rice, passion fruit, long bean and pepper. Rice is mainly upland and in general is planted by the Hmong people who do not live in the village. As we were unable to speak to any Hmong people we have only the Thai perceptions of their farming systems. The headman and the assistant headman's wife also grow passionfruit, following the led by the king's self-sufficiency economy (SSE) scheme (Naipinit, et. al. 2013; Piboolsravut, 2004). One woman, Lanukar, also produces bamboo shoots, and uses the taller bamboo canes to make furniture. Many of the respondents in the questionnaires told us that they grow just cabbage or chilli; however when we did the interviews we found that most villagers grow many more things.

Table 5: List of interview respondents and the crops they grow.

Name	Crops grown
Su Pan	Chinese cabbage, long bean, pepper, sweet pea and coconut palm.
Pairot	Chili and cabbage (sometimes)
Sanit	Chili and cabbage
Lanukar	Chili, cabbage and chinese cabbage
Lamduan	Cucumber, cabbage, rice, passion fruit
Church	Chili and cabbage
Lung Bun	Chayote, chinese cabbage
Sa-Whak (Headman)	Cabbage and chili

When asked how farmers make their crop choices, we received a wide range of responses. The headman, for example, replied that the villagers do not change which crops they grow or how they grow them, as they learned this way of farming from their parents and they have not learned anything new. Banoi agreed that there have been very few changes in the village, in terms of crops, and that only passionfruit is new in the village.

However, three farmers said that the price is the main factor governing their decisions. Su Pan, who has grown cabbage for the last five years, said his choice of crops depends on how much it will cost him compared to what he can earn; he would like to grow chillies but they are more expensive because of the fertilizers and workers needed. Price fluctuations were also noted multiple times as a reason, in particular for why not to grow cabbage, and higher prices at the time of planting is also a reason for crop choice. Cabbage is also more at risk of weather damage, for example from hail. Others just said that they grow what they always have grown. Su Pan also said he has problems with soil acidity and therefore cannot plant certain crops.

It seems to be an interesting pattern that *all* those who rent have the cabbage/chilli system, yet of those 12 owned pieces of land, 8 do *not* plant chili or cabbage. Two owners plant chili and cabbage and 2 plant chili *or* cabbage. These could perhaps be because many of the owned plots are smaller than 1 rai, and are mostly dedicated to home gardens. Furthermore, renters may need to plant more cash crops to cover their costs.

According to the owner of the fertiliser shop, in recent years fertilizer consumption has increased from 2 bags per rai to 3 bags per rai; and herbicide use has increased. This could perhaps be due to the introduction of the self-sufficiency policy, encouraging crop diversification, as this has been seen to increase chemical inputs (Kasem and Thapa, 2011). For the cabbage and chilli system, the most common soil inputs used were chicken manure as well as inorganic fertilisers. 5 farmers tend to use the chicken manure as a preparation once before planting, and then inorganic fertilisers after planting, usually in a top placement between plants. One farmer prefers to use bat manure on his chillies, and 3 also mentioned using compost. All of the renters from our questionnaires said that they use pesticides and herbicides, while only half of the owners did. This is perhaps due to the fact that it seems like the cabbage chilli combination is particularly cultivated by those who rent land, and this may require more chemical input than other crops. Of those who own land (greater than 1 rai), only half of them use pesticides and herbicides. Similarly, chemical fertiliser is used by all of the renters, yet only 5 out of 8 owners use it. Cash crops perhaps are needed to make rented land pay for itself. Given that many of the owned lands are very small, under 1 rai, and not really considered to be agricultural land by the

villagers, then we do not include them in the analysis. Overall therefore it seems that there could be some differences in the inputs used by owners and renters.

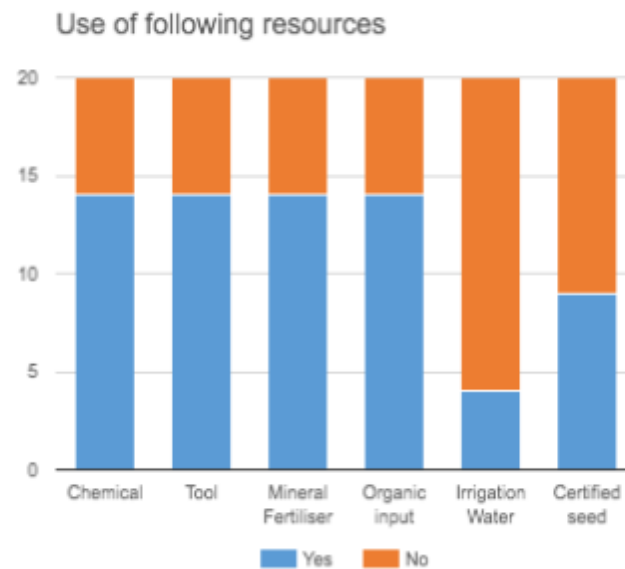


Figure 4. Diagram that shows the different resources used on each plot (data from the questionnaires)

Many farmers said that the soil quality on their land is poor but that they add organic fertiliser to the soil to improve it. Lanukar said that the other farmers consider the soil to be good but that has only improved due to the addition of the chicken manure and straw mulch. Three farmers said that regularly leaving the land to rest has helped the soil; usually after ploughing. We observed a significant amount of burning land in the village, although we did not question farmers about it as it seemed to be a too sensitive issue; the Hmong seem to take the brunt of the blame for any burning in the area. However it seems that shifting cultivation is a way to deal with the continuing acidification of the soil, which is alleviated by the high alkalinity of ash (Tanaka et al, 1997).



Top: burned land. Bottom: Upland, which Hmongs are blamed of burned down years ago, where there was used to be a forest.

Research shows that with the increase of land rights farmers tend to invest to improve the soil quality and open the possibility of multiple cropping (Chankrajang, 2015); however, these findings contradict ours, since we have found that there is not a significant difference in the way the land is used under different types of access.

Although Su Pan said that pests and diseases are not a common problem in the village, Joo said that the farmers have become concerned in recent years about the increase in insects. Sanit said that it depends on the season, and those who grow chillies said that the main problem they encounter is insects. They are a big problem for chillies, because they stay for a month before the harvest and can cause huge crop damage.

Table 6: Inputs and Farming Practices (data from the questionnaires)

	Pesticides/ Herbicides	Tool Use	Chemical Fertiliser	Organic Fertiliser	Irrigation	Cabbage/chili rotation/intercrop	Is agriculture the main income source	Have you sold land in last 20 years?
6 renters	100%	100%	100%	100%	33.3%	100%	100%	83.3%
2 take care	100%	100%	100%	50%	100%	50% + 1 bamboo	100%	50%
12 owning	50%	50%	50%	58.3%	16.6%*	33.3%	66.6%	8.3%
8 owning >1 rai.	50%	50%	37.5%	62.5%	12.5%	25%	75%	62.5%

*(58.3% have no water resource on the land)

All except one farmer sell most of their produce, and most of this is sold at Lom Sak market, not far from the village. Pairot explained the process to us: he sells his crops at Lom Sak market. Prices can be from 10-20 baht per kilo for chillies, but a good price for Pairot should be at least 10 baht per kg. If the prices increase, the middleman comes to him, and so he sells to the middleman who gives him the best price. There are four levels of middleman: the middleman at Lom Sak, the middleman who buys from Lom Sak, the one who distributes in Bangkok (30B/kg), and the small shops in Bangkok (40B/kg). Lamduan, however, sells her passionfruit to the Blue Sky resort, or she pays rent to them in crops.



Figure 5. Diagram that shows how the farmers sell their crops (data from the questionnaire)

In recent years passion fruit has been introduced to the village. The farmers explained that the government provided the training and seeds for it. The government also provides training courses in the village every month, in which they teach about composting methods to improve soil quality, the use of manure, inorganic fertilizers and pesticides, as well as meetings about government loans with low interest rates. This teaching, training and distribution of seeds come from the district office and is facilitated through the headman to the villagers, and the monthly meetings are held in his house.

The headman told us at our welcome meeting that the villagers “live sufficiently as the king advises”, as they have small gardens to provide their own food. However we found that the SSE seems to mean a different thing to different people. To Banoi it means growing things that are easy to grow, making brooms, and making sure she has enough produce from her garden and does not have to go to the market. To Sanit it means being able to borrow from neighbours, for Lamduan it means rotating her crops and plant with the other villagers, and for Joo it means saving money for retirement. There was only one respondent who was unaware of the SSE, and the rest said that it was a good idea, however for many people the reality is that they feel unable to practise self-sufficiency, whatever it may mean to them. This is because they have debts and costs, for example sending their children to school. Therefore they justify growing cash crops and selling them at market; all except 1 of those we did questionnaires with said they sell most of what they grow.

However we did observe that many villagers have their own home gardens, mainly growing fruits and vegetables for their own consumption. These are small gardens on the owned land around their

houses. As Banoi explained, most villagers have sold off most of their land except their own home. Therefore the homegarden is an important place where they grow a range of vegetables and have fruit trees which sustain their own family. Banoi said that having a homegarden means that she is following the king's self-sufficiency policy; she grows almost everything she needs for herself at home, on her 2 rai of land, and gives away the rest to others.



At Banoi's homegarden, where she practices self-sufficiency economy

1.3 What are the outside farm incomes?

Agriculture seems to be the most important income source in the village; 11 of the 20 people in our questionnaires have agriculture as the main income source, and of these, 9 are growing chilli or cabbage. For renters, agriculture is the main source of income; whereas only *some* owners have agriculture as the main source. There could be some suggestion, therefore, that those who depend on agriculture are growing these cash crops. Much of the off-farm income comes from construction and resort work, especially in the dry season. Out of the 20 farming households, 8 have at least someone in resort/tourism and 4 have someone in construction; many of these are the children of the farmers.

Research question 2: Which aspects of farming systems affect environmental sustainability?

2.1 What is the soil quality under different land access?

In order to assess the soil quality in Ban Pa Ka, the raw data has been transformed into scores (To see the map of the soil samples please refer to figure 2). The goal of this transformation is to ensure all data is set to represent its function and eliminate the effect of the unit (detailed approach please refer to appendix 5). In general, land owned has the best quality with average score 2.6; land looked after has second highest average score, 2.2; and land rented has the worst quality with average score, 2.0. Compared with the questionnaire about soil quality, there is no significant difference between farmers' opinion (see figure 7) and our lab results (see figure 6) but they do not correlate each other very well. Except for Lung Bun, most of the respondents believe their land is fairly good. This is because, according to the interviews, most farmers are usually aware of soil quality by observing soil colour, soil taste, crop growth, and crop yield. Even though some farmers do not examine their own land, they still appear to have awareness of soil quality as they add soil amendments, shift crops, and use fallow periods. For instance, Pairot checks soil quality before planting seeds. Su Pan tastes the soil himself to ensure it is prepared for planting.



Figure 6. Comparison of soil quality according to the scores divided by three land access.

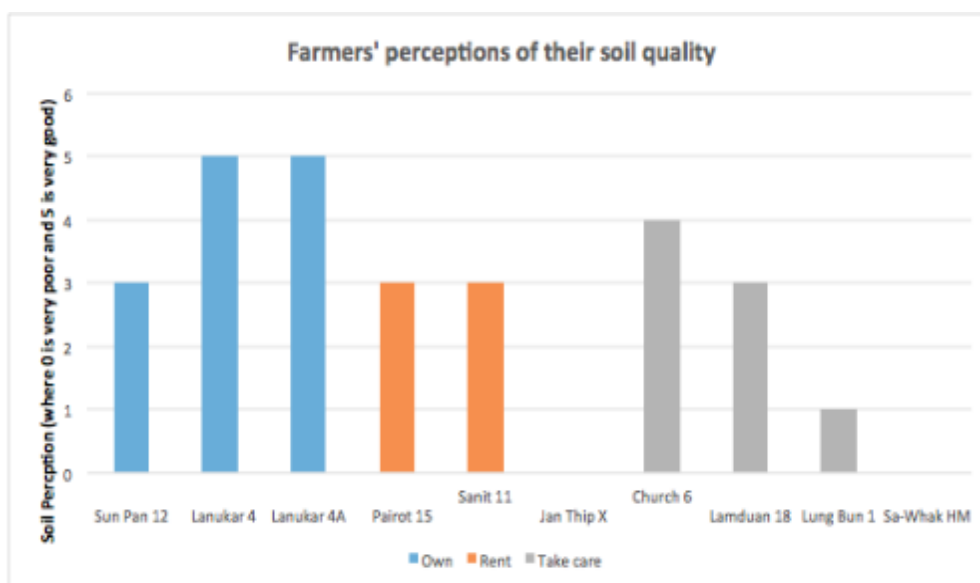


Figure 7. Comparison of soil quality according to questionnaire answered by the same farmers (0 means missing data; 1 means very poor; 5 means very good).

