

Location 1 Bang Song Kheaw, Nan Province



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Preface

In the SLUSE project we have experienced the different obstacles and successes that interdisciplinary working processes imply in all the phases of the work. Especially we have found it an experience to work with our fellow students from both different university – and cultural background. More over it has been an eye-opening experience to work with interpreters this has at times lead to a slow process in gaining an understanding of the concept of the work with in the group and has, at times, been a stress factor for all parts. All in all the interdisciplinary experience and working with our fellow Thai-students and the interpreters has been a learning process – not only within the concepts of the course, but as well on conflicts and stress factors which can have an inhibiting effect on the working process.

In the preliminary paper for the work that was to be conducted during the fieldwork, we have learned that some of our pre-hand thoughts and sampling strategies were not possible to carry out. However, the discussions have helped us to stand stronger in the process of gaining a common group focus, due to our discussions on the different methods and their limitations and the strengths. Furthermore the process of writing the synopsis has helped us in terms of becoming familiar with what we wanted to focus on in the comprehensive data ‘ocean’ we soon learned we had to navigate in.

We would like to thank all the villagers, the headman Mr. Saeher, RFD and TAO representative’s who have provided us with essential information, which has made it possible to write this report. Lastly we would like to thank all of the teaching staff as well as our Thai colleagues, Miss Panit Nakyan, Miss Tanvarut Robkum, Mr. Thanakorn Nathnoisakul and Mr. Chalermchon Boonkiatsakul for the exceptional experience it has been to conduct this survey.

Abstract

The pressure on the natural resources have increased in the North of Thailand and has become a problematic conflict. The growing population has resulted in a intensification of the agricultural practices, hence the traditional farming methods have been replace by the use of chemical inputs to ensure productivity, however not sufficiently.

Simultaneously the government policies express an increasing wish to protect the forest cover by implementing national parks. However, the rural people are depending on the access to the resources to maintain there agricultural livelihood strategy. The aim of this paper is to discus the impact of the above mention issues have on the natural resources and what options the farmers have to maintain their agriculture livelihood, since no other alternative livelihood activity are feasible.

Chapter 1 – Introduction

Since the 1960s Thailand has established National Parks to protect forest areas. The motives of this policy have changed over time and have never had real clarity, some of the present objectives include the provision of water resources and the conservation of endangered biodiversity (Ghimire, 2001: 202).

The SLUSE-program 2004 took place in the province of Nan in north eastern Thailand in the area of the proposed Nonthaburi National Park. Its intended boundaries could seriously affect agriculture in the area – as it results in no possibility of extending agriculture land. This can become a big problem, if the land and natural resources in general are degraded.

The demarcation of the National Park would officially restrict the farmers' use of the natural resources, which in the future could lead to a radical change of the basis of their present livelihood strategy. In the village Ban Song Khwae the land the villagers cultivate is classified as C-Zone¹ which means that the cultivating practices in the area are illegal, as the government has labelled this land as a forest conservation zone. Thus it is evident that the slopes surrounding the village are in deed cultivated. However, the conflict between the departments is clear since the department of interior affairs regards the settlement area in the village as an actual village hence schools, electricity, roads and a drinking water system have been build. In other words, the village is recognised, while the connection between the users of the natural resources in a rural lifestyle appears grossly neglected.

1.1.1 History of Ban Song Khaew

The people of Ban Song Khaew belong to the Hmong hill tribe that originally came from the Khun Aow Mountain in Nan province. One of the reasons behind this settlement may have been the governments concern about the presence of communists in the Northern Thailand in the late 1960s. Though, the first settlers may very well have been former employees from the logging firms operation in the area with the blessing of the government. Which ever reason, the village Ban Song Khaew was established in 1968 (Document form the headman (HD), 2003, see map of the area in appendix 13).

In the early days of the settlement area of the village belonged to one man, but new villagers finally bought the land and claimed it as theirs (HD, 2003). With the settlement in the area of Ban Song Kheaw, the clearing of the land was to a certain extent necessary for the villagers, to uphold a livelihood through agricultural activities. This was apparently accepted by the government, which main wish at this time was to diminish the communist territory, and also forest clearing for commercial purpose was accepted, letting logging firm profit from the natural resources. Thus the forest areas surrounding the village were cleared for the purpose of farming land and logging, which resulted in

¹ The zoning system, A agricultural, E economic and C conservation zones were established in 1992 as a result of the National Forest Policy to reach the goal of 40 % forest cover (Traynor et al. 2001: 48).

forest land reduction; in 1962 the forest cover was 52%, and already in 1988 the forest cover was down to 28%² (Aj. Pat, pers. comm. 2004).

1.1.2 The Ban Song Khwae village

Ban Song Khwae is a village with a population of approximately 1685 people. The village has a large Hmong population, and the fact that there are 238 people in the village who do not possess a Thai citizenship card could create some conflicts between the indigenous Thais and the non-Thai citizenship holders (Khunarak et. al, 2003: 21). Problems arise when attempting to resettle those inhabitants who do not possess citizenship cards, a handicap, which impose restrictions on their movements within Thailand (appendix 10, headman). We expect the main income to come from farming and the average income to be roughly BHT 20,000 or approx. DKR 3,500 per annum³.

1.2 Objectives

Our main focus in the data collecting fieldwork experience was to establish an overview of the contextual situation in Ban Song Khwae village. We wanted to obtain knowledge and information on the villagers' livelihood strategies and agricultural trends in the present in relation to the present situation regarding the natural resources in the area. Furthermore, we wanted to gain an understanding of their perception of the changes in land use tendencies the implementation of the Nonthaburi National Park would cause. To sum up we have been working on getting an outline of the predominant livelihood strategies in the village and investigated whether these activities in their use have lead to degradation of the natural resources in relation to the trend of preserving these by implementing a national park.

1.3 Problem formulation

How are the villagers of Ban Song Khwae dependent on the natural resources to sustain their livelihood activities?

1.4 Research questions

- *Are the natural resources degraded?*

This working question has helped to guide us when investigating the following indicators, soil fertility, the water quality and the diversity of the c.f. forest. It also helped us to investigate the reasons for possibly degradation of the natural resources.

- *Are people from the village depending on farming as their livelihood strategy?*

This has directed us in our investigation of the peoples dependency of the natural resources and as well in our aim to map out the different income generating income activities present in the village.

² This of course depends on the definition of forest, as the National park division has used to define forest cover.

³ This assumption is based on the information from the Join Basic Paper (Khunarak et. al, 2003: 21) as well as on National Statistical Office and the Ministry of Information and Communication Technology (2003) http://www.nso.go.th/eng/agriculture/agr_census2003.htm#list3

Chapter 2 – Methodology

In this chapter the qualitative as well as the quantitative methods that have been applied during the fieldwork will be presented and discussed in relation to their strength and weaknesses in respect to the validity of our findings. The relevant collected data will in this chapter be presented in logic order according to the practical implementation.

2.1 Data needed

In the initial information on the situation in Ban Song Khwae village the headman had stated that the main problem was the degradation of the natural resources, since the majority of the village population practiced cultivation of the land. Therefore our main objective was to investigate whether the natural resources in the area was in a natural science sense degraded. Furthermore we wanted to find out how the people of the village perceived the status of the natural resources and how dependent they were on these to be able uphold their livelihood strategy.

2.2 Sampling strategy

The case of sampling the relevant groups and testing areas has proven to be difficult, due to the size of the population in the village. Our initial idea, from the synopsis, of choosing only farmers proved to be problematic, since the majority of the people within the community did, to some extent, use farming as a livelihood activity (appendix 10). In this report *farmers* will be defined as all who are dependent on farming, in relation to either supporting the household with non-cash products for own consumption or for cash crop production. The argument for this is that these people were dependent on this type of activity to sustain their living standards.

2.3 Headman interview

In the first stage of collecting data and thereby finding our target group, we contacted the headman of the village. This was done to gather information of the structure of the village and led to the beginning of the formation of the four categories⁴ of people we investigated.

- People who cultivated more than 16 rai⁵.
- People who cultivated less than or 15.99 rai (as we below refer to as 15 rai).
- People who have non-farm activities.
- People who did not have Thai citizenship cards.

The interview was conducted with the help of a semi-structured interview guide, which allowed us to keep the control, though still enabled us to be flexible in relation to other interesting statements in the interview situation (Mikkelsen, 1995: 28f).

⁴ These categories were defined with the help of the headman, and to the best of our knowledge, serve the purpose in this report as a strata, which covers the different structures present in the village.

⁵ rai is a unit of area measurement and usually associated with building sizes or land. To give reference in this paper: 1 rai = 1,600 m² = .39 acre or 40 by 40 metres

In the category of people who farm more than 16 rai and people who farm less than or 15 rai we wanted to investigate, if there were a difference in land use or crop trends and/or the use of alternative income activities to subsistence their household.

The category of people, who sustain their household through Non-farm activities,⁶ was relevant to include in the survey, as we wished to gather data on the possibility of shifting from the primary livelihood strategy, farming, to other income activities. We would thus investigate, if these other income activities could prove to be a feasible alternative to the agricultural livelihood strategy for the average farmer in Ban Song Kheaw.

In our preliminary work we had become aware of the issues in relation to non-Thai citizens and their lack of rights as citizens though having lived in Thailand for years. The headman confirmed that this were an issues in the location of the survey. Therefore the last category with the non-Thai citizens was included as they represented a part of the community that does not have any legal rights in the community. We were especially interested in how this group would be affected by the park boundaries, because the non-Thais are not officially recognised in the village registration office (HD, 2003⁷).

For all the categories that are depending on the use of the natural resources we wanted to gain an understanding of the influence the National Park boundaries would have on their way of life. One might say that the farmers with more than 16 rai and the non-Thai citizens can be seen as two extreme categories, due to the differing amount of accessible farmland although none of villagers have legal rights over all the land they cultivate. Still it is only the non-Thai, who don't figure in the official registration document of the villagers land us (HD, 2003). Hence the non-Thais needs might be neglected in the process of negotiation with the National Park Department in the demarcation of the park boundaries.

In the informative interview with the headman and with his assistant we gained basic information of the history and structure of the village and the trends this watershed has experienced. We became aware of the very active role the headman in Ban Song Khwae has played in the process of the demarcation of the national park, which led us on an interesting track of exploring the actual process with the involved stakeholders i.e. (Royal Forest Department), and the local NGO (Non Government Organisation), Hug Muang Nan⁸. We were pleased to get hold of the formal complaint paper, which the headman in cooperation with the NGO, Hug Muang Nan, had written. This paper had all of the citizens of the village, who officially had claimed the land they cultivated. This helped us to target the first 3 categories (HD, 2003). The respondents in the non-Thai citizenship

⁶ In this report Non-farm activities is defined as people who depend on income activities in other occupations than agriculture. People who supplement their income from contracting work for other farmers or side-occupations are defined as off-farmers.

⁷ In the headman document tables over the villagers land holdings were listed, but was not been completely translated. The Thai students have orally interpreted the relevant information.

⁸ To verify and explore the information we have acquired through the headman interview about the villages complain document to the National Park Department we would have done a interview with the involved NGO, Hug Muang Nan. Unfortunately we were not able to set up an interview with the local NGO, due to the person we were encouraged to speak to wasn't present.

category were chosen with help from the headman. He informed us of the places where they tend to live (appendix 12). The sampling strategy applied was random and we conducted the questionnaire survey with every third household in the particular area.

In short we gained information on the following aspects. For more in depth description see appendix 10.

- Crops grown are mainly upland rice, maize and lychee.
- Upland sloping fields are common.
- Many villagers have planted fruit orchards, as they believe this more profitable.
- Low soil fertility and hard pan soil.
- The lack of title deeds, as a result of the government policy.
- The forest resource in the utilisation and conservation community forest.
- The water resource in the village – the village have recently build a pipe system.
- The Non-Thais that do not have citizenship, but only green card. They live in a separate part of the village, usually in houses built of cheap materials such as bamboo, and they are not allowed to be a member of any social groups or leave the province.

We are aware of the dangers of accepting one-sided information as the truth, which could be an error in our stratification of the village population. Maybe the categories are but the mere image of how the headman, from his position in the village sees the community. But we got the impression that he and his representatives were very involved in the community. During the days we spend with the villagers we learned that the headman and his representatives also were highly respected and people felt that their opinions mattered and was respected. This led us to believe that the headman was in touch with the villagers, and we therefore trust and perceive the information that we based the categories on as plausible.

2.4 Community representative meeting

We initiated a community meeting where we were to implement Participatory Rural Appraisal (PRA) methods to gain an understanding of the community's position in regards of the demarcation of the National Park (Mikkelsen, 1995: 73f). The information we wanted to collect through the community meeting was, by initiating a participatory mapping (appendix 12), to see which issues the community found most critical in relation to the proposed National Park as well as use this as a starting point for further discussions on e.g. land use tendencies, tenure and the present state of the natural resources. This experience did not pan out as we had hoped and resulted in a situation which most of all, was a key-informant group interview with the headman's chosen representatives within agriculture, forest, water and a TAO (Tambon Administration Office) officer.

Though the meeting didn't turn out as planned we got invaluable information, through initiating the headman in doing a participatory mapping (appendix 12) of the village

which lead to a discussion about the changes in land use tendencies in the area⁹. We learned that the farming areas of the farmers in the village were very spread out, and that there in recent years had been planted far more fruit orchard than in the past. We also gained demographic data and information about the drinking water supply in the village. Furthermore we got specific information on the views of the representatives of the village and how they perceived which farmers had access to 'many rai', 'less rai' which helped us adjust the target-group categories.

2.5 Sampling strategy of the questionnaire survey

Based on the document from the village headman we began conducting the questionnaires within the chosen categories. The choice of using questionnaires carries the possibility that the data is of a shallow character (Mikkelsen, 1995: 205). However, we chose to execute a manageable amount of 21 questionnaires, four in each of the category: Non-farm activities and the Non-Thai. Seven questionnaires were done for Less-rai and six questionnaires were done in the category of Many-rai, because we wanted to have a common data sheet of all the farmers' plots we were to conduct soil-tests from. The reasons why we took an uneven number of questionnaires was due to the later stratification of choosing 8 farmers out of the 21 respondents, to complete soil samplings followed by the supplementing agricultural interviews. As we found it relevant to look at a variety of crops, use of inputs as fertilizer etc, the 8 farmers had to be sampled out from the two groups Many-rai and Less-rai, as we found Non-Thais used little inputs and crop variety and non-farmers only had limited farming practices.

The amount of respondents is not representative of the total community, but is chosen purely by pragmatic limitations, because we wished to combine the use of qualitative methods to obtain data. Due to the limited numbers of respondents we have to be cautious when generalising the results from the data collected through both the questionnaire survey and the in depth interviews. This will of course place us in a weaker position in the data analysis hence we will not be able to conclude how the villagers in general perceive their situation in relation to the implementation of the national park, due to the fact that we have not asked everybody within the community. However, our intention was to create an overview of the situation, in regards of the stratification of the village community, which resulted in the four categories

2.5.1 Design of the questionnaire

The questionnaire survey was predominantly designed to give us general information of the respondents' household composition and obtain knowledge on the livelihood strategy implied. This information was especially relevant in relation to investigate through which activities or networks people uphold their livelihoods and thereby look closer at the tendencies in income related activities. In practice the structured questions such as household members, names and educational level etc. was asked in the beginning. Later questions regarding income related activities and agricultural trends were asked. In the end the more controversial and sensitive issues such as savings and loans were approached (appendix 6).

⁹ In the house the community representative meeting took place a model from a previous watershed project in 1992 was placed.

2.5.2 The implementation

The practical implementation of the questionnaire survey was primarily conducted by our Thai colleagues, due to the fact that Hmong language was predominantly spoken in the village. This resulted in the use of local interpreters from Thai to Hmong and then back to Thai again. The Danish students conducted both a pilot testing of the questionnaires as well as a limited amount of the adjusted questionnaires. This was done to ensure that the group had the necessary knowledge as to how the questions worked in the context and had an understanding of how they were implemented. The questionnaire was rather comprehensive and took about 45min to one hour to conduct, which maybe in hindsight may have been a bit too long, though people we asked was very polite to us. The lengthy situation might have fatigued people and causing people to get impatient, which might have influenced on the answers.

In short, we obtained information on; household issues as – members, contribution, culture, religion, education, occupation, economic, NTFP (Non Timber Forest Product) and agriculture issues as – crops, chemical input use and irrigation system (appendix 7). The most relevant data we gained is pointed out below:

- Agriculture: crops grown were mainly rice, lychee and maize. Most of the respondents used fertiliser and some also used pesticides. The irrigation was mainly through rain fed and from creeks by using a pump.
- Occupation – most of the respondents were more or less depending on agriculture – except the deliberately chosen non-farmer group, some farmers had some off-farm activities as a supply to their income. The education level varies in between the categories.
- Household economy– the non-farmers have highest income and non-Thais the lowest income, and the Many-rai and Less-rai were in between (appendix 11).
- NTFP: the respondents mainly use fuel-wood, bamboo and mushrooms for own consumption. The only group that is selling NTFPs, is some of the Non-Thais.

2.6 In-depth interviews

To complement the ‘quick and dirty’ collection of data through the questionnaire survey in-depth interviews within two main subjects – household and agriculture were applied. We became aware, during the questionnaire survey, that there are 8 main family lines within the village (appendix 10). Therefore we chose to stratify the sampling of our respondents to ensure as many family lines as possible were represented. The aim was, yet again, to eliminate that our survey only would represent certain groups in the village.

2.6.1 Household in-depth interview

The individuals we interviewed were chosen from the sample of the already interviewed persons from the questionnaire survey. The intent was to get more comprehensive data on household economics, livelihood activities and gain an understanding of the respondents’ opinion on the present and future situation of the village. In other words we wanted to gather more data on the villagers consideration of agriculture as a livelihood strategy and what other options, if any, they considered as feasible in the future (appendix 8 & 9).