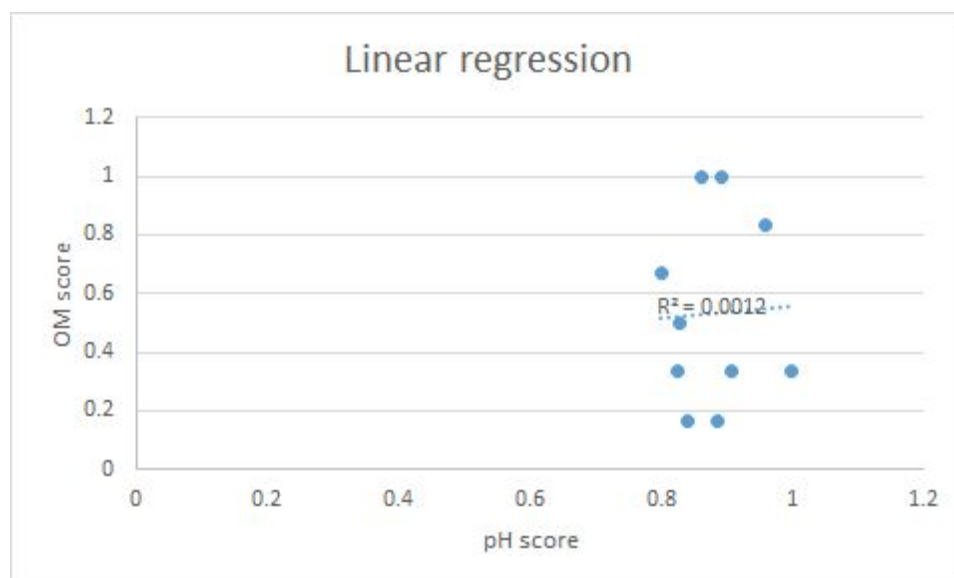


Figure 8. The relationship between OM and pH.

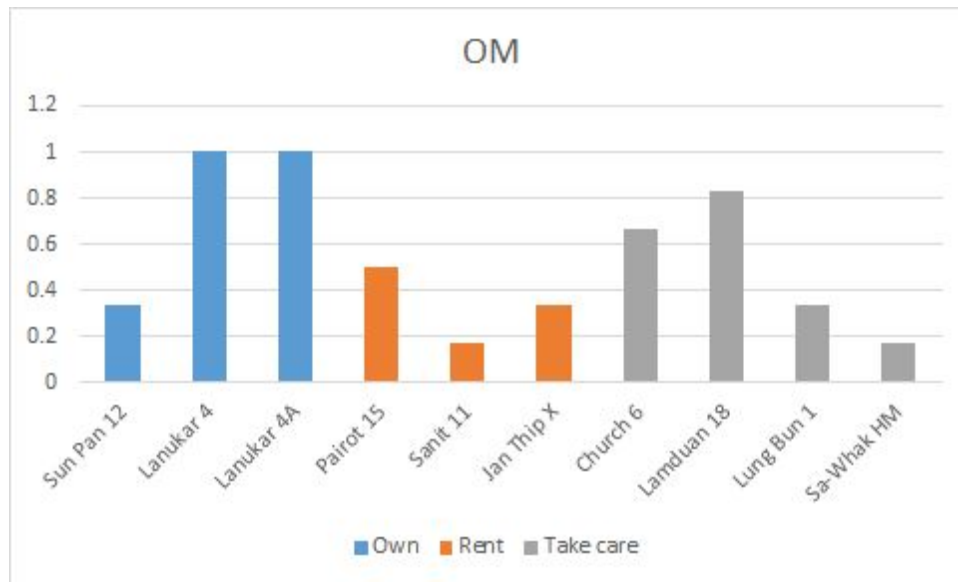


Figure 9. OM scores divided by different farmer.

However, we argue that the soil quality in Ban Pa Ka measured in the sample is not as good; according to Jones (2001), a pH under 5.5 is considered as strongly acid soil, which causes less nutrient availability and microbial activity. 80% of the soil samples belong to this category, and 20% belongs to acid soil (pH 5.5~pH 6.0). This fits with the findings of Tanaka et al. (1997) who note that the soil in this area tends to be highly acidic, which they say is due to excessive land use. We were also informed by farmers such as Su Pan, that soil acidity sometimes happened, resulting in certain crops which cannot tolerate low pH cannot be cultivated. The reasonable speculation for soil acidification may be inefficient use of nitrogen, followed by the export of alkalinity in produce. This hypothesis can be supported by low nitrogen proportion of the soil with average 0.115%, and the linear regression between OM and pH showing there is no significant relationship between them ($R^2=0.0012$) (see figure 8). Soil acidification is not caused by organic carbon.

Looking at pH and C/N data respectively, there is insignificant difference between pH and C/N scores, showing the condition of each field is similar. However, there is a considerable difference between OM levels (see figure 9) in different fields. There could be four explanations for this: (1) Climate factor, in terms of rainfall and temperature. During our fieldwork, Ban Pa Ka was in dry season, and the temperature was over 30°C. OM may increase with the increase of rainfall, or decrease with the increase of temperature. (2) Terrain

in terms of upland and lowland. Ban Pa Ka is close to the mountain, where it is difficult to preserve OM due to erosion. (3) Soil texture. OM is difficult to preserve in coarse soil such as sand. For instance, Su Pan and Pairot, whose land is sandy clay loam, may have this issue (see figure 2). (4) Farming activity, which may influence OM the most. Successive farming leads crops to absorb OM and the supplement is not immediately added. Even if respondents have applied manure or compost before planting, all of them, except for Lanukar, implement solely chemical fertilisers that cannot improve OM afterwards.

2.2 How do different farming practices affect soil quality?

Soil quality is of importance in understanding the association between land use and the environment; this is also implicit in the research of Kasem and Thapa (2011). Whereas, we will argue insufficient organic matter may be the main cause for declining soil fertility.

In order to improve soil quality, chicken manure is often implemented in Ban Pa Ka. Compost and mulch; however, are not in widespread use. Only two respondents have applied compost and one respondent has applied mulch, since others think compost and mulch are not as useful as chemical fertilisers. Whereas, animal manure has two main disadvantages which impact soil quality: nutrient variability and high salt levels. As farmers bought chicken manure from the fertiliser shop, the quality of the manure is critical.

Table 7: Observed timing and application of soil amendments.

Timing	Application
7 to 10 days before sowing/planting	Chicken Manure, Herbicide
7 to 10 days after sowing/planting	Pesticide, Chemical fertiliser, Herbicide
Every 10 to 20 days during cultivation period	Pesticide, Chemical fertiliser
Every 14 to 15 days during cultivation period	Chemical fertiliser
7 to 10 days before harvesting	Chemical fertiliser

Table 7 reveals that the farmers use one type of manure and different chemicals regularly. Farmers who take care of land tend to apply more chemical fertiliser at a regular time. Whereas, compared to land owned, quality of land looked after is not better, suggesting the correlation between soil inputs and soil quality is not clear. On the other hand, the use of farming tools such as planter, tractor and plough is not directly beneficial to soil quality, since Lanukar, who has the highest soil quality score, does not utilise tools. Besides, the number of crops does not relate to soil quality. For instance, Su Pan and Lanukar, who cultivate three kinds of crops this season, have the opposite soil quality score (2.2 and 2.8).

With regard to the change of soil quality in ten years, there is no apparent change. We observed most farmers do not notice the change, which may be caused by insignificant change that is hard to notice.

2.3 How is water access for agriculture?

The questionnaires revealed about two third of the respondents have a water source included in their cultivation plot (see figure 11). Most of them have only one source; while two have all types of water sources including river, reservoir, and drainage ways at the same time. However, having no water source does not mean they do not use the water sources. It is very common to apply water via neighbours' pump or pipe irrigation system. It is very common to utilise thin pipes with the help of a sprinkler and center pivot to transport water.

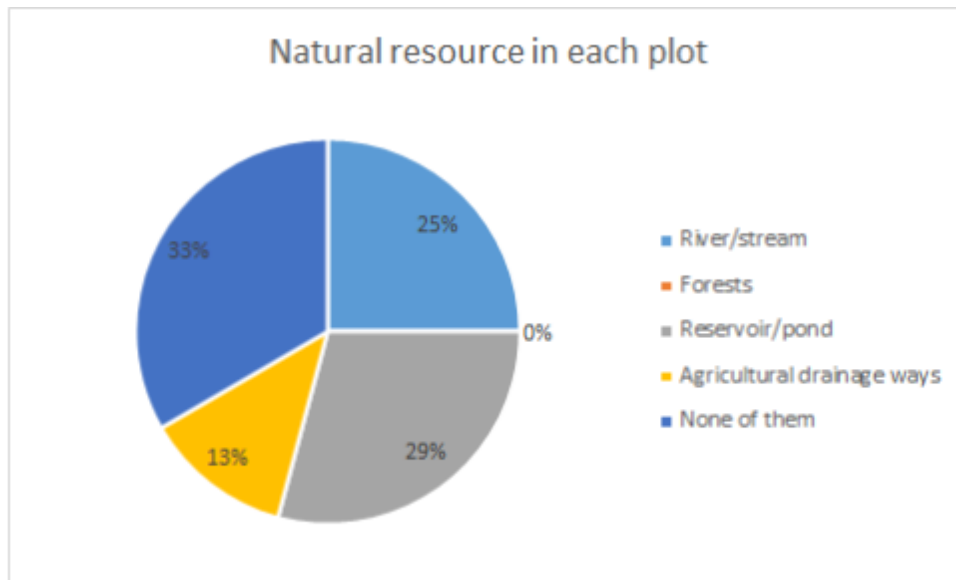


Figure 10. The proportion of natural resource used in each plot (data from the questionnaires)

Based on questionnaires, only 20 % of respondents use irrigation water, however this result seems to contradict the result that a much higher proportion of respondents have water resources on their land (figure 10) and our own observations. This could be due to having a different understanding of the term. In this report irrigation water refers to any water which is used on land for farming activities. According to this definition over two thirds of the farmers are apparently using irrigation water.



Cabbage field with sprinkler-irrigation system

Irrigation is mostly used during the dry season. Farmers who have their fields just beside a water stream or a pond find it easier geographically to irrigate these fields. 45 % of the respondents consider their water access as *good* (see figure 11). It is interesting to note that of the 8 respondents who have no water source on their land, 7 own their land (see appendix 13). This could give some indication of the distribution of land and that there could be some difference in the *quality* of land available under different access, yet with such a small sample it is hard to draw conclusions.

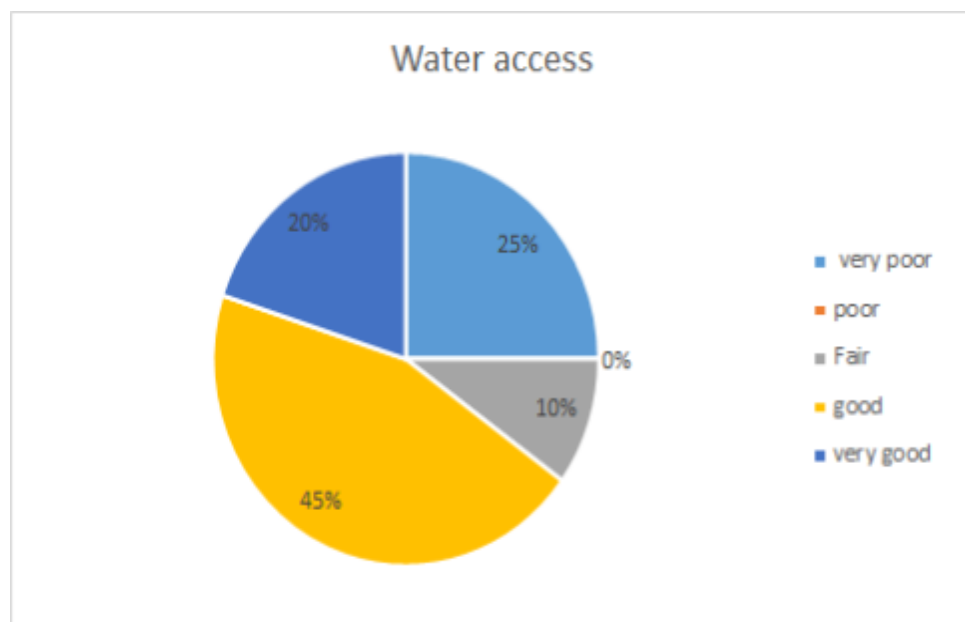


Figure 11. The farmers answer on the question “How would you describe your access to water for agricultural activities?” (data from the questionnaires)

Even though ‘only’ 20 % thinks the water access is very poor, most of the people expressed their concerns over water access in the future, especially for the dry season. Generally it seems water shortage has become a bigger issue over the last decade. When we had a sleepover at Banoi’s house, we could not use the toilet at the 1th floor at midnight, because of reduced water pressure. One respondent also mentioned that her pond is getting dryer. Less rainfall seems to be the most reasonable explanation, which is also coherent with more extreme weather that also has been studied recently in the area (Masud et al, 2016). Also a villager mentioned, the non-stop rains during the rainy season last year destroyed her cabbage cultivation.

Some told us the water access has become more difficult because of “the capitalists”, who in this case are the resorts, making a 45 rai pond that controls the natural flow to the village. A farmer explained that in the past people in the village were used to sharing everything and taking care of each other but now this has changed because of the resorts who use most of the water, because they are not interested in the people. And this, he explains, is why the farmers needed to build the ponds. This idea was repeated by some farmers who no longer have land in the village due to water issues, as well as others, and therefore seems to be a common concern in the village.



One of many ponds used for irrigation

2.4 Has there been any deforestation in the area in recent years?

There is no forest in Ban Ka Pa specifically, but outside of the village, mostly on the upland in the north and south. Villagers said there has been no deforestation and not much change in the forest or in nature around the village. Through satellite pictures of the village area, we can see some small forest loss in last decade (see figure 12). But in the same period there is also another forest gain in the area (see figure 13).

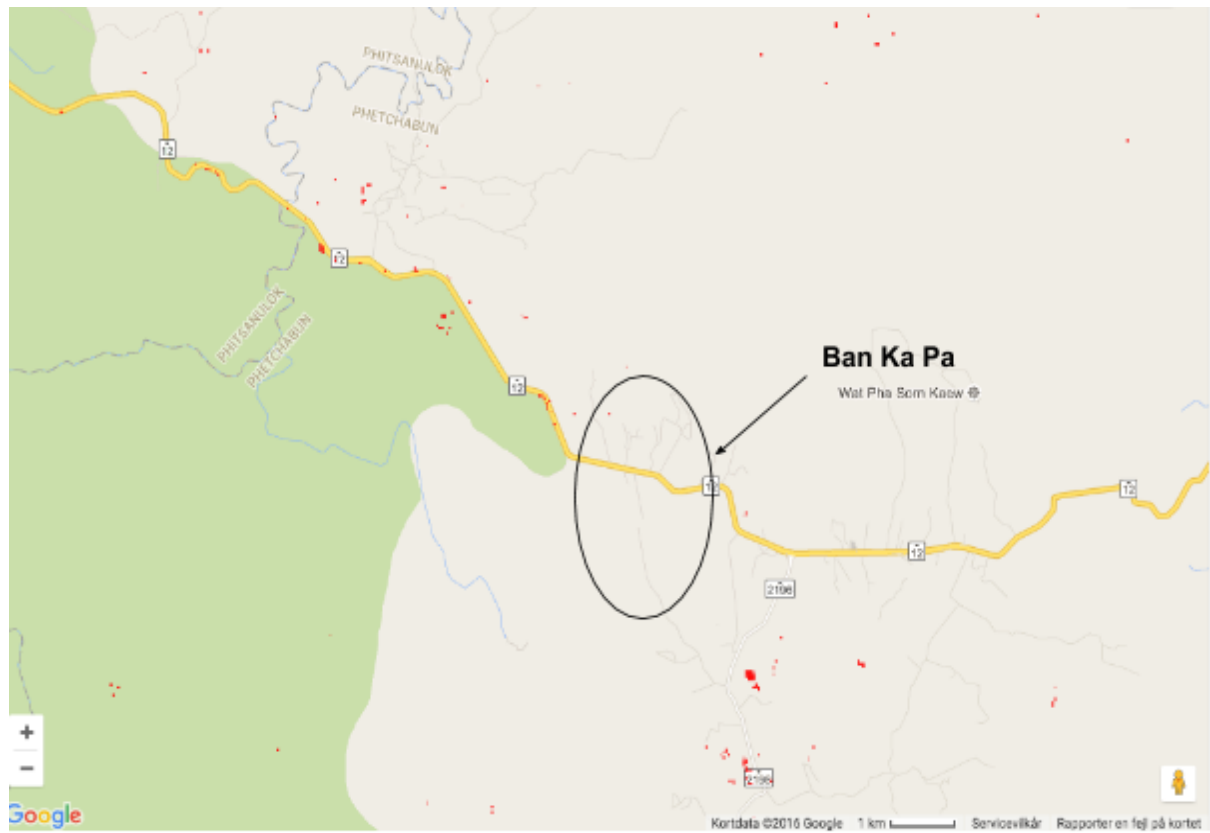


Figure 12. Forreest cover loss 2000 - 2013 (marked with red colour). Reference: Global Forest Change (2015)

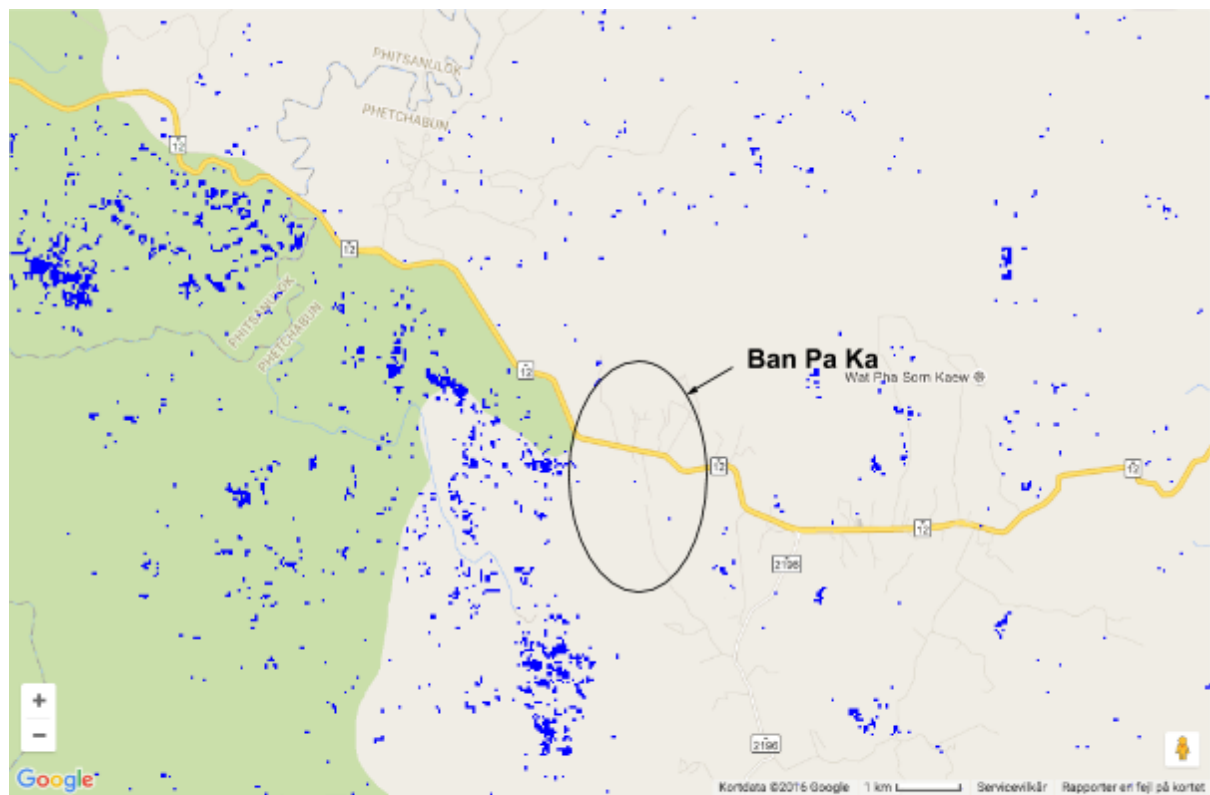


Figure 13. Forreest gain 2000 - 2013 (marked with blue colour). Reference: Global Forest Change (2015)

The pictures indicate that deforestation in the area is insignificant or even that the area is regaining forest. But when we asked, *Was there more forest or forest 10 years ago?* everyone agreed, also saying that there had been a lot of fires before and there are still fires every year. Now when we have these contradictory results, we are unsure how to understand it. When we asked about deforestation we were actually interested in *any* loss of trees, but maybe the villagers might not consider small plots of trees, as in shifting cultivation, as deforestation. We should have been more clear about this.

The chief of the fire control of Thung Salaeng Luang National Park told us that the most common reason for deforestation is hunting, which was said by many. Another reason is to get land to cultivate.

Research question 3: How are social networks and the land-ownership interdependent?

In this chapter we investigate the social factors implied in land-ownership in Ban Pa Ka. The term ‘social network’ reflects that we did not know the more specific social structures of the village before departure. Rather than a complete analysis of the social structures of Ban Pa Ka, with kinship ties mapped out, power relations uncovered and chains of decision making unfolded, we will present some concrete examples of social networks coming into play in relation to distribution of land and land-ownership in general.

3.1 How do villagers obtain and sell land, and what is the influence of investors in Ban Pa Ka?

Throughout our fieldwork one concern about land access was mentioned repeatedly by our informants: the rising price of land and farmers selling their land to companies and resorts. To investigate this we use data from our questionnaires, semi-structured interviews and the PRA community mapping.

10 out of 18 respondents from our questionnaire own their land. Six farmers had bought their land and 4 had inherited between 1975 and 2011. It is important to mention that a majority of owners refer to a relatively small piece of land: 8 out of 10 own less than 3 rai (0,48 hectare). If we turn to the selling of land, 10 of the 18 respondents had sold land in the last 20 years. 2 of 10 have sold to family members, 7 have sold to external investors and 1 farmer sold to 3 different people. 3 farmers said directly that they sold to a ‘*capitalist*’². A possible shortcoming from our methodology is that we deliberately sought out farmers to conduct the questionnaires and interviews. Potential villagers who gave up farming after selling their land are therefore “invisible” or diminished from our material. The reasons for selling were many, but one common explanation was that there had been a drought 10 years ago that indebted many of the farmers. Therefore they had to sell their land, to pay back the debt that came

² *Capitalist* was a term that many mentioned during interviews, and we were a bit puzzled by the use of the terms. So we asked some farmers to elaborate on what *capitalist* meant to them: “A person who invests in land to get some sort of profit”. This we translate to investors in our research question, also including resort owners and companies.

from a failed harvest. Many added bitterly that if they had waited to sell their land until now, they could have been very rich by now.

Through interviews and informal talks it became clear that the business of selling land to “capitalists”, companies or resorts was a complicated affair. After selling their land, they continued farming, either taking care or renting from the new owners. Therefore the farmers have to give up their livelihood: some still use the fields without paying or giving part of the crops to the actual owners. To the question about land security, many replied that they did not feel insecure because the landowners did not intend to use the land for many years to come. Others elaborated that it actually made them worry less with a one-year contract, because they can decide from year to year, if the soil quality and water supply are good enough to get a surplus.

There are divided opinions about the appearance of resorts in the area. A few said that the resorts create jobs and attract tourists, the rest do not like the way that the resorts and companies buy up the land. Su Pan, who has lived in Ban Pa Ka for 40 years, said that *“capitalist already made him sell one of his lands by buying all the land around his and blocking his way in”*. The limited land access was emphasized when we did the PRA community mapping. At a point the participants stopped drawing, but there were still white spots left in between houses and cultivated fields. We asked what was missing and the answer came promptly: *“The empty land belongs to the resorts; we cannot farm there”*.