The limitations present when implementing qualitative data collection methods are the restriction on directly quantifying the obtained information. Furthermore, the information does not necessarily represent the general situation or opinions of the entire community of Ban Song Khwae village. Nevertheless, by gathering information through this method we have been able to gain knowledge as to some of the issues and present trends within the community. Evident and very frustrating limitation on the flow of the conversation has been the lack of direct face-to-face correspondence with the interviewees, due to the language barrier, which at times seemed similar to the children's game *Chinese whispers*. To 'overcome' this particular barrier the interpreters have been invaluable (Mikkelsen, 1995: 31f).

2.6.2 The practical implementation

Interviews were conducted on a total amount of 8 people, 2 in each category from the questionnaire survey. A semi-structured interview guide was formed with topics on e.g. the household structure in respect of gaining information on whether it is common for relatives, settled in other locations, to contribute to the household economy (Mikkelsen 1995: 103, Casley & Kumar, 1988: 14, Appendix 8). Questions also addressed issues on the complex patterns of different livelihood activities the sampling group apply in their daily lives. In relation to the use of the natural resources e.g. the community forest and the water for either consumption or for agricultural purposes questions were asked as well.

The interviews were conducted in the respondents' home, which in general made the interview situation comfortable and made it easier to ask sensitive questions about the respondents' economic situation. This particular setting in the respondent home gave us the opportunity to observe different household items which at times helped or puzzled us in relation to the answers we were given. For an example, we experienced incoherent responses from a farmer in the category of many rai who lived in polygamous relationship with two wives in a fairly new build brick house with TV and stereo. In front of the house a pick-up truck was parked and he also had a pump for irrigating his fields. Still he insisted that the family had a low income – and considered the family as poor. There can be many reasons for the information he gave us, but the respondent was very evasive in his replies and in this particular situation we chose not to pursue the matter of his means to accrue this in his stated situation.

From the in-depth interview we gathered a great amount of qualitative data, which we have tried to quantify (appendix 9). However the issues we concentrated on were, land use tendencies, off-farm and non-farm activities, land tenure, natural resource degradation, helping organisations, and national park boundaries.

2.6.3 Agricultural Interview

To gain specific information in regards of agricultural trends, a total amount of 8 people, from the questionnaire survey were interviewed – 4 in each of the categories many rai and less rai. Stratified sampling criterion was applied, due to our specific interest on investigating the fertility of the soil in relation to farming practices e.g. use of fertilisers and pesticides and the kind of crop (such as maize, rice, and orchards) that are grown on

the plots. Therefore, the kind of crop cultivated as well as the location of the plots¹⁰ was taken into consideration. This resulted in the choice of four upland and lowland plot, which represented the abovementioned crops. It was relevant to include these aspects, because farming practice e.g. irrigation possibilities, varies depending on the location of the fields and on the characteristics of the soil. Prior to the soil sampling, knowledge about which crops that are cultivated is important, hence, information on cropping practices, the fundamentals of the crops requirements, and trends in farming activity, may influence on our soil test results as well as deepen our understanding of the farmers present farming techniques.

In short, the purpose of the agricultural interviews was to collect data, which could help to substantiate and explain the findings of the soil fertility that were conducted on the 8 farmers plots. As well as using local knowledge to locate the 10 selective places we were to collect samples of the drinking water and to get indicators on where to take samples from the two main streams the area.

2.6.4 The implementation

The interviews were either conducted in the respondents' home or in the fields. Especially the 'on-the-spot' interview situations has helped us to gain an understanding of the practical problems in relation to, for an example, the run-off effect of water and fertilisers on slopping fields and the origin of top-soil erosion.

2.7 Key-informant interviews

People within the community who had extensive knowledge as to the management of the community forest, the agricultural trends and the maintenance of the drinking water supply were interviewed. Besides the key-informant interviews within the community, we also conducted interviews with the RFD and TAO (appendix 10).

From the GOs we gained information regarding the National Park boundaries problematic, from a governmental point of view. We also gained information on relevant issues concerning the land tenure, land certificates, the negotiations between government and villagers and other important political issues. The answers we found important to get was concerning the future perspective, how the national park boundaries was going to be enforced, the possibility of achieving more farmland, to understand the future perspectives on an agricultural livelihood (appendix 10).

2.8 Natural resource survey

To generate a picture of the state of the natural resources in the area in relation to the human influence on the environment, we conducted soil and the water tests and a forest inventory for the two community forests.

¹⁰ We define *Upland* as land located on slopes on an interval from 10% and above, whereas the *lowland* slopping fields, in this report is represented by 0-10% interval.

2.8.1 Soil fertility

The headman and the majority of the people we have interviewed had stated that the soil was not as fertile as it had been in the past (appendix 9 & 10). To supplement this information, we took samples from the 8 chosen farmers' plots, the utilisation community forest and the conservation community forest. So we could compare the data from the areas exposed to human influence to an area, which probably best expressed the soil conditions without human influence – the conservation community forest.

The soil samples from the farming area were implemented on 8 plots, cultivating maize, rice, mango and lychee, with 10 samples in each plot. To ensure a representative soil sample, the 10 samples were collected in a zigzag pattern on the plot and after completing this, we mixed all 10 samples together. An auger with a dept of 20 cm was used to collect samples of the topsoil. The level and composition of nutrients is of importance in gaining a picture of the fertility, but the topsoil is especially important since this is the layer the crops primarily subtracts the nutrients (Frederikesen, 1995: 3). The fields were measured at each sample spot with a clinometer to determine the slope.

2.8.2 Soil tests

The soil samples was dried in the shade for 2 days, and then sieved in order to get a fine and acute soil sample to test chemical and physical patterns and as well to determine the soil texture. This was done by using a 5% salt solution was added to the sieved sample of 10g, which then was shaken for half an hour and left until the soil particles had separated. The biggest particles, being sand, would then settle in the bottom then silt and the clay particles in the top (ICGA, 1990: 20-25). These layers was then measured with a ruler and calculated in a *soil texture triangle* to get a classification of the soil texture. The Thai soil analysis kit was used to get the chemical concentration of nitrate, ammonium, phosphate, potassium and the pH value.

From the results of the soil tests, we found out that the soil fertility in general is low. This is seen by low concentrations of the basic nutrients, N (nitrogen), P (Phosphor), K (Potassium), as we compared the findings with a soil fertilizer evaluation. E.g. the average level of P has to be between 60-90 ppm (parts per million), however our findings the P level mostly lied below 60 ppm (appendix 1).

The pH level was low, in average around 6, which means that the soil tends to be acid (appendix 1, and, Soil and Plant Analysis Council, Inc, 1998: 33). The most of the plots are located on slopes, which might make the soil more vulnerable to e.g. erosion (appendix 9). The results indicate that the soil exhibiting fertility exhaustion. Regarding erosion, the farmers find, it is not a common phenomenon in the village, but some of them have started encountering this problem, as topsoil erosion occurs on the sloping fields, due to heavy rain (appendix 9).

The farmers basically use chemical NPK fertilizer, which is applied with different concentrations on the majority of the fields once or twice a year, depending on how the individual farmer estimates the soil's requirements (appendix 7). Regarding other inputs, as use of insecticides and herbicides, the farmers do not use these frequently on their plots (appendix 7). In some cases, where they need to control and prevent the propagation

of insects, they apply Grammoxone, which is the chemical insecticide most commonly used in Northeast of Thailand (appendix 9, and, NSO¹¹2003).

2.8.3 Stream water quality

Water samples were taken from three different spots at the Salai River and on the Sanian River, which are the two main rivers that runs through the village and through the intensified farming area. The salinity, temperature, pH, electro conductivity and TDS (Total Dissolved Solids) were all measured on the sample spot. The bio-indicators were collected by the use of nets and sieves, and were afterwards analysed and identified by the use of a Thai aquatic guidebook. Hence this could indicate pollution and the water quality.

The concentration of phosphate in the water was determined by the use of a *Quantofix Merck kit*. Unfortunately this was the only test for residues of fertilisers we has access to, due to the rather expensive tests we otherwise would have needed.

In the water samples of water from the streams (see appendix 3), we found the pH was in average around 8.4, which is quite high, but for stream water, this pH level is quite normal, as the standard pH for rivers can vary between pH 5-9. The EC differs a bit from the standard of 200 $\mu\text{s}/\text{cm}$ (National Environment committee No. 8, 1993), but is in general acceptable thus the results are within the range of 157.6-206 $\mu\text{s}/\text{cm}$, though is highest measure in the samples were in the centre of the village.

The TDS level is acceptable up to 200 mg/l in streams (ibid), was in our samples below 103 mg/l, which is good. The salinity is normal on 0.1 %, the only place where the salinity was zero, were at the intersection of the two streams. Where there is a high level of phosphate, indicates that the stream in some places is polluted. This could be a result of farming activities and/or household waste, since the level is especially high in the end of the village (3mg/l) (appendix 3).