We will argue that this shows how the investors are affecting the access to and selling off land in Ban Pa Ka. Some parts of the investors' land are still cultivated by farmers renting or taking care of the land. Other and broader areas are described as "*empty*" because the villagers cannot farm on these fields - some because of construction of big resorts, others are just left to wait for the land prices to raise.

3.2 How is land distributed in the village?

Most of the land in Ban Pa Ka is owned by external investors who have bought the land during the last decade, predicting that the prices will rise; while at that moment the price of 5 rai (0.8 hectares) of land was between 5,000 to 7,000 Bath, nowadays it can go up to a million baht. One of the companies that owns most of the land in Ban Pa Ka is Thai Wa. Thai Wa owns 600 rai (96 hectares) in Ban Pa Ka, 43.8% of the land used by the people that we made questionnaires or interviews with. The total cultivated land area from farmers that participated in either questionnaires or interviews is 17.34 hectares this held by 18 villagers, 12.56 hectares belong to external investors and is rented or taking care by 10 villagers, 7.6 hectares of these are owned by Thai Wa and only 5 villagers uses them. The people renting or taking care of land from Thai Wa have the highest average hectares per villager (1.52 hectares) followed by the villagers that rent from other investors (0.986 hectares) and finally

people that own the land (0.601 hectares). This includes the small areas of land around people's houses, which may explain why the owned land is so much smaller.

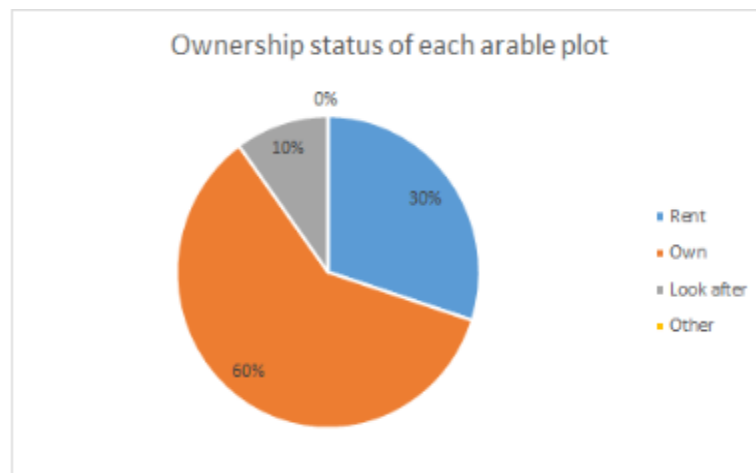


Figure 14. Diagram showing the ownership status of each arable plot (data from the questionnaire).

100 of the 600 rai owned by Thai Wa are managed in the village by a middle man, who is responsible for the distribution of land and the arrangement of the contracts between the company and the farmers. With the same definition the headman and Lung Bun both said they are the distributor of the 100 rai. Lung Bun said that he and the headman share the responsibilities. The land is rented for a maximum of 500 baht per rai per year, but according to Lung Bun, the company does not expect the farmers to pay if the harvest has been poor, and has not collected rent for the last 2 years. For that reason Lung Bun believes the companies are good for the village. The villagers in Ban Pa Ka have priority over the rented land over people coming from other villages, including Hmong people, and they are not exempt from payment.

Figure 16 shows how land belonging to Thai Wa is distributed in the village. From the 600 Rai (yellow circles) owned by the company, 100 rai are managed by Lung Bun and the headman (the distributors), the remaining 500 rai are empty land. The distributors then rents the land to 7 people (green) including themselves, and these 7 people have the right either to use the land or subrent it (blue), however all the farmers using the land from Thai Wa have to inform the distributor and the distributor subsequently to the company.

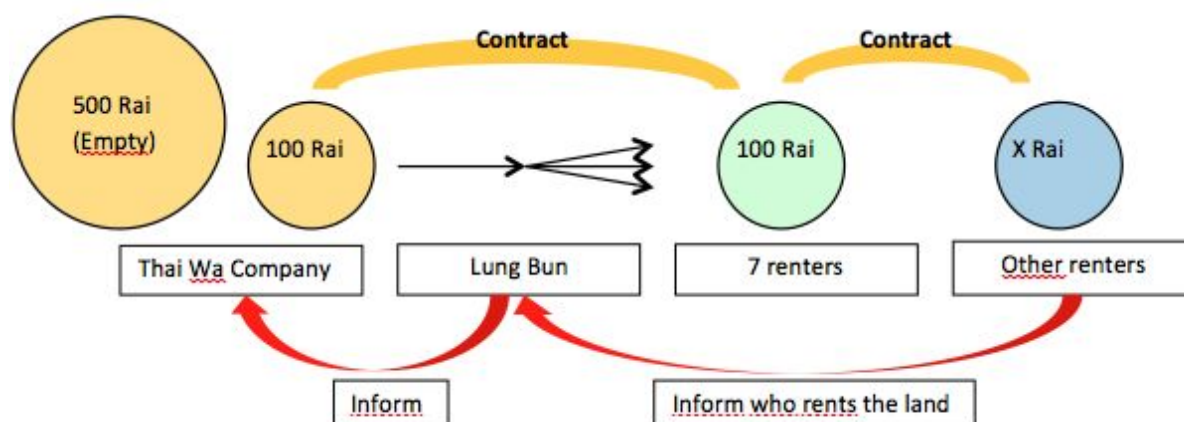


Figure 15. Distribution of the fields of Thai Wa according to Lung Bun.

Beside from this system of distributing fields of Thai Wa through the distributor to the 7 villagers, we will argue that the personal relations between people also play a role in the agreements over land. One example is Lamduan, whose husband is assistant headman and works on Bluesky resort. She takes care of some fields owned by Bluesky and talks very positive about them: *“The owner is very kind and generous. He only takes rent from some people”*. She added that she does not pay and that the owner does not need the fields back before her children grow up. We heard a similar story from a neighbor of the Headman, called Ge, who takes care of a part of Thai Wa’s land. His son has a high position in the company, so he *“looks after it for free”*. Some of the other farmers who rented land from other companies explained that they did not know the name of the person collecting rent. Sometimes they just said “capitalist” and in other cases they said that different people collected rent every time; both suggests that the relationship between investor and renter is rather impersonal.

3.3 How does ethnicity play a role in the access to land?

To try and grasp the concept of ethnicity in relation to land access in Ban Pa Ka, we are very limited as we only have access to villagers from the Thai ethnic group. The Hmong do not live in the village, but rent land in the rainy season, as only Thai can obtain land titles (Royal Forest Department; USAID, 2005). Therefore we focus on the Thai *perceptions* of

Hmong people. Hmong farming practices and land access are very intertwined, as we were told that the cultivation of ginger, a “*Hmong crop*”, made the Hmong move from one field to the next. Moreover, the practise of shifting cultivation was said to be the main reason for deforestation in the area by more than a few villagers, and the Hmong were accused of causing erosion by cultivating on highly steep land, which is illegal. Furthermore, they were said to be ruining the soil by adding too much fertiliser and adding salt to the fields. We will argue these perceptions of Hmong have resemblance to the literature about ethnic conflict in Northern Thailand (Wittayapak 2008; Hares 2009). On the other hand a few villagers were approving of the Hmong; saying they are skilled farmers and good people. That there are such a range of opinions about the Hmong, despite no one being in contact with them. Even though some farmers employed Hmong in the rainy season they could not put us in contact with them. Song, our driver, said that Thai and Hmong live in different communities, and live separate lives. Englehart (2008) argues that the state in Northern Thailand has preferred assimilation between the ethnic groups which partly explains the minimal ethnic violence in the area, compared to the neighboring countries (Englehart 2008). To some degree, this seems the case in Ban Pa Ka. However there was some presence of Hmong people in the village; they buy fertilizers in the shop, visit the fortune teller and rent land in the rainy season. As Banoi put it: “*We do business with them, but we don’t communicate*”. We will argue that the social distance between Hmong and Thai is perpetuating the prevention of access to land for Hmong people.

Conclusion

To answer our problem statement about access to land in Ban Pa Ka and how it interrelates with the farming systems, environmental sustainability and social networks, we will here sum up the results we have gathered relating to our research questions.

Ban Pa Ka has a complex system of landownership, divided into owners, care takers and renters, most of whom are growing cabbage and chili. While owners in the village have smaller pieces of land, others take care or rent land from owners, companies or even resorts. We had expected land insecurity to feature heavily amongst those who rent land, however the contrary seems to be true. Some of the landowners feel under pressure as they might have to sell their land to resorts while some renters feel their temporary landholdings will not be affected as the owners will not use the land in the near future. Most of the farmers commented that the government gives training to them once a month on farming practices, and it would be interesting to learn more about how this creates differences in their practices, as we did not observe this.

Soil quality in Ban Pa Ka cannot be considered good, particularly for rented land. As we assumed different farming practices will affect soil quality; however, our findings revealed soil quality will in turn impact farming practices. Most of the farmers believed they had good access to water at the moment, but expressed concern about the situation for the future. As almost none of the land from the questionnaire with a water resource is owned by the villagers, we suggest that the investment in land from the companies could be affected by the water resources. The apparent misuse of water by resorts gives the same impression. So this may have an impact of access to land, from the investors' perspective. If we had more time we would like to investigate this more by trying to include the investors in our field work. When we asked directly about deforestation, farmers said there was none. The satellite photos underline this point. However the villagers told us about burnings in the area, where there used to be forest. There could be a definition bias of deforestation, as we may not have made the definition clear, and villagers may not see shifting cultivation as deforestation. In retrospect, we could have asked for more details about the fires and the forest.

To investigate the social networks in relation to land access is a complex task. We decide to focus on the practice of buying and selling, distribution of land among villagers and the perceptions of Hmong people in Ban Pa Ka. We find that the rising price of land, and the impact of investors, companies and resorts occupying the fields of Ban Pa Ka, influences access to land among the villagers. Farmers who used to own land sold it and rent instead, which creates new challenges and possibilities for the farmers. Also parts of the land are left empty or ready for new resorts, thereby diminishing the area of cultivated land. We will argue that the distribution of land is mediated through different power structures: either a selected middle man, or personal or impersonal agreements with the particular land users. The focus on the Thai people's perceptions of Hmong shows that there is a great span between these two ethnic groups, both in access to land and also socially - they do not interact on a personal level. To look more into the interaction between these two ethnic groups we would have to conduct fieldwork in the rainy season where this minority is present.

SLUSE has been a learning process from the beginning, working as a group and exchanging disciplinary insights from anthropology, agricultural development and environmental planning. During our ten days in the field we applied a wide range of methods and approaches, combined and explored in the context of rural northern Thailand. Such a short time meant we had to compromise and adapt to our situation. The interdisciplinary scope gave us the opportunity to triangulate findings, often realizing that every methodological approach added new perspectives on the the topic, sometimes in contradictory ways or simply making us ask new questions. Even though we tried to avoid the bias of the Headman and his son in our selection, the majority of the participants has close ties to that family, and we are aware that it affects our findings.

In doing this research, we have gathered some interesting results. Land access is an important issue and very relevant to research. It is intertwined in various ways with many aspects of life in the village, particularly farming systems and social networks, and we have tried to untangle the complex system of access to land. Particularly noteworthy, and unexpected, was the absence of Hmong people, however this gave us some interesting

insights into the village. It is evident that this village is experiencing an era of change and the impact of tourism in the area is made clear by the resorts. We have found hints that there may be other aspects than access to land affecting these three issues, and that these issues themselves may have an effect on access to land, particularly the social and environmental aspects, for example access to water. The information we have collected gives an insight into many issues surrounding land use in this area of Phetchabun, which can be useful in relation to many other areas.

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Appendix 1. Questionnaire
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Appendix 1. Questionnaire

We are a group of students in Interdisciplinary Land Use and Natural Resource Management at the University of Copenhagen, working with Kasetsart University, Bangkok. In this survey, you will be asked to complete 23 questions relating to your land use. It will take you about 30-40 minutes to complete the questionnaire. Your participation in this study is totally voluntary. Your survey responses will be reported only in the class and your information will remain strictly confidential. If you feel uncomfortable answering any questions, you can withdraw from the survey at any point. Thank you very much for your time and support.

Demographic information

1. What is your name? _____

2. What is your age?

☐ under 16 ☐ 16~25 ☐ 26~35 ☐ 36~45 ☐ 46~55 ☐ 56~65 ☐ 66~75 ☐ 75~

3. What do you consider to be your ethnicity?

☐ Hmong ☐ Thai ☐ Other _____

4. What is your main occupation? ☐ farming ☐ other (please explain):

5. Please list the other members of your household (anyone who lives in your house or contributes to your income):

Household member name	Relation to head of household	Age	Occupation	Comments

Income

6. Please rank the income sources of the household? (where 1 is the most important)

- | | |
|--|--|
| <input type="checkbox"/> Agricultural income | <input type="checkbox"/> Forest and environmental activities |
| <input type="checkbox"/> Business income | <input type="checkbox"/> Governmental service |
| <input type="checkbox"/> Pension | <input type="checkbox"/> Remittance |
| <input type="checkbox"/> Livestock | <input type="checkbox"/> Cash crop |

☐ Gift

Other_____

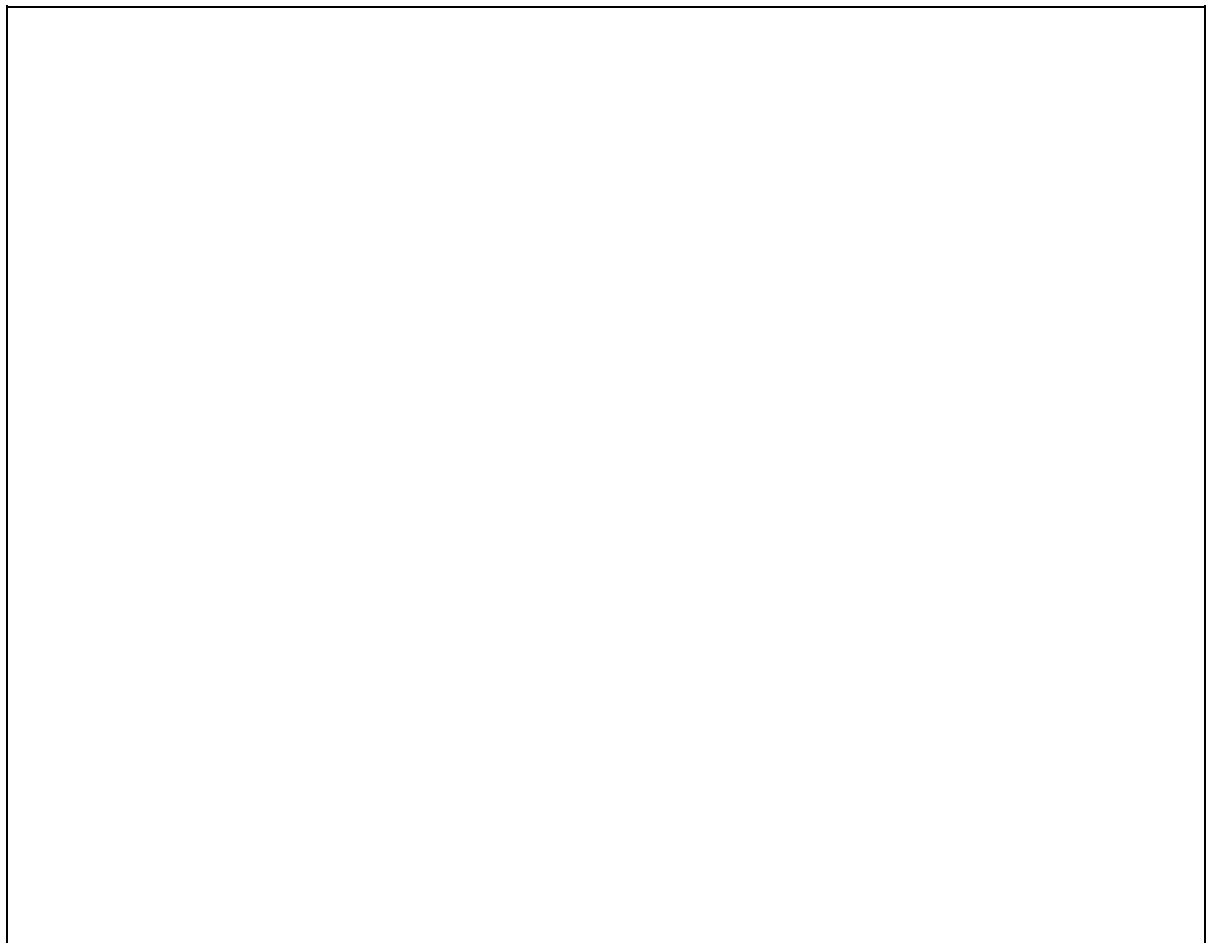
7. What is the average monthly income level for the household (in baht)?

- ☐ lower than 4000฿ ☐ 4001~8000฿ ☐ 8001~12000฿ ☐ more than 12000฿

Land

8. How many plots of land do you have? Please draw them on the sketch below:

We will have a basic sketch/map/satellite
photo of the village here where they can indicate where
their land is and where they live.



For each plot of land indicated above, please fill out the following questions (Q 9-23).

9. How big is the plot of land? _____ rai

10. What is your ownership status?

☐ I rent it (go to question 11, skip 12)

☐ I own the land (go to question 13)

☐ Other, please specify

_____(go to questions 13)

11a. Who do you rent the land from?

☐ from family ☐ from government ☐ from agribusiness company ☐ from other villagers

☐ Other, please

specify _____

11b. How many years have you rented it for? _____

11c. How many more years is your rental contract for? _____

12a. When did you obtain this land? _____

12b. How did you obtain the land?

☐ I bought it ☐ I inherited it ☐ other (please specify)

13. Have you sold any land in the last 20 years? ☐ yes ☐ no

13b. If yes, to who?

14. Does your land contain any of the following resources? (Select all that apply)

☐ agricultural land ☐ forests ☐ reservoirs ☐ agricultural drainage ways

15. Is this land mostly upland or lowland? ☐ upland ☐ lowland ☐ other

Contracts

16. Are you signed up to any farming contract? ☐ Yes ☐ No (If no go to question 20)

17. What is the main reason that you are involved in contract farming?

☐ income security ☐ high income ☐ other _____

18. Who is your contract with? ☐hotels/resorts ☐large business ☐other

19. What percentage of your production on this land is produced for contracts?

Cropping system

20. Do you use any of the following in your farming?:

- | | | | |
|--------------------------------------|---|---|--|
| <input type="checkbox"/> Pesticides | <input type="checkbox"/> Insecticides | <input type="checkbox"/> Manure | <input type="checkbox"/> Water pumps |
| <input type="checkbox"/> Fertilizers | <input type="checkbox"/> Fungicides | <input type="checkbox"/> Compost | <input type="checkbox"/> Herbicides |
| <input type="checkbox"/> Lime | <input type="checkbox"/> Irrigation water | <input type="checkbox"/> Planters | <input type="checkbox"/> Certified seeds |
| <input type="checkbox"/> Tractor | <input type="checkbox"/> Plough | <input type="checkbox"/> Other resources? please specify: | |
-
-

20. Which crop(s) do you cultivate on this land? Please list in order of importance and describe how you use it:

	Crop	% home consumption	% sold
1			
2			
3			
4			
5			

21. How do you market your agricultural produce?

- ☐Sold at your home
- ☐Sold at the market (please specify) where: _____
- ☐Sold to a middleman/Contract (please specify) _____
- ☐Other (please specify) _____
-

Land use

22. How do you consider the soil quality on this plot?

- ☐very poor ☐poor ☐good ☐very good ☐I don't know

23. How would you describe your access to water for agricultural activities?

- ☐very poor ☐poor ☐good ☐very good ☐I don't know

Appendix 2. Headman Interview Guide

1. What does it mean to be a headman in Ban Pa Ka?
2. Can you describe your everyday activities as a headman?
3. What are your responsibilities? Can you give some examples?
4. What are your relations to the government, municipality and other villages?
 - i. What are your responsibilities to them?
5. Are you involved in the process of villagers buying, selling or renting land?
6. Have you ever invested in land in Moo five or other areas?
 - i. And / or made micro loans with the villagers?
 - ii. What does a capitalist mean to you
 - iii. Why did you stop investing in land and making loans?
10. Do you advocate any kind of cropping system in the village and how?

Can you explain the self-sufficiency economy and what does it mean to the village?
11. Can you explain to us what changes in land use there has been in the village while you have been the headman?
 12. Landownership / contract farming
 13. Kind of crops
 14. agricultural methods
15. And what are the reasons for these changes in your opinion?
16. What kind of problems are you usually dealing with / what kind of problems do people come to you with? And what problems are you facing at the moment?
17. What are the advantages and disadvantages of the changes?
 - i. According to reports buying land and influencing the village.
18. What kind of environmental issues do you see in the village, and do you have some responsibilities to these?
 - i. For example according to pollution, deforestation, water scarcity etc.

19. We learned that the villagers mainly are cultivating cabbage and chili. Why is it so, in your opinion? Why not other cash crops (as rubber trees, ginger, rice and pineapple)?
20. Who is in charge of managing the fields of companies? And who is looking after the land?
21. Are any Hmong people involved in agricultural activities in Moo 5?
 - a. In what way?
 - b. How do you see the relationship among Hmong and Thai?
 - c. Are there any conflicts?
22. In the future, what are your concerns, hopes and expectations for the village in the future?

Appendix 3. Interview Guide (Semi-structured farmer interviews)

After introducing ourselves and politely ask for 30 minutes of the informants time, we give a short explanation of the purpose with the visit and interview, for example: *Thank you for taking time to talk with us. We are students from Copenhagen University and Kasetsart University, Bangkok, and we are here for about 12 days to learn about the agricultural practices of the farmers in this community, and take part in the everyday life of the village. If there are any of the questions you don't want to answer, please tell us and we will skip it and move on.*

Introductory Questions:

1. How many years you have lived here in this house with your family?
2. Where did you grow up - here in Ban Pa Ka or in another area? What about your husband/wife? Do you have other relatives in the village?

Walkabout:

3. Can you show us around the farm? We would like to see your different fields.
4. What are you doing in the fields at this time of year? Is there a lot of work at the moment compared to the rest of the year? Which parts of your land need attention/work the most?
5. (If bought) how did you decide to buy this land ? (story?!)
6. Have land prices changed in recent (last 10) years? Do you know why? How does it affect you?
7. (Check questionnaire) Have you already bought or sold land? Can you tell us about it? Have you thought about selling parts of your land?
8. Would you be able to rent or buy more land if you needed / wanted to?

Farming system:

9. What have you grown here *in the last year*?
10. When did you sow and harvest each crop? Wet/dry season?
11. Did you plant one thing at a time or did you grow them together? (how were they intercropped?)
12. Did you use fertilisers and pesticides? Where did you get it from? How often did you apply it?
13. Did you use irrigation? What is your irrigation system? Where does the water come from? How often do you have to irrigate?

14. Did you use any other treatments?
15. What did you grow the last 5 years - same or different? What did you grow last year? The year before?
16. How do you decide what to grow?
17. Has the soil quality here changed over time? Does the quality of the soil influence your choice of crops? How?
18. Have you experienced problems with pests or diseases?
19. What do you know about the self sufficiency programme? // How would you explain the self-sufficiency programme? Has it changed the way you farm?
20. Have you made any improvements to your land in recent years? Why?
21. If you think of your land overall, do you have any concerns or worries?

Other:

22. How do you sell your crops? DETAILS?!?
23. (If renting) How does your rental contract work ?
24. Do you worry about the security of your land?

In the village generally:

25. Have you experienced changes in the landscape concerning deforestation or reforestation?
26. Do you know the headman well? What is your interaction with him?
27. Do you participate in any community groups activities? What are they, please specify?
28. Do you have any interaction with the Hmong people during the year?
29. Do you have any comments or anything else to tell about your land?
30. Can we sample your soil? (Would you like the results?)

Thank you!!

Appendix 4. Key informant interview guide

1. What is your role in the village?
2. What are the different farming systems in the village?
3. What types of crops are cultivated in the village?
4. What are the main problems encountered with agriculture in the village?
5. What are the different forms of land ownerships in the village (out right ownerships, rent or leasing)?
6. Are there people with no land? Are there squatters?
7. What kind of land-use in the village has been going on in the last couple of years according the changes of land? (More or less deforestation?)
8. How is land distributed in the village (equally/not)?
9. How do land contracts and tenure systems work in the village?
10. What is your role in contracts in the village?
11. How does contract farming work in the village?(Are many people involved in contracts with resorts/other?)
12. What are your future plans in the village?
13. Are there many conflicts in the village?
14. Can you describe the ethnic groups in the village?