2.8.4 Consumption water

In regards of the drinking water tests (see appendix 2), 10 samples were collected in the village – from the beginning at the tank to the end of the village. Again we tested for the salinity, temperature, pH, electro conductivity and TDS. We wanted to test for E-coil to see if there was any indication of pollution from the livestock, but this was not possible due to an accident with the growth serum.

The water tests for consumption indicated the pH levels were between 7.67- 8.64. Thus the water for consumption varies in quality within the village and has some places a high concentration of alkalinity. In relation to electric conductivity this is confirmed by the EC, which ranged from 203-308 $\mu\text{s}/\text{cm}$. By comparing this to the standard measure, 200 $\mu\text{s}/\text{cm}$, indicates a high concentration of alkalinity particles (salt). The salinity measures indicates an acceptable level at 0.1mg/l¹², so this does not explain the high pH and EC, even though these three factors often influence on each other. However, the apparently

¹¹ http://www.nso.go.th/eng/agriculture/agr_census2003.htm

¹² According to the National Environment committee (1993) the salinity standard is on 0.1mg/l

normal level of salinity might be due to inefficient measurement of salinity, and can thus be an error.

The TDS (total dissolved solid) ranged from 101.7-154.1 mg/l. TDS is the measure of sediments particles, which carries bacteria, and the TDS level should therefore be relatively low, around 180 mg/l is acceptable for drinking water (National Environment committee No. 8). The measured TDS in the village was therefore quite good, and the results indicate that there is low possibility of finding large bacteria populations in this water. The content of phosphate particles was strangely high in some areas, which could indicate presence of residues from fertilizer (appendix 2).

The general the results indicate that the drinking water quality is not very good for household purpose such as drinking etc. This is due to the high pH and EC, although the TDS was low.

2.8.5 Diversity of the community forests

Forest inventory for both the community forest were carried out, by measuring a 40m x 40m square, laid out with the help of a compass. This square was then divided into 10m x 10m and all species was counted and identified by the help of one of the key-informants and a Thai forest book. In the conserved community forest 5 soil samples were taken – one in each corner of the 40m x 40m square and one in the middle (due to the rocky terrain the amount differs from the utilisation forest). In the utilize forest 10 soil samples was taken in a zigzag pattern. The soil tests were carried out in the same manner as the test from the farmers' fields.

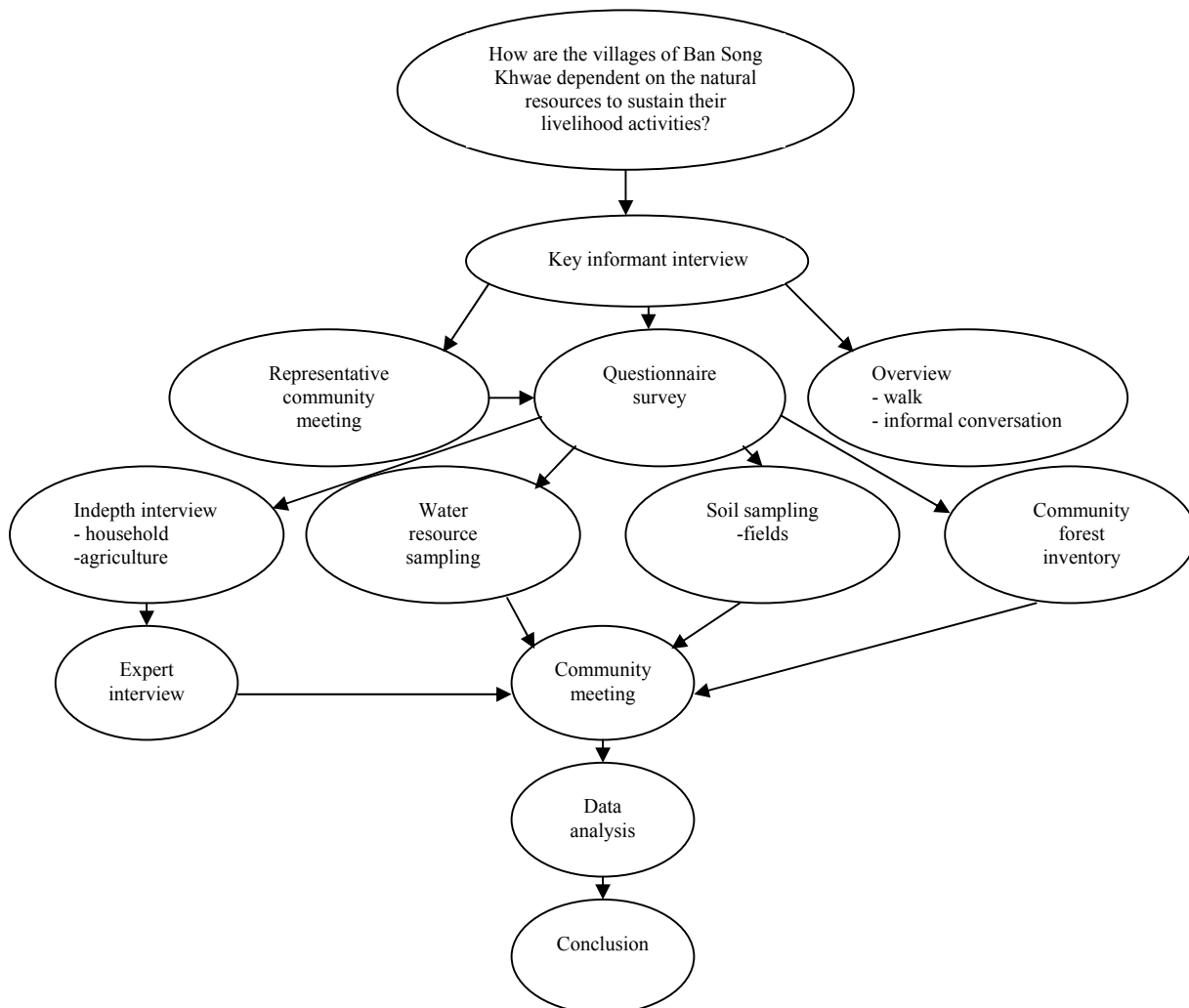
The number of tree species observed in the conservation community forest was 15, and the most dominating species was *Sterculia balanhas*. Other rare species as Wai, Tao, wild orchids and banana flower were observed in this forest, which are probably due to the physical/chemical conditions of the forest. The forest was humid, and this might explain the presence of Wai, which requires a high level of humidity (appendix 4). The soil condition in the conservation community forest was characterized as thick, silty topsoil, with reasonable levels of nutrients (NPK and NH_4^+) and the pH level was around 7, which proves a good fertile soil quality (appendix 1, and, IGAC, 1990:20-25). Ferns, moss and lichen were observed, and the forest cover was thick, which all in all gave the impression that the community forest represented an acceptable level of diversity.

In the utilisation community forest we chose our 40m x 40m test plot in a part that represented both tree seedlings and of course bamboo. We separated these parts in the counting phase to get a more accurate picture of the situation. The diameter at breast height (DBH) of the tree trunks was calculated by measuring around the trunks. The bamboo tufts were counted as well as the amount of canes. In each tuft three canes were chosen and measured to calculate an average.

In the utilisation community forest we found that the dominating tree specie was Mai pradu (*Pterocarpus macrocarpus*) out of the 9 species identified, and different kind of bamboo (4 species) was also richly represented (appendix 5). There were many tree stumps observed in the forest, which indicates previous logging. The condition of the soil

was not as fertile as the conservation community forest, as we found out that the pH level around 6.5, and low level of N, P, K, the forest cover was relative thin which the total BA of 11.74 m²/ 1 Rai, compared to the conservation community forest that had a BA at 39.69 m²/0.25 Rai. The topsoil in the utilization community forest was shallow and clayey (appendix 1).

2.9 Field work design



2.10 Limitations

We have met several limitations through our fieldwork some of which probably could have been prevented by more experienced researchers and/or more time available in the field.

Geographical limitations have been inevitable and in practice resulted in pragmatic soil and water samples and have as well resulted in forest resources only have be investigated

in the villages community forests. Another limitation has been expressed through our initial search for outlining the income based activities and thereby the villagers level of income. This has proven to be very difficult to investigate, due to the answers to the questions either where avoided, conflicting or perhaps just lost in translation.

Example: Household economics

The data we collected about the household economics was through the questionnaire. However our information regarding the household economic does not always seem to be reliable e.g. resulting in odd negative numbers in the total balance. This might not be because the respondents are not giving the correct data, but it might depend on many other factors. E.g. the fact that the respondent have had a bad agriculture production year, can reflect the negative total balance, but also the fact that it is very difficult for the respondent to estimate the income of the household, if other members of the household are contributing with other income activities. Obviously we have tried to ask into to these possibilities, but have not always received useful answers.

However the motives of not answering correctly are also a possibility, meaning that the respondent do not want to inform us of the correct income level. This can be due to fear of creditors or the feeling that the income is a private affair that is of no concern for us. Another feasible explanation is illegal income activities, which we cannot go further into, but obviously makes the respondents unwilling in answering correctly.

This problem we also had in finding the amount of loans and savings in the pilot testing, as many did not wish to answer, so we decided within the group to avoid asking this, but only if they had loans or savings.

2.11 Data strategy

We will use the data presented above to discuss and answer the main research question, regarding how the villagers are dependent on the natural resources to sustain their livelihood strategy. To get a reliable answer we will analyse and compare the data results from the questionnaires, chemical/physical samplings, in-depth interviews, transect walks and key-informant interviews to gain a broad and comprehensive picture of the different issues. We will thus use data collected from the different method to supplement, confirm and complement each other by analysis and discussions. The strategy is to centre our discussions on the following topics; the land use tendencies, the natural resources, lack of title deeds in the area, income activities and lastly the national parks influence on the villagers present livelihood activities.

Chapter 3 – Data Analysis

In the following chapter our findings will be discussed in relation to the natural resources, the tenure issues and livelihood activities in Ban Song Khwae.

In the location of Ban Song Khwae it was evident that large parts of the hills in the area were used for agricultural purposes. This observation was confirmed by the headman and his representatives, as well as represented by 20 of the 21 respondents in our questionnaire survey that to some extent do rely on agricultural practises to uphold their livelihoods. The most common agricultural business is primarily through cultivation of crops, though it is not uncommon for the household to have livestock for own consumption or for selling within the village.

3.1 Land use

3.1.1 Land use tendencies

The land use tendencies in the area are primarily linked to villagers' livelihood activities. Before analysing the dependency of natural resources, we will examine which tendencies that is present in the village community.

The crops cultivated are mainly rice, lychee, mango and maize, (headman, appendix 10 & appendix 1). However, a tendency is that most of the respondents still grow some rice for own consumption, while fruit orchards are mainly cash crop production (appendix 9). It is important to notice that two out of four respondents from the non-Thai category are not growing fruit orchards, but only rice (appendix 7). This is due to their subsistent agricultural livelihood – they simply do not have enough resources (land, capital, input etc.) to grow anything else than rice for own consumption to uphold the basic needs to support their family (Traynor et.al, 2002).

In the past the respondents were cultivating rice, maize, ginger and cotton, but the tendency towards fruit orchards has been going on the past 5-10 years (appendix 9). One reason for this is due to low profitability in rice and cotton compared to relatively higher profitability in fruit orchards. Ginger is not very popular to grow anymore because it gives problems with fungus in the soil (appendix 9). Maize is still some places popular to grow (appendix 1) however most farmers find it more profitable to grow fruit orchards (appendix 7).

Another reason for grown fruit orchards is that this is less labour demanding, which means that the farmer can allocate his time on other activities (appendix 9). A third important reason for establish fruit orchards is that the government has recommended growing long-term crops such as fruit orchards. According to TAO, the government indicates that farmers with long-term crops are more secure, de facto, in keeping their land than the farmers with short-term crops e.g. rice and maize (appendix 10, TAO). Some of the villagers are aware of this, and give this as explanation for changing to cultivating fruit orchards (appendix 9).

The general view of the agriculture and the farmers' opinions can be summarized as follows; Rice and maize are often necessary to grow for own consumption, but the most profitable farming activity is lychee. However, it must be acknowledge that it is difficult for the government to change the farmers' cultivation habits – especially the older farmers, who are often growing rice due to tradition (TAO appendix 10).

3.1.2 Land resources

Fallow land has in the past been a common way of maintaining the soil fertility. Some farmers still use fallow period, but the improvement of the soil might not always be visible. An example in our data indicates that fallow period of 5 years might not regenerate the soil fertility as the soil is still relatively acid and have low nutrients level (see appendix 1). This might be due to uncontrolled vegetation cover during fallow, which as well would require nutrients.

However, the concept of fallow periods is not very common in the village anymore and only the respondents with many-rai or the non-farmers having fields in fallow (appendix 7). Two feasible explanations for the decrease, is due to the population pressures, as newcomers have bought up plots in fallow¹³ (appendix 7), but also the policies of implementing national parks and thereby no extension of cultivating land. In this context, RFD finds fallow, and the use of shifting cultivation, a bad idea, as the land in fallow instead can be used for tree planting (appendix 10, RFD).

3.2 Soil fertility

Soils throughout most of Thailand are of low fertility, largely as a result of leaching by heavy rainfall. Differences between the various soil types are the result of differences in parent rock material, variations in the amount of rainfall, length of wet and dry seasons, type of vegetable cover, and other natural factors. In general, stony and shallow soils characterize the hill and mountain terrain of the North (Dr. Mingtipol, pers.comm, 2004).

In the location of the survey we found that the soil texture on average is fairly high in the concentration of clay particles (appendix 1), which in general is perceived as a good composition to keep the soil humid and fixate the nutrients.

Most farmers, who can afford it, are using fertiliser to improve their soil fertility (appendix 7). The reason why they find this necessary is, because they experience low productivity. However, despite the use of fertiliser, most farmers consider the soil as degraded (appendix 9).

By comparing the condition of the agricultural soil (on average) with the soil samples from the conservation forest, we can analyse how the soil quality has changed and whether it is degraded or not. This is done from the assumption that the conservation forest is the nearest we come to previous soil conditions. In other words, we will take the soil of the conservation community forest into consideration, to be able to see if the cultivated soil is degraded (appendix 1).

¹³ This transaction has happened within the village community, and does not involve official title deeds to the land.

The concentration of nutrients of NPK was on average low in the cultivated plots, compared to the conservation community forest. The soil proved to be more acid compared to conservation community forest (appendix 1). The high acid level might be explained by the use of Grammaxone (appendix 9). A statistical survey made by the Thai government¹⁴ points out that the use of pesticides are not as commonly used in the Northeast of Thailand as the other parts of the country. This result can be confirmed, as pesticides are not as frequently used in the area (appendix 7). However, when used, the respondents stated the brand Grammoxone as effective to control insects. The use of this brand has a tendency in affecting the pH value and makes the soil more acid this might explain the differing pH values we have obtained in our tests on the cultivated land (Kaosa, 1999: 35).

A reason for the low nutrients level can be due to the sloping fields, as the fertiliser (and nutrients in general) often are washed away from the sloping up-land fields – a problem, created by heavy rain and wind (appendix 1 and 9, and, Frederiksen, 1995: 7). However, the impact of this problem depends on what crops are grown in the plots. Regarding fruit orchards, a possible solution could be to dig small ditches around the trees to hold the fertiliser, as one of the respondents does. This can easier be done with trees, as these have deeper roots than rice and maize (appendix 9). Another reason for the low level of nutrients can be an insufficient use of fertiliser. This is often because the farmers do not have knowledge as to the optimal use of the chemical fertilisers, but also because the use of organic matter is not a common practice in the area (appendix 9). This means that more education is needed, because the use of organic matter would provide the soil with the natural requirements (Rasmussen, 2002: 81). However, the degradation of the soil could also be due to the mono-cropping agriculture, no or short fallow periods, no use of leguminous plants and lack of permanent water supply.

The discussion on which incentives the farmers have to invest in soil improving and/or intensification methods is interesting. Seeing that new methods demand labour and capital, however without recognised land holdings, the incentives become small, due to the insecurity of keeping the land in the future. The reluctance to invest in the land they cultivate was primarily due to the fear of the land would be enclosed in the National Park. Therefore they found it too risky to invest in long-term soil improvement, as e.g. permanent irrigation system (appendix 9, see land tenure section below).

To determine whether or not the soil is degraded, as our qualitative data indicates, a reliable picture of the nutrient content and pH was needed to compare the present state to how the soil fertility most likely was before the agricultural practices. The results from the conservation community forest indicate that that the soil is less acid than in the farming area and the nutrients level is higher and thereby indicates better soil conditions.

3.3 Water resources

Due to the fieldwork period was in the dry season, we did not observe the farmers in their most productive time of the year and could therefore not fully observe the local way of

¹⁴ http://www.nso.go.th/eng/agriculture/agr_census2003.htm#list3

irrigating the land. Although, we did not observe any permanent irrigation systems e.g. ditches. Our respondents stated a pipe system with a pump was used to artificially irrigate the plots (appendix 9). However, only one of the interviewees had invested in a pump and only three in total had access to use this system regularly. Our information obtained through interviews indicates that this irrigation system is not commonly used, due to functional problems with leaves blocking the pipes or by the impeded location of the upland plots. Although the price of acquiring the pump and pipes, was by all respondents stated as the main restraint. Thus most of the respondents were depending on rainfall, which obviously depends on the rainy season (appendix 9).

To generate a picture of the natural resources in the area we tested the water quality in the two main streams, to investigate whether the agricultural practises has influenced on the quality (appendix 3). As mentioned the fields are located on hillsides and this may be the reason to the sediment of the streams shows an unacceptable amount of phosphate, due to run-off effect (NPA¹⁵ 2004). However, the water quality differs quite a lot, probably due to run-offs (fertiliser etc.) from the plots near the test spots. It is possible that these run-offs flow down with the stream into the village. As our results indicate a high phosphate level measured in the end of the village (appendix 3). There is a faster water flow up stream, but the stream is wider within the village and has slower flow, this results in higher pollution in the village stream. This was as well confirmed by the complete lack of bio-indicators at the villages test spot. A plausible explanation for this could be an insufficient level of oxygen for fauna to survive. The pollution comes not only from the plots, but also from the village as wastewater from the households (American Chemical Society, 1999). Due to the slow flow in the village it is thus difficult to maintain a clean stream here.