Appendix 5. Soil Scoring Approach

The scoring approach we used for research question “2.1 *What is the soil quality under different land access?*”

According to Ngo-Mbogba, Yemefack and Nyeck (2015), different soil data can be integrated into one parameter, which specify the trend in soil quality assessment. The parameter is computed in steps: (1) transforming the data set to proportional coefficient (scores) and (2) combining the scores into a single index (modified from Ngo-Mbogba, Yemefack, & Nyeck (2015)). The first step, determination of proportional coefficient, data is ranked in ascending or descending order depending on whether a high value is considered good or bad in terms of soil function. The goal of this step is to ensure score 1 represents the best function and eliminates the effect of the unit.

For OM, the higher the value, the more organic matter is contained in the soil. For pH acidity, based on Jones (2001), the plant can absorb essential elements very well between pH 6.0 and 7.0. However, all observed pH levels are lower than this interval. Thus, we consider the nearest observed value as the best. For C/N, C/N ratio below 20 is reported as low values (Klemedtsson et al., 2005) and our data is between 7 and 11, which is lower than the standard.

We have determined that in our data, the higher value is considered better. In order to set the highest value as score 1, each observed value was divided by the highest observed value, resulting in scores from 0 to 1. After summing up three scores, we got an index, which can assess soil quality comprehensively in 10 samples (Figure #).

Appendix 6. Synopsis

Access to land and livelihood strategies in Ban Pa Ka, Petchabun, Thailand

Moo 5

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Amalie Thygesen, Nes Odone, Yi-Jen Lu**

Word count: 2745

Introduction

This field study will take place in Ban Pa Ka (Moo 5) village in Camp Son subdistrict, Khao Kor district, in Petchabun province, northern Thailand. The land is primarily flat with some hilly areas; as it is located near to the highway it is relatively easily accessible. There are around 83 households in this village, with 256 inhabitants; Thai citizens are the primary inhabitants, but some areas are rented by Hmongs for upland ginger cultivation, among other crops. Originally, cabbage, maize and sugar pea were the main crops in the village, but now an important crop is upland rice, which the villagers mainly produce for home consumption. Besides, short rotation vegetables are increasingly cultivated, because they have a high value and can be sold directly to the resorts. The village is also situated in an area with many tourist resorts which are known for contracting farmers to produce vegetables. Some farmers are contracted by the headman of the village for vegetable production, while he provides seeds and other inputs and commits to buy their vegetables. Land prices are increasing in the village due to tourism and the proximity of the village to the highway. Investors are buying up the land and the villagers are selling their land and having to rent it back.

Chankrajang (2015) found that land ownership can affect the way farmers invest in the land, based on their perception of land security; we hope to investigate whether this is a variable in the way the land is used. According to the headman, the villagers face water problems during the dry season. Soil quality is suffering due to overuse of herbicides and the headman claims that the Hmong use saline water on their fields. Tanaka et al (2006) also found there to be significant differences in the way different ethnic groups cultivate their land in the north of Thailand, and that this affected acidity and nutrient availability; therefore we have reason to believe that this may be an important aspect affecting soil quality and the long-term sustainability of the land. However from the literature we have learned that the Hmong-Thai relationship in this area can be complex and involves aspects of natural resource conflict, land access and cultural identity amongst others, and is something to be investigated further (cf. Wittapayak 2008; Englehart 2008). We hope to identify other variables which may affect the way that agricultural land is used, having identified land ownership, contract systems, land size and ethnicity as possible relevant factors.

PROBLEM STATEMENT

Our aim is to investigate the access to land in Ban Pa Ka and how this interrelates with farming systems, environmental sustainability and social networks of the villagers.

Included in the *farming systems* we consider the cropping systems, natural resources, agricultural practices and contributions to household incomes.

Social networks cover the social structures at stake in Ban Pa Ka, such as relationships grounded in kinship, age, ethnicity, and power relations such as decision making processes of the headman or other relevant individuals onto the farming systems.

By *access¹ to land* we specify farmers owning, renting land and a potential involvement in contract farming.

RESEARCH QUESTIONS

1. What are the characteristics of different farming systems, and what is the relation to access to land, if any?

- 1.1 What types of access to land exist in the village?
- 1.2 Who has access to land, and how is it distributed amongst the villagers?
- 1.3 What are the different farming systems in the village?
- 1.4 What are the outside farm incomes?

2. Which aspects of farming systems affect environmental sustainability?

- 2.1 What is the soil quality under different cropping systems?
- 2.2 To what extent do other aspects of farming systems affect agricultural productivity and yield in the village?
- 2.3 How is water access for agriculture?
- 2.4 Has there been any deforestation in the village in recent years?

3. How are the social networks and the land-ownership interdependent?

- 3.1 What influence do social aspects have on access to land, with a main focus on contract farming?
- 3.2 What is the influence of the political institutions in the decision making of agricultural practices, on household level?
- 3.3 What is the position of the Headman in the village regarding distribution of land?
- 3.4 How does ethnicity play a role in the access to land?

Methodology

In the following section we will elaborate on our choice of methods and how they apply to our field of study. It is a *best case scenario*, that we need to adjust along the way, as we meet potential obstacles or new possibilities. In the appendix we have two tables, linking methods with the research questions (Appendix D) and a timetable (Appendix E), respectively.

Small-scale Questionnaire

The survey will be conducted with at most 20 closed-ended questions and 15 open-ended questions (*Appendix A*). We hope to complete all questions in 30 minutes.

¹ Ribot and Peluso, 2003

When we arrive at the field, the questions will be translated into Thai and we will run a pilot before adjusting the questions to the specific context. We intend to use a random sampling strategy, based on a list from the headman, to select interviewees. However in the case that the headman does not provide this or is biased in any way, we will use a snowball sampling strategy, for example to include Hmong people in the sample. Hopefully approximate 20 respondents will join the survey. It will be conducted with at least one student and interpreter per questionnaire. Any qualitative data we wish to analyse, we will use Statistical Package for Social Science (SPSS) version 20 to generate descriptive statistics on considered variables.

It is important that we introduce our project and say that participation in this study is totally voluntary. Before we begin questioning, we will show the respondent a satellite map of the area, and ask them to highlight on it their house and respective lands (that can very well be far away from each other). Later we will use this information in the semi-structured interviews and walkabouts. Most of our questions will have a quantitative character, roughly divided in three categories:

1. Demographic variables such as names, gender, ethnicity, age, access to land.
2. Different forms of access to land, contract farming, sources of income
3. Agricultural practices and farming systems, including inputs and output such as pesticides, yields etc.

Interviews

Conducting interviews with villagers from Ban Pa Ka is an important way to gain information about *how* and *why* farmers do as they do, as well as revealing thoughts about more sensitive topics such as beliefs, worries and hopes related to livelihood strategies and issues about access to land. In our field work we will use semi-structured interviews as well as informal unstructured interviews, *in situ* at the farming sites, walking with informants and also hopefully at people's homes. The choice depends on the situation and what we want to find out. The interview guide for the semi-structured interview and the key informant question list are available in appendix C.

Sample strategy

We hope to establish rapport with the Headman and the assistant Headman early in our field work, so there will be time to conduct several interviews with them during our time in the village. We hope that the headman can assist us with an overview of the villagers, hopefully all 83 households. If this is not an option, we will still ask him to guide us in the direction of potential informants, representing different types of farming systems and status as landowner or tenant, with or without contracts. On the other hand we are aware that the selection of informants we get access to can be biased of the beliefs or preferences of the headman, more or less consciously. Therefore we will try to get a broad representation of the households by including people from all parts of the

village, in the basis of gender, ethnicity, income level etc. We hope to be able to do so based on the questionnaires as we will ask the people involved, if we can visit them again. We hope to conduct 5-10 semi-structured interviews with farmers, based on their responses to the questionnaires.

The content of the interview

We will test the interview guide with a pilot, then adjust it and translate it to Thai. As we are working with interpreters it is very important that we seek a common understanding of the objectives of the interview, and how the translation will take place; *during* or *after* the interview. We will mainly ask the farmers about their experience with different form of access to land and farming practices, and their thoughts about the relation between this and external factors such as ethnicity, kinship etc. *The complete survey you can find in Appendix B.*

Location and form

As the content of the interviews treats the agricultural practices and the everyday life of the household, we believe it makes sense to include the interview as a part of a walk around the farmer's land supplemented by participatory methods and an analysis of nutrient flows (cf. PRA's below). If we want to touch upon more sensible topics about family, wealth or ethnicity we can return to the house of the farmer if necessary at the end of the visit. Besides from the semi-structured interviews, we will engage in informal conversations in the field, when we take part in activities and the everyday life of the families.

Focus Group discussion

The aim is to analyse the social aspects of our research, as discussed in research question 3. This method is an interactive way to encourage participants to discuss what they find important and to discover the social relations between them, which can be difficult to obtain in individual interviews. These interviews will be arranged in the last couple of days, in order to better know people and understand the issues at stake in the village, based on participant observation in the first part of the study. Depending on the time, we would like to do two or three separate focus group interviews; we will decide which combination is the most appropriate when arrived. The suggested research groups include: one of Hmong farmers and one of Thai farmers, or divided by gender as a third option. The separate groups will make interviewees more homogenous, which could encourage them to open up and feel more comfortable. There will be one student facilitating the interview together with the interpreter, and one assisting with supplement questions. During the interview one or two students observe the body language and non-verbal communication of the group.

Participatory Rural Appraisal

A group of 3-5 farmers from the village would be brought together in a participatory rural appraisal that would seek to explore village mapping, crop seasonal distributions and the wealth distributions (Mikkelsen 2005). We would like to divide them into two homogenous groups but we have not yet decided how - we would like to observe the social divisions in the village and divide them based on this; it is likely to be male/female, land owner/renter or hmong/thai. One group will do participatory mapping and the other a wealth ranking; with possible replications and a seasonal calendar, depending on the time and resources available, and the willingness of the participants. The PRA's will be facilitated by one student, with another student as an 'observer' and one translator.

Participatory mapping

Individual groups would be provided with drawing/writing material and large pieces of plain paper. The groups would then be instructed to develop a map of the village and include notable resources as water and land resources and the distribution of farm sites, as well as sites of social importance. After individual groups have finished, their assigned tasks maps would be exchanged between groups for editing and comments. the final maps would then be captured using a camera. Facilitators of the process would then ask questions about the distribution of ethnic groups and kinships on the developed village maps. This process would aim not only at developing an overview of resource distributions in the village but also help identifying social structures and interactions within the village.

Seasonal calendar

Groups would again be assigned based on farming systems and crops with a year calendar in Thai presented on a larger paper and writing material to produce a seasonal calendar. This exercise would encourage each group of farmers to distribute the different crops grown in the village by months where they are commonly planted. For the purpose of cross checking, group calendars would be exchanged for comments and additional inputs. this method would aim to establish crop choices and short rotation cropping systems. This method is an optional method that we will use if we have time after the individual interviews. We may decide to focus this on labour use and use it as a timescale of times when a lot of labour is required and when there is labour migration to the cities/resorts.

Wealth ranking

In individual groups participants would be instructed to draw a map of the entire village and illustrate all households within. Using conspicuous seeds participants would then be instructed to distribute them per household where the numbers of seeds assigned would be proportional to the perceived wealth of these households. Identification of these households would help snowball rich and poor households where information pertaining to agricultural involvement, land ownership and the existence of outside

farm incomes would be queried through other methods. We can replicate this method with wealth, land ownership and quality of land.

Walkabout and farm sketch

A walkabout is a useful way to see a farmer's land in the way that the farmer sees it (Strang, 2010). We will use the same sampling selection as the semi-structured individual interviews, in order to have a more in depth understanding of their land and how they use it. After the interview, we will use the time walking to the farmer's fields for soil sampling to discuss the farming system in a more informal and relaxed way. The aim of the walkabout is to establish how the farmers uses his land, cropping systems and to establish previous uses of fields, which is useful for soil quality; to establish any water issues; if there has been deforestation; triangulation to ask whether they notice soil quality problems/changes. Finally we will use participatory mapping with the farmer to sketch the land, highlighting important inputs, outputs and the different uses of the land. This allows for triangulation of the information we get from the farmer during our preliminary questionnaire and the interview.