3.3.1 Water for consumption

The water supply for drinking water is collected in a water tank from streams in the conservation community forest, and supplies the villagers with water through a pipe system. However the water for drinking is some places in the village – depending on the location of the house, restricted within the day and limited due to size of the pipes (headman, appendix 10).

Five of the eight respondents find that there is a shortage of water supply in the dry season, which is a problem for many households. The opinion of the water quality was mixed; some respondents considered it as good for consumption purposes even though they boil the water before drinking it (appendix 9), and others had experienced poor water quality in terms of yellow coloured water and limestone sediments (appendix 9). According to the water tests, the water quality is not consider good without boiling and removal of solid particles, as it has a relatively high pH level ranging from 7.67-8.64 (8.3 in average), whereas it should lie between pH 7-7.9 to be good quality water (Dr. Mingtipol pers.comm., appendix 2).

The explanation for the deteriorated water quality can be that a small amount of the water for consumption actually comes directly from one of the main streams in the village,

¹⁵ <http://wilkes.1wilkes.edu/~eqo/secstandards.htm>

(appendix 3). Another reason for the reduced water quality could be due to the pipe system within the village. As we observed the pipes often are lying on the dusted streets where people and livestock go about, and the pipes can therefore easily be damaged. We have observed that several 'alternative' reparations had been done on the exposed pipelines, without paying much attention to the sanitation and cleaning of the pipes.

3.4 Land Tenure

Land tenure is a broad term, which we define as all the possible title deeds, which is ranging from full ownership, NS-3 document, to temporally cultivation rights, as SPK document (Traynor et. al, 2002: 45-52). As the farmers aimed for title deeds for different purposes as mentioning below, title deeds are mentioned as a general term, as it differs what precise title deed is wished among the farmers, e.g. NS-3, SPK, PBT-5 (TAO appendix 10).

Most of the respondents got their agriculture land by clearing the forest themselves, or 'inherited' it from the family (appendix 9). A few people have rented the land, but this is apparently mainly the non-Thais who came later to the village and could not clear forest to get land. Only one interviewee has got title deeds, a NS-3 certificate, but only on 3 rai (appendix 9). The villagers have no title deeds, which mean they are not in reality allowed to cultivate the land, neither to sell it nor to use it as security for loans, (TAO appendix 10).

The pressure for land titles of various kinds increased during the 1960s and 1970s as the number of farm holdings expanded rapidly (Ghimire, 2001). In general, the lack of title deeds on the land is a problem for farmers, since they can not pass the land over to their children nor use the land as collateral for bank loans, (Khunarak et. al, 2003: 39) However, cheap loans from social organisation are available for the villagers in Ban Song Kheaw, (appendix 11), title deeds are in this context not necessary for loan-taken.

Nevertheless, the respondents aim for title deeds, mostly because they want to pass the land over to future generations. Apparently the farmers do not wish to sell the land, as only one respondent (in the group of 'many rai') says he wish to sell some of his land. The Non-Thais want more security on keeping the plots they cultivate, as they have no registered land use (appendix 9). Thus in the document we obtained from the headman it clearly states all the villagers' cultivated land, except of the Non-Thais. One of the Non-Thais stated that he was very concerned about losing the land he, in the present has access to, since the National Park Department has the authority to claim land, which is listed as fallow land (appendix 9). As the Non-Thais in general are the latest arrivals they haven't been able to clear a plot of land in reasonable distance to their homes, and are forced to rent land from the recognised villagers, which usually is registered as fallow land and located in remote areas.

According to the RFD, the government has no incentives or reasons to give the villagers land certificates. This is due to the belief that the villagers will sell the land to capitalists (town-people who will build resorts), which will result in degradation of the natural resources, as the villagers will cut more trees to gain new land, and the resorts will

pollute the environment (RFD Appendix 10). Recently there have been problems with people from other villages, selling their SPK and PBT-5¹⁶ land (appendix 10, TAO) to town people, who has believed they had the ownership of the land, which they did not (TAO, appendix 10). However it must be noticed that the government, according to both TAO and RFD, will be flexible regarding the villagers use of the natural resources within the National Park. This is only de facto, meaning that on the local level the villagers use are accepted by the local forest departments, and this must be distinguished from the official law (de jury), which does not allow any activity within the National Park area. Even though the villagers are not able to extent the land, they will still have de facto right to cultivate on the land and also collect NTFPs from the National Park area (TAO, appendix 10).

The importance of the title deeds must however not be neglected. The title deeds affect the villagers' motive of investing in the land and natural resources in general. For example, investments in more sophisticated water canal systems, soil improvements and improvements of the utilisation community forest is closely linked to the conflict of land tenure (Traynor et. al, 2002:58). Our qualitative data indicates to some extent this asserting, as only one of the respondents actually did endorse soil improvement methods, by digging holes around the stems of the tree to help the water and fertilisers to settle (appendix 9).

Another issue is the decreasing possibility to get more agricultural land, as the farmers are allowed to have maximum 5 plots (appendix 10, RFD). With the growing population, and on average 4-5 children in each household, these plots divided out to the next generation, will decrease the amount of farmland considerable, and the agriculture will thus be an even more limited livelihood activity for the future generations.

With the lack of title deeds, the investment incentives seems rather irrelevant, seen from a rational economic point of view, and this of course reflects the villagers in their daily live decisions regarding improvement of the natural resources, but also regarding their agriculture livelihood strategy. Thus a widespread opinion on the agriculture livelihood strategy in Ban Song Kheaw is that agriculture is not enough for supporting the family and other income generating activities are needed in the future. This view is mainly represented by non-farmers, less-rai and non-Thai categories. Education of the children is very important, so they have the opportunities to go to the city and work. The opportunities to go to the city and work are possible for some, but age and lack of education limits many of the interviewees (appendix 9).

3.5 Household economics and activity

Household economy is relevant to look at, to get an overview regarding of which income activities that are applied in the households; farming or non-farming activities, and which kind of income – non-cash income by using the output for own consumption or cash income from selling the output (Traynor et. al, 2002:206).

¹⁶ The PBT-5 is a tax certificate that proves the farmer pay tax on the land, and some farmers got this, however this does not mean that they own the land – or are able to sell it de jury (Khunarak, 2003 pp 40).

Despite the difficulties of collecting reliable data regarding the household economy we will try to look at the income level for the categories, in order to see if the income levels are around the 20,000 baht/year. This income level is from the Basic Information Paper (Khunarak et. al, 2003: 21) and the reason for using this information is to see, if this first impression of the income level actually fits with our collected information in the questionnaires. As we are not able to conclude much from the total balance, as the annual expenditure often exceeds the annual income level, we can thus only indicate the differing levels of income within the categories.

To calculate the average for the four groups without taking out the extreme cases, does not give useful results, as the income levels within some of the categories differ a lot. Therefore we have decided to look at how the income levels are ranging, and in the cases where it seems possible, to calculate an average by leaving out the extreme cases (appendix 11). It is thus complex to draw any general conclusion on these figures and calculate the average however we can indicate some trends of which category is worse and which best off, by looking at how the income levels ranged in between the categories. This is shown in table 1.

Table 1

Group	Income range, Bht/yr	Average, Bht/yr
Non-Farmers	72,000 – 1,656,000	Not poss.
Many-rai	15,000 – 482.000	Not poss.
Less-rai	2,000 – 60,000	14,600
Non-Thai	7,000 – 15,000	10,600

The income range clearly indicates, how the groups are ranked: the Non-farmers are the highest income group; even the lowest income within this group is high compared to the three other groups. The second highest income level is many-rai and then the less-rai, and by ignoring the extreme and unrealistic number of 2,000 Baht/year (which is likely to be an error) this group lies higher, on average, than the lowest group the Non-Thais. However, there is large variation within the two highest income-levels, especially the non-farmers, where two of the respondents had an income around 80,000 Baht/year, and the two others on respectively 294,000 and 1,656,000 Baht/year. This shows that some non-farmers are much better off than others, and has established a very profitable non-farming activity. From observing the shops of the respondents, this becomes quite evident, as the high profitable respondents had a large shop, with a wide selection of goods, which attracted customers from all over the village.

Many of the respondents also had savings, along with having loans, which at first appear odd, but looking more into the loans and saving conditions, it turned out that the savings gave a higher interest returns than the interests paid on the loans (appendix 11). This was because most loans are taken in the agricultural organization as the Villages Subsidy Foundation and BAAC (which has relatively cheap loans – interests on 1-2%), compared with ordinary bank loans or private loans (appendix 11). One respondent in the in-depth interview enlighten us that loans could be obtain from the rich people in the village, but at a higher interest rate than the bank.