Soil sampling

Soil sampling will be done and directed towards identified farming and cropping systems. The aim is to test the quality of soil on different farming systems as influenced by different treatments, to examine effects towards the environment. On 5 farms we will randomly take soil from different areas of the field. By doing this we hope to also investigate the claims by the headman that cultivation practises of the Hmong affects soil quality as well as differences between access to land. Soil sampling will be done using an auger. Laboratory soil analysis would include soil texture, pH, CEC, soil carbon and electrical conductivity.

Some closing words on the expected outcomes

By the end of this study we hope to gain an in-depth understanding of the factors that come into play when considering land ownership forms, social relationships and its interrelation with certain aspects of livelihoods strategies in the village. We hope to describe how access to land and land quality contributes to crop choices and how these factors would contribute to agriculture as sustainable means of supporting household incomes. We also hope to make recommendations to change agents and government agencies that would eventually function in the village concerning what changes can positively impact the village life of Ban Pa Ka.

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Appendix 7. Log Book

Date and time	What	Who did it	Comments
Thursday 3/3, 4-6 pm	Group meeting and introduction of projekt to New and Lhong	Everyone	
Friday 4/3 8-17 Day 1	1: Informal meeting and introduction to the headman and his family/neighbours 2: Visit Banoi, the lady living across the Headman and she showed us her garden for app. 2 hours. 3: Pilot questionnaire w. "Lungbon". 4. Visit at the 'Bluesky Resort' and a tour on a passion fruit land.	Everyone	1: Really nice first day in the field. But, we were together all six all day + New and Lhong, so it was a bit unstructured and chaotic. 2: Almost no changes need to be made to the questionnaire
Saturday 5/3 9-17 day 2	1: Song, our driver showed us around, and we saw the hilly fields and some parts of Moo 5. 2: Questionnaires (G2: No. 2-4, G1: No. 5-6), mostly from around the headman's house and the west part of Moo 5. 3. We were invited to lunch at the house of the Passion Fruit Lady.	Split in two groups when we did Quest. G1: Søren, Yijen, Amalie. G2: New, Luis, Kwaku	1: Song told us alot about the Hmong People who cultivate the "Illegal fields" on the highland. 2. Song was with us all day, including when we made the qestionnaires. We became aware of potential biases.. Kwaku went to the hospital in the evening.
Sunday 6/3 11-17 day 3	1: More Questionnaires: G1: No. 7-8, G2:No. 9-11	Two groups: G1: Luis, Amalie G2: Yijen, Nes, Søren	Did not do that much - we began at the temple and walked without the driver - much more difficult to find respondents.
Monday 7/3 8-14 day 4	Interview with the Headman, questionnaire No. 12-15,	Headman Int: Søren, Amalie, New. Questionnaires: Nes, Yijen, Luis	Nice to have a well prepared interview for the headman. He did not confirm the stories we had from his son about Hmong people, his role as "capitalist" etc. Went home early to visit Kwaku.

Tuesday 8/3 day 5	Interview w. the head of the fire department of the National Park. Questionnaire. Interview with fertiliser shop owner. Interview with Banoi (making brooms)	Fire Dep: Søren and Nes Fertilizer: Nes and Luis	
Wednesday 9/3 day 6	PRA (community mapping) Interview with: Su Pan and the Monk	Facilitator: Amalie. Observers: Søren, Yijen.	
Thursday 10/3 day 7	Soil sampling day 1 +SSI Sleepover at Banoi's House	Everyone	
Friday 11/3 day 8	Soil sampling day 2 Interview with: Sanit	Everyone	
Saturday 12/3 day 9	Interviews with the remaining soil sample-informants Session with fortune teller: Søren, Yijen and New 19-21.30: Night Market in Lom Sak. Interviews (Amalie and Luis) with: Church, Lamduan and Lanukar	Everyone	
Sunday 13/3 day 10	Group meeting 10-15 Community Meeting 18-20	Everyone	Almost all our informants came - nice way to end the fieldwork in Moo 5

Appendix 8. Participants list

#	Name	Description	Questionnaire	Interview	PR A	Key Informant	Soil
1	Lung Bun	Owens and Rents. Thai Wa distributor; neighbour of headman	X	X	X	X	X
2	Tong Yib	Owens 1.5 rai; grows chili with her sister. Husband in construction.	X				
3	Mana	Policeman from Bangkok. Has a small resort, on 2 rai.	X				
4	Lanukar	Owens 2 plots of 3 rai. Grows chili, cabbage and chinese cabbage.	X	X	X		X
5	Kwan	Rents 1.5 rai from a caretaker	X		X		
6	Church	Takes care of 3 rai, grows chili and cabbage.	X	X			X
7	Kantona	Owens coffee shop. No land.	X				
8	Paysan	Rents 3-4 rai from Thai Wa. Grows chili, cabbage and pepper.	X				
9	Narung	Manager of 'Foresta Hill' resort.	X				
10	Yatima	Owens 6 rai, grows chayote. Runs cafe.	X				
11	Sanit	Rents 5 rai. Grows cabbage, chinese cabbage and chili.	X	X	X		X

12	Su Pan	Owens 7 rai. Grows cabbage, long beans and chili with his sister.	X	X			X
13	Chulilat	Rents and owns , grows bamboo, rice, chili and lemongrass.	X		X		
14	Banoi (Tasana)	Owens 2 rai, makes brooms.	X			X	
15	Pairot	Rents from deaf man; grows chilli	X	X			X
16	Suliya	Owens sculpture shop. No land.	X				
17	Naali	Owens the convenience store.	X				
18	Lamduan	Owens and takes care. Grows passion fruit, cabbage and paddy rice.	X	X	X		X
19	Dee	Hmong man visiting fortune teller.	X				
20	Jan Thip	Owens land and recently moved to the village.		X			X
21	Sa-Whak	Headman. Rents land.				X	X
22	Joo	Owens the fertiliser shop with her sister				X	
23	Song	Headman's son and our driver				X	
24	National Park Fire Officer					X	

Appendix 9. Data Matrix

Research Question	Sub-question	Objective	Data required	Methods / Activities	Equipment	Important Assumptions
1. What are the characteristics of different farming systems, and what is the relation to access to land, if any?	1.1 What types of access to land exist in the village?	To identify the different forms of land ownership	Types of land ownership (owning, renting, contracting)	Interviews with head man, key informants, owners and tenures	Students, interpreter, voice recorder, pens, paper	Assumes that there are different forms of land ownerships
	1.2 Who has access to land, and how is it distributed amongst the villagers?	To identify the different systems of contracting, who they involve and to whom they are contracted	Contract types and contractors	PRA farmers mapping; semi-structured interview with key informants (probably also head man)	Students, interpreter, voice recorder, pens, paper; large sheets of paper	Assumes that there are differences between land contracts.
	1.3 What are the different farming systems in the village?	Describe the different farming systems that function under the different forms of land ownership	Types of farming systems, Including crop systems, inputs...	Questionnaires with a sample of farming households; PRA mapping and seasonal calendar	Students, interpreter, voice recorder, pens, paper	Assumes that farming systems are different depending on the land ownership.

		established in				
	1.4 What are the outside farm incomes?	To identify alternatives to farm incomes	Types of incomes from outside farm activities	Interviews with a sample of farming households, questionnaire	Students, interpreter, voice recorder, pens, paper	Assume that all villagers are farmers and that other incomes are part of the farm systems
2. What are the variables that affect environmental sustainability?	2.1 What is the soil quality on different crop fields?	To identify the differences in soil quality based on the type of cropping system on the land	Organic matter, pH and salinity levels of the soil	Soil Sampling; Observation of soil colouring and texture for quality; Soil testing for Organic Matter with Permanganate Oxidisable Carbon (POxC) to test for soil carbon; pH test to see the acidity and the nutrients available; salinity levels tested by electrical conductivity; interview farmers about previous uses of the land.	Auger, falcon tubes, sterilised water, pH test, POxC test, salinity test.	Assume that we can find out how land has previously been used accurately
	2.2 To what extent do other aspects of farming systems affect agricultural productivity and	To find out the intensity in the use of land, with focus on quality of the soil,	Important factors affecting yields and productivity.	Interview farmers about factors affecting productivity and yield.	Students, interpreter, voice recorder, pens, paper	

	yield in the village?	nutrients etc.				
	2.3 How is water access to agriculture?	Identify the water situation of the village	Information about water problems in the village.	Water resource survey and interview farmers about water problems in recent years.	Students, interpreter, voice recorder, pens, paper	Assumes that water use is affected by land ownership
	2.4 Has there been any deforestation in the village in recent years?	To know changes in land use and reduction of natural resources	Information about the relation between farmers and the natural forest resources.	GPS-mapping. Walkabout with key informant. Semi-structured interviews with village inhabitants	GPS (or phone?)	Assumes that there has been important deforestation in recent years
3. How are the social network and the land-ownership interdependent?	3.1 What influence do the social aspects of livelihood have on access to land, with a main focus on contract farming?	To establish the social effects on access to land, especially on contracts	Types of social capital, types of contract, types of access to land	Participatory mapping of family structures in Ban Pa Ka. // Semi-structured interviews // Focus-group interview (with observation).	Dictaphone and/or video camera., pen and paper.	Assumes that there is influences between social aspects and access to land
	3.2 What is the influence of the political institutions in the decision-makin	To identify the linkage between interest institutions	Types of political decisions about agriculture, types of institutions	Participatory mapping // Wealth ranking to establish social structures and interactions in the village // Focus group interview (observation)	Dictaphone and/or video camera., pen and paper.	Assumes that there is any influence from political institutions

[illegible]

	g of agricultural practices, on a household level?	and households				
	3.3 What is the position of the Headman in Village Ban Pa Ka, regarding distribution of land?	To access and understand the power the headman hold and the influence he posed to households	Asset and access to land the headman has,	Key Informant interview. headman. Informal interviews with villagers. Participant Observation (with observation)	Dictaphone and/or video camera., pen and paper.	Assumes the headman has a role in land distribution
	3.4 How does ethnicity / ethnic identity play a role in the access to land?	To identify the importance of different ethnicity regarding land use	Use of natural resources, types of ethnic identities	Transect mapping/ participatory mapping to see who has the land with highest value (access to water and land size etc) // Focus group (with observation)	Dictaphone and/or video camera., pen and paper.	Assumes that ethnicity is an important factor in the village

Appendix 10. Timetable

	02/03	03/03	04/03	05/03	06/03	07/03	08/03	09/03	10/03	11/03	12/03	13/03	14/03
--	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Community Meeting													
Return to Bangkok													
Key:													
	Full-time activity												
	Part-time activity												

Appendix 11. PRA Map



Appendix 12. Soil Tests (SLUSE)

Soil Analyses

Samples have to be air dried and crushed to a fine powder prior to the chemical analyses.

Total C and N

Will be conducted by Isotope-Ratio Mass Spectrometry (IR-MS) at Department of Plant and Environmental Science

An introduction in how to weigh the samples prior to analyses will be arranged upon return from the field.

Permanganate Oxidizable Carbon

Determines how much Carbon is oxidized in a solution of 0.02 M KMnO_4 in 0.1 M CaCl_2 at pH 7.2 by determining the bleaching of the purple KMnO_4 solution by a handheld spectrometer. You can read more about the method in Weil et al. (2003) available in the 'Soil and Water' folder.

Equipment

Permanganate reagent: 0.2 M KMnO_4 in 0.1 M CaCl_2 at pH 7.2

A glass beaker for the KMnO_4 solution

2 l glass bottles for Mili Q water

25 ml graduated cylinder

Milli Q water

1-5 ml pipette + tips

200-1000 μl pipette + tips

Racks for 50 ml Falcon tubes

Plastic flasks for Mili Q water

Plastic pipettes

Spectrometer

50 ml Falcon tubes

Plastic container for waste

Analysis

1. Weigh 2.5 g of crushed soil to 8 Falcon tubes.
2. Add 18 ml of milli Q water to each tube and then 2 ml of the permanganate reagent.
3. Shake for 2 minutes.
4. Leave to settle for 10 minutes.