3.5.1 Non-cash and cash income

The agriculture income can be split into cash income, from selling the crops, and non-cash income, for own consumption (Traynor et.al, 2002: 202-208). We found that the rice production is mainly for own consumption for all the respondents (non-cash income). The Non-Thais are especially depending on the output of their rice production, and are also depending on the NTFP for selling (appendix 9).

The higher agricultural income category, Less-rai and Many-rai are mainly producing fruit for selling, cash crops, and sometimes maize for own consumption, and these categories are to some extent depended on NTFPs for own consumption. The non-farmers are in general not economically depending on crop production or forest products, even though some use rice and NTFP for own consumption.

3.5.2 Non-farming activities

Many of the farmers are to some degree depending on other activities than farming – off-farm activities (see footnote 6). This must be distinguished from the purely non-farming activities.

The non-farm activities vary – most have shops – the 4 respondent we interviewed, had noodle shops and grocery shops. To see if there was a tendency towards non-farming activities, we asked into the opportunities the villagers have in gaining income from other activities than farming. This was to find out if they had any opportunity to change livelihood strategy to maintain, uphold or improve the household economy, now and in the future (Riggs, 1998 pp 503-504).

We found that the non-farmer category is a good example of this, as they have moved from agriculture towards new activities that are more profitable to them. However, starting a non-farm activity like a shop demands some sort of investment capital, depending on size of shop, building materials, goods etc. The question is, if non-farming activities are the solution to the low production in agriculture and whether the average farmer in Ban Song Kheaw is able to change livelihood strategy. Another issue is that to manage a shop, often demands a certain level of education, which therefore limits many of the villagers, (Rigg, 1998 pp 503-504). As we in the questionnaire asked into the education level, we found that the three out of four non-farmers are educated, whereas hardly any of many-rai and non-Thais is educated. The reason for no education could thus be due to age (many-rai) or due to no possibility of education (non-Thais). Non-farming activities are therefore not a possible option for the average farmer, and especially not the ones without education and capital to invest.

Our data indicates thereby, that the income level to some extent is correlated with the use of the natural resources, (land and forest resources). The only category who is not depending on the natural resources is the Non-farmers, who due to other income activities can uphold a livelihood strategy outside agriculture. In theory this could be a possible solution to an alternative way of upholding the livelihood for the villagers in Ban Song Kheaw. However, our data does not support this as plausible.

3.6 The Nonthaburi National Park

Our prior concern that the demarcation of the national park would affect the livelihood strategy of the majority of the villagers in Ban Song was partly confirmed, as six out of the eight respondents meant that the park would affect their livelihood in relation to their ability to officially extending farmland. However, four out of eight believes that they will be allowed to keep the land they currently cultivate, due to the negotiation process between the headman and the National Park Department (appendix 9).

The proposed boundaries of the Nonthaburi National Park will possibly, when implemented, extent into the village conservation community forest. This was stated as a concern from two respondents, as they expressed that they felt the National Park Department would take their source of living from them, (appendix 9). This concern was linked to the possible lost of farmland, but as well directed at the limitations the national park would have on their activities related to collecting NTFPs. According to TAO, the government will reclaim some of the conservation community forest, due to suspension of illegal logging activities – the government will in this way try to ‘protect’ the villagers against themselves by enclosing some of the conservation community forest in the national park, (TAO, appendix 10).

The government of Thailand has since the 1960s focused on protecting the biodiversity through implementing a grand scale implementation of national parks (Ghimire 2001: 199). In the present the number of parks in Thailand has exceeded 200, in the name of preserving the forests (Aj. Pat, pers. comm. 2004). The idea of establishing community managed forests is closely linked to this government policy hence the idea is to create forest areas to ensure the fundament of the local people and thereby limit use on the park areas.

However, we find this not to be true in our case, since the people’s needs of Ban Song Khaew has been neglected in the process of implementing the Nonthaburi National Park. The restrictions on what can be extracted from the two community forests are established by the headman and the village committee. But one of the Non-Thai respondent expressed a concern as to the possibility of extracting fuel-wood from the conservation community forest would be further limited if categorised as a national park.

The concept of community forests arrived in the late 1970s and was a new strategy to permit utilization of the forest by the rural people in a sustainable a locally managed manner (Warner, 1997). At this time the demand for fuel wood was considered as the most important NTFPs collected in the forest, but as lack of fuel wood was believed to lead to deforestation and land degradation, the community managed forests came into the picture. To solve the problem the community forest areas was used to plant more forest, to provide the rural people with fuel-wood and to maintain the forest area. However, these early community forests proved to be insufficient, for the rural people needs, as they required other NTFPs than fuel-wood e.g. fodder, fruit etc. (Warner, 1997) The present objective for community forests has therefore changed and there is more focus on what the rural people actually need and can benefit from. The management of

forest for conservation and development, and participation of the community along with secure tenure rights is thus important in the context of community forests (Warner, 1997).

The governmental motives of encouraging community forests might primarily be for the sake of avoiding deforestation by maintaining and increasing the forest cover, instead of for the sake of people's benefit and needs (Warner, 1997). In our context this information can help us understanding some of the political aspects concerning the establishment of community forests and the National Park implementation. As the Thai government aims for more forest cover in Thailand, the encouragement for community forests might very well have been a strategy to control and limit the rural people use of the forest reserves.

Through our questionnaire survey we learned that all of our respondents at some part of their lives had used products from the utilized community forest, whether it was for building purposes or for consumption needs. Especially the Non-Thai group expressed their dependency of extraction NTFPs for either selling purposes and or for consumption. However, we found that the variety of spices represented in the community forests have been steadily decreasing in the recent years. Eatable spices such as *Wai* and mushrooms were said to be hard to find, which has claimed a further use of the conservation community forest. This was confirmed by the forest inventory we carried out (appendix 4 & 5).

Regarding the local peoples needs we saw that the utilization community forest was dominated by bamboo, which is a sign that the original vegetation has been removed. The many stumps of larger trees we observed through our forest walk validate this and confirmed as well by the RFD (appendix 10, RDF).

The utilisation community forest is thus similar to the more modern concept of community forests, regarding the rural people's needs and benefits from NTFPs. However, concerning the conservation of the community forests, the utilization community forest indicates signs of degradation and overuse, possibly due to the population pressure. These problems are closely linked to the concept of the tragedy of the commons, which refers to the overuse of resources (Oakerson, 1992). The fact that there apparently were no restrictions or present adequate management of the utilisation community forest¹⁷ could result in the villagers could remove 'unlimited' amounts of the NTFPs and occasionally also logging.

Thus a feasible explanation of the degradation of the utilisation community forest is the human interference and impact on the natural resources, such as over-use of the forest resource by 'insiders' (the villagers themselves) or 'outsiders' (non-villagers of Ban Song Kheaw). Six of the eight interviewees have stated that they have experienced problems with outsiders taking products from their utilization community forest, and claim this is the explanation of the shortage in NTFPs. However we found it very difficult to get a clear answer on who these 'outsiders' was in the in-depth interview.

The fact is that the Non-Thais are settled a bit outside the village, close to the utilization forest, as well as being the ones who are most depending on the NTFPs. This could

¹⁷ However, the headman has to give permission for cutting trees in the utilisation CF.

indicate that the non-Thais are considered as ‘outsiders’ by some of the villagers. This allegation can be confirmed by one of the respondent’s statements that ‘the new-comers’ used to be grateful and humble, but now they are more arrogant and use all the NTFPs (appendix 9).

In this context the problem with the increasing population is relevant to address, as the new-settlers and the increasing population within the village will put further pressure on the natural resources in the future. In regards to the degradation of the natural resources, whether addressing the lack of drinking water, accessible NTFPs or the decrease in forest cover, all of the respondents claimed the main reason for this was the ever increasing population in the village. In regards to the tendency to implement national park to protect the natural resources a conflict between the stakeholders arise, hence the villagers might not have incentives to support the demarcation of the National Park, due to their livelihood are depending on the access to the natural resources in the area. This could lead to a failed protection project. Therefore a negotiation between the involved stakeholders regarding a realistic agreement on the future use of the resources needs to be debated in relation to the demarcation of the park boundaries. However, a solution to the problem is complex, due to the different levels of interest. Our data can neither verify nor falsify the assumption that the park boundaries will not be respected. However, our data shows that it seems unlikely that the villagers will be able to turn to Non-farm activities in the village or in the cities, since the needed opportunities e.g. tenure, capital and/or education level, is not sufficiently represented.

The implementation of National Parks in Thailand is a common strategy to protect the natural resource and maintain forest areas. However the question arises whether it is possible for the government to ignore the fact that many rural people live in these areas. As we found in section 3.5.2, many farmers have no other alternative livelihood strategy than farming, and this will inevitable put pressure on the land resources, as the expansion on arable land has reached it limit. The problem with lack of title deeds is in this connection important to consider, as the title deeds would give the farmers incentives to invest in the land improvement to gain higher productivity, which could limit the need for expanding the agriculture land area. If the government would give title deeds, the question is what impacts this will have on the farmers. However, it is unlikely that the government will give full ownership as NS-3 certificate, due to the belief that the farmers will sell it. A SPK title deed might be more realistic, especially as it limits the farmers from selling.