5. Label 8 new Falcon Tubes for subsampling and add 19 ml of Mili Q water (equal to a 20 fold dilution) – These are the solutions that you will use for measuring KMnO_4 concentrations.
6. When the samples have settled for 10 minutes use an electronic pipette to transfer 1.00 ml of the supernatant to the tubes with 19 ml of Mili Q water
7. Pour about 10 ml of the diluted solutions into the spectrometer glass vial (to the mark). Put on the cap, measure and note the reading. Measure the 8 samples as fast as possible.

*It is very important to maintain consistent procedural timing (pre-shaking, shaking and settling). This means that once you have added the KMnO_4 you have to very strict with the time control.

Waste handling

Pour the permanganate solution into a plastic container and use a plastic bottle to get most of the soil out of the Falcon tubes and into the plastic container. The 'almost empty' Falcon tubes can be disposed of in the normal waste bins. Use a permanent marker to label the plastic container 'O1' + Thilde Bech Bruun.

Calculation

The bleaching of the purple KMnO_4 (reduction in absorbance) is proportional to the amount of oxidizable C in the soil (the greater the colour loss the lower the absorbance reading) the greater the amount of oxidizable C in the soil. To estimate the amount of oxidized C it is assumed that 1 mol MnO_4 is consumed (reduced from Mn^{7+} to Mn^{4+}) in the oxidation of 0.75 mol (9000 mg) of C.

$$\text{MnoxC (mg/kg)} = [0.02 \text{ mol/l} - (a \text{ mol/l})] * (9000 \text{ mg C/mol}) * (0.02 \text{ l solution} / 0.002 \text{ kg soil})$$

0.02 mol/l is the initial solution concentration

'a' is the concentration measured in the supernatant

9000 mg is mg C oxidized by 1 mol of MnO_4

0.02 l is the volume of KMnO_4 solution reacted

0.02 kg is the weight of the soil being used

pH in water

Measurement of pH in a 1:2.5 soil:water solution

1. Weigh 10.0 g of soil in a 50 mL Falcon tube
2. Add 25 mL of milliQ water
3. Shake for 20 minutes
4. Leave for 30 minutes – for the sediment to settle
5. Calibrate the pH meter using the pH 4 and pH 7 buffer solutions (See manual)

6. Clean the electrode with milliQ water between each measurement. Collect the liquid in a glass.

When all samples have been measured the Falcon tubes (with content) and the milliQ water in the glass are collected in a plastic bag.

EC

Measure conductivity in the same solution that you use for measuring pH (See manual)

Physical analyses

Soil bulk density

Collect samples with 100 cm³ soil cores, air dry samples and weigh them. If a sample contains more than 5% stones these have to be removed and weighed. The weight of the stones must be subtracted from the weight of the entire sample and the volume of the stones must be subtracted from the volume of the sample. When calculating the volume of the stones you can assume that stones have a bulk density of 2.6 g/cm³.

Ex:

The weight of a sample collected with a 100 cm³ soil core is 125g

The sample contains 25g of stones

Real weight of soil sample is 100g

The volume stones collected in the 100 cm³ ring is: $25\text{g} / 2.6 \text{ g/cm}^3 = 9.6 \text{ cm}^3$

The bulk density of the soil sample is: $100\text{g} / (100 \text{ cm}^3 - 9.6 \text{ cm}^3) = 1.1 \text{ g/cm}^3$

Texture analysis

Remember to collect extra samples if you want to determine soil texture. The extra samples do not have to be volume specific.

Soil texture can be estimated by field methods - such as the 'feel method' presented below. The soil has to be moist when determining soil texture by 'feel methods'.

Name	Gender	Age	Ethnicity	Job	Total	Numb	NumbDep	IncAgri	Incbusin	IncPensi	IncLives	Constructio	Govern	Remittan	Other
Chulilat Plot 1	Female	46-55	Thai	Farming	5	3	2	Yes	No	No	No	No	No	No	Yes
Kwan	Female	36-45	Thai	Farming	7	4	3	Yes	No	No	No	Yes	No	No	No
Lung Bun Plot 1	Male	56-65	Thai	Farming	4	4	0	Yes	No	No	Yes	No	No	No	No
Pairot	Male	36-45	Thai	Farming	5	4	1	Yes	No	No	No	No	No	Yes	No
Pi San	Male	46-55	Thai	Farming	4	2	2	Yes	No	No	No	No	No	No	No
Sanin	Male	56-65	Thai	Farming	4	4	0	Yes	No	Yes	No	No	No	No	No
Banoi Tassana	Female	66-75	Thai	Farming	1	1	0	No	No	Yes	No	No	No	Yes	Yes
Chulilat Plot 2	Female	46-55	Thai	Farming	5	3	2	Yes	No	No	No	No	No	No	Yes
Dee (not Moo 5)	Male	0-25	Hmong	Farming	7	5	2	Yes	No	No	No	No	Yes	No	No
Lamduan Plot 1	Female	36-45	Thai	Farming	4	2	2	Yes	No	No	No	No	No	No	Yes
Lamduan Plot 3	Female	36-45	Thai	Farming	4	2	2	Yes	No	No	No	No	No	No	Yes
Lanukar	Female	36-45	Thai	Farming	7	5	2	Yes	No	No	No	No	No	No	Yes
Lung Bun Plot 2	Male	56-65	Thai	Farming	4	4	0	Yes	No	No	Yes	No	No	No	No
Mana	Male	36-45	Thai	Other	4	1	3	No	No	No	No	No	No	No	Yes
Naali	Female	66-75	Thai	Other	4	4	0	Yes	Yes	Yes	No	No	No	No	No
Su Pan	Male	56-65	Thai	Farming	4	3	1	Yes	No	No	No	Yes	No	Yes	No
Tong Yib	Female	46-55	Thai	Farming	3	3	0	Yes	No	No	No	Yes	No	No	No
Lamduan Plot 2	Female	36-45	Thai	Farming	4	2	2	Yes	No	No	No	No	No	No	Yes
Shirt Susan	Male	46-55	Thai	Farming	5	4	1	Yes	No	No	No	Yes	No	No	Yes
Kantona	Female	36-45	Thai	Other	3	2	1	No	Yes	No	No	No	No	No	Yes
Narung	Male	46-55	Thai	Other	5	3	2	No	No	No	No	No	No	No	Yes
Suliya	Male	36-45	Thai	Other	3	3	0	No	No	No	No	No	No	No	Yes
Yatima	Female	26-35	Thai	Other	9	8	1	Yes	No	No	No	Yes	No	No	Yes

Averalnc	SoldLand	ToWhom	Plot	Access	Owner	YearRent	Moreyears	ObtainYea	ObtainHow	River	Forest	Reservoir	Drainage	UpLow
8001-1200	No	9	3	Rent	Other	10	1	9	9	No	No	No	Yes	Lowland
12000-	No	9	1,5	Rent	Other	9	9	9	9	Yes	No	Yes	Yes	Other
4001-8000	No	9	10	Rent	Agribusiness	20	2	9	9	No	No	No	No	Lowland
4001-8000	No	9	10	Rent	Other	4	1	9	9	No	No	Yes	No	Upland
0-4000	No	9	3,5	Rent	Other	5	9	9	9	Yes	No	Yes	Yes	Lowland
0-4000	Yes	Man from t	5	Rent	Agribusiness	6,5	9	9	9	No	No	Yes	No	Lowland
0-4000	Yes	Bluesky (6	2	Own	9	9	9	1975	Buy	No	No	No	No	Lowland
8001-1200	No	9	2,5	Own	9	9	9	1986	Buy	Yes	No	No	No	Lowland
4001-8000	No	9	15	Own	9	9	9	1996	Other	Yes	No	No	No	Upland
12000-	Yes	To capitalis	10	Own	9	9	9	9	Inherit	No	No	Yes	No	Lowland
12000-	Yes	To capitalis	2	Own	Family	9	9	9	9	No	No	Yes	No	Other
4001-8000	No	9	3	Own	9	9	9	2011	Buy	Yes	No	No	No	Lowland
4001-8000	No	9	2	Own	9	9	9	2006	Inherit	No	No	Yes	No	Lowland
8001-1200	Yes	Sibling 8 Ra	5	Own	9	9	9	2005	Buy	No	No	No	No	Lowland
9	Yes	A rich guy f	2,5	Own	9	9	9	9	Buy	No	No	No	No	Upland
12000-	Yes	3 parts to 3	1	Own	9	9	9	1996	Buy	Yes	No	No	No	Lowland
4001-8000	Yes	Sister	0,4	Own	9	9	9	2011	Inherit	No	No	No	No	Lowland
12000-	Yes	To capitalis	20	Look after	Other	4,5	9	9	9	Yes	No	No	No	Lowland
8001-1200	No	9	3	Look after	Other	4,5	9	9	9	Yes	No	No	No	Lowland
4001-8000	No	9	9	9	9	9	9	9	9	9	9	9	9	9
12000-	No	9	9	9	9	9	9	9	9	9	9	9	9	9
12000-	No	9	9	9	9	9	9	9	9	9	9	9	9	9
12000-	Yes	Professor C	6	9	9	9	9	9	Inherit	No	No	No	No	Upland

Pesticides	Insecticide	Manure	Water	Fertilizer	Fungicides	Compost	Herbicides	Lime	Irrigation	Planters	CertiSeeds	Tractor	Ploug	OtherRes
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	0
Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	1
Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	Yes	Yes	No	0
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	Yes	Yes	0
Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No	No	No	0
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	0
No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	0
No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No	No	0
Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No	0
Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	0
No	No	No	Yes	Yes	No	No	No	No	Yes	No	Yes	No	No	1
Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	No	1
Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	0
Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No	No	No	No	0
No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	0
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No	Yes	0
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	0
No	No	No	No	Yes	No	No	Yes	No	No	No	Yes	Yes	No	0
Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	0
9,00 (Missi	9	9	9	9	9	9	9	9	9	9	9	9	9	0
9,00 (Missi	9	9	9	9	9	9	9	9	9	9	9	9	9	9
9,00 (Missi	9	9	9	9	9	9	9	9	9	9	9	9	9	9
No	No	Yes	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No	0

Chili	Cabbage	ChinCabb	Longbean	Pepper	Rice	PassionF	OtherF	OtherV	EatorSell	HowMarket	SoilQual	WaterAcce	AccFarmer
Yes	Yes	No	No	No	Yes	No	No	Yes	Sell	Sold at market	Poor	Very good	Rent
Yes	Yes	No	Yes	No	No	No	No	Yes	Sell	Sold at market	Good	Very poor	Rent
Yes	Yes	No	No	No	No	No	No	No	Sell	Sold at market	Very poor	Poor	Rent
Yes	No	No	No	No	No	No	No	No	Sell	Sold at market	Poor	Very poor	Rent
Yes	Yes	No	No	Yes	No	No	No	No	Sell	Sold at market	Good	Good	Rent
Yes	Yes	Yes	No	No	No	No	No	No	Sell	Sold at market	Poor	Good	Rent
No	Yes	No	No	No	No	No	Yes	Yes	Consume	Other	Good	Good	Own
No	No	No	No	No	No	No	No	Yes	Sell	Sold at home	Good	Good	Own
Yes	No	No	No	No	No	No	No	Yes	Sell	Sold at market	Good	Good	9
No	No	No	No	No	Yes	No	No	No	Sell	Sold at market	Poor	Very good	Own
No	No	No	No	No	No	Yes	Yes	Yes	Sell	Sold at home	Good	Good	Own
Yes	Yes	Yes	No	No	No	No	No	No	Sell	Sold at market	Very good	Poor	Own
No	No	No	No	No	No	No	Yes	Yes	Consume	9	Very good	Very good	Own
No	No	No	No	No	No	No	Yes	Yes	Consume	9	Very poor	Very good	Own
No	No	No	No	No	No	No	No	No	9	9	Very poor	Very poor	Own
Yes	No	Yes	Yes	No	No	No	No	No	Sell	Sold at market	Poor	Good	Own
Yes	No	No	No	No	No	No	No	No	Sell	Sold at market	Good	Poor	Own
No	No	No	No	No	No	No	No	Yes	Sell	Sold at market	Good	Very poor	Take care
Yes	Yes	No	No	No	No	No	No	No	Sell	Sold at market	Good	Good	Take care
9	9	9	9	9	9	9	9	9	9	9	9	9	Non-farmers
9	9	9	9	9	9	9	9	9	9	9	9	9	Non-farmers
9	9	9	9	9	9	9	9	9	9	9	9	9	Non-farmers
No	No	No	No	No	No	No	No	Yes	Sell	Sold at home	Very poor	Very poor	Non-farmers