By giving title deeds on the land, the government can thus meet the farmers’ needs and at the same time perhaps enhance the chance of protect the forest within the National Parks. However, the case regarding the trade in PBT-5 tax certificate indicates that other certificate as SPK possibly also would become tradable, de facto, despite the official law. Regarding the natural resources removed from the community forests, the RFD states that the villagers also will be allowed to go into the National Park (de facto), despite the law of no access to the forest reserves. If the conservation community forest is also going to be within the National Park, the need for NTFP would probably increase, as the utilisation community forest is already used intensively. The concept of creating a ‘buffer

zone' that secure the villagers rights to use a small area within the National Park, could become a solution, and would leave the natural resources (forest, biodiversity) protected in the remaining National Park, (Ghimire, 2001: 225). The discussed population growth can in this context not be neglected, as this inevitably will put further pressure on the natural resources, also within a possible 'buffer zone' as our data indicates has already happened in the utilization community forest.

4. Reliability and validity

We have collected data in a manner, which includes and complement both ‘hard’ data and data from the interviews. Meaning we have, when possible, tried to check up on our findings from different sources, and thereby strengthened the validity of the data.

Many of our findings have derived from the interviews we have conducted. We are aware that our presence in the interview situation may have influenced on the information. Furthermore, the process of the meaning condensation of the information might as well be biased, by our subjectivity. Nevertheless we feel confident in relying on these data, despite the low representative, because our natural science data have confirmed many of the statements from the interviews. For an example, the headman stated the main problem in the village was, the degrading natural resources, which was confirmed by the respondents in both the questionnaire survey and the In-depth interviews and, yet again, by our tests on the soil, water and the community forests.

Pragmatic reasons caused the implementation of the fieldwork to be broken into specific sub-working-groups. This has lead to the Danish group unfortunately do not have a complete understanding of how the target group for the questionnaires was chosen as well as the fields which was chosen for the soil tests. Furthermore we experiences inconsistency, within the group, in the way the questionnaires and the interviews were carried out i.e. in some of the questionnaires and interviews the data related to e.g. household economics were neglected. This might be caused by poor communication within the group and is of course regretful and problematic. However we tried to reduce this error by having a group discussion every night to discuss what each sub-group had done and what the future plans were. Despite these errors we have tried to ensure reliability of our findings by making our choice of methods and the implementation as transparent as possible.

As discussed in the data analysis our data indicate that there is a tendency in planting long-term crops instead of e.g. maize and cotton, which is more labour intensive. During the fieldwork we did observe many plots planted with fruit orchards and the majority of our respondents had planted fruit orchards. The headman has as well explained that many farmers in the village preferred investing in fruit orchards. However, we were not able to obtain agricultural records from the area, and can therefore not with certainty claim that this in fact is the development in the area. Concerning the tendency towards non-farming income activities the restraint on our findings is, yet again, lack of registration records within the village, but due to the specific focus in the interviews on this trend we feel that the data acquired is valid. Seeing that the data indicates that people are inclined to turn to alternative income sources; however the non-farming activities might not be an alternative for the average farmer in Ban Song Khwae, as it demands education and capital for investment.

In regard to the water quality of the drinking water and the streams, our data may allow us to indicate certain conditions present at the moment they where taken. However, these do not represent the quality of the entire stream, due to local conditions may have

influenced on the results. Stating general conditions of the water quality is problematic because our findings primarily indicate the present conditions; however it could be argued that the data on the bio-indicators creates a more representative measurement as to the long-term conditions of the water quality of the streams. In regards to our data on the soil tests the limitation, mentioned above, is as well relevant, because of the limited testing period. To get more comprehensive and precise data, soil samples should have been taken over a longer period of time and in far more place, than we have been able to.

The lack of officially recognized title deeds in the village was validated by all of our accessible sources of information. But in our attempt to establish a clear link between the lack of right to cultivate the land and the degradation of the natural resources it could be disputed that the foundation of data is insufficient. It would for an example have been a good supplement, if we had been able to compare to a similar location where land deeds had been granted. However, we feel confident in stating that the population growth is the main reason for the degradation of the resources in the area. Due to this seems plausible and correlate with 1) the need for increasing agricultural practices, 2) the lack of accessible farmland and 3) the limited possibility for traditional farming practice. However, we were not able to get exact records on the population growth from the headman and can therefore only weigh this from the interviewed respondents.

As our methodology shows we decided to make a questionnaire survey first, to gain an overview of the village, however, it could be argued that by doing in-depth interviews first on topics found through a community meeting and then quantifying the data through questionnaires, could have provided more comprehensive and reliable data. This, which ever way around, the overriding limitation concerning time in the field would remain the same. However it could have been interesting to re-examine the data we collected, by quantifying the qualitative data in this way, and would probably have resulted in more reliable data, on the important trends and issues. This could have been interesting, as it would have provided us with a clearer understanding of the problems in Ban Song Khaew.

Though we are in reality not able to quantify and draw any strong conclusions on our collected data, due to the lack of time, number of respondents, interpretation and other errors, we still believe that our data indicate some relevant trends and issues.

5. Conclusion

The conclusion on how the villagers are depended on the natural resources to sustain their livelihood activities is a complex and surely not straightforward answer, as the issues discussed in the report, clearly has other aspects and explanation, besides the once we have addressed.

Agriculture practices are the main income activities in the village, however, this livelihood activity highly depends on the natural resources. The soil fertility is low, possibly due to poor investments in soil improvements, which could be explain by the lack of title deeds. There was a tendency in fruit orchards, as these are less labour demanding and more profitable than traditional crops.

We find that the population has increased the pressure on the natural resources, as the disturbance of the forest, especially in the utilization community forest clearly shows sign of lower plant diversity than the conservation community forest, due to overuse, poor management and control.

Supply of drinking water is insufficient in the dry season, partly due to the inadequate pipe line system. The quality was acceptable for drinking, but cannot be recommended without proper treatment. The water quality of the streams is poor in certain places, which indicates pollution from household waste and agriculture, but in general the quality of the streams was acceptable.

The household economy, in relation to income, indicates very large differences in income levels, the Non-Thais are the poorest group, and the non-farming the richest. The non-farm activities are present in the village however as an alternative livelihood strategy in general, the non-farming activities are not a possibility, as it often requires education and capital.

Lastly, the implementation of the Nonthaburi National Park will affect the villagers' livelihood strategy as this will cause an increase of the use of the remaining available natural resources in the area. In relation to the present lack of title deeds along with the increasing population growth could be see as feasible explanations, as to why the natural resources are degraded, which the villagers in the present are depending on in their choice of livelihood strategy.

The conclusion is that some of the natural resources are degraded, due to the increasing population that has put pressure on the available resources. We find that the livelihood strategies in the village are greatly depending on the access to the natural resources. Alternative income activities are not a common strategy in the village, due to the relative low level of education and capital to invest in shops.

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Appendix 1 Soil

The result of soil testing

No.	Farmer	Soil Test					Type of soil	Slope (%)
	Crop	N	P	K	pH	NH ₄ ⁺		
1	Mr. Wangya Saesong Maize	VL	>25	60-90	6,5	L	Clay	25%
	Maize	L	>25	<60	7,0	L	Clay	25%
2	Mr.Panya Wisetkantrakhorn							
	Rice	VL	<10	<60	5,5	VL	Silt Clay Loam	18%
3	Mr.Yau Saeher							
	Rice	VL	10-25	<60	5,5	VL	Clay	18%
4	Mr.Yangao Saesong							
	Mango	VL	>25	<60	5,5	VL	Clay	10%
5	Mr.Wong Pitcham							
	Mango	VL	<10	>90	6,5	VL	Silt Clay Loam	10%
6	Mr.Jakkapan Saesong							
	Lychee	VL	<10	<60	6,0	VL	Silt Clay	25%
7	Mr.Wang Saeher							
	Lychee	VL	>25	<60	6,5	VL	Silt Clay	30%
8	Mr.Jang Saeher							
	Fallow Land /5 Years	VL	>25	<60	5,5	VL	Silt Clay	45%
9	Conservation Part of the forest (Dong Seng Forest)							
		L	>25	60-90	7	L	Clay	26%
10	Utilize Part of the Forest							
		VL	<10	<60	6,5	L	Silt Clay	55%

Source: Document of Soil Chemical properties for evaluate soil fertility in Thailand
Standard values:

Ranges of values of concentration: VL: Very Low, L: Low

Ranges of values of slope: 0-10%: Low land, >10 %: Upland

Standards Levels: Phosphorus (P): Measured in particles per million

Low: <10, Medium: Between 60 – 90, High: >25

Potassium (K): Measured in particles per million

Low: < 60, Medium: Between 60-90, High : >90

Appendix 2 Drinking water

Appendix No.2 Quality of drinking water

To give an overview of the water resources conditions in the village we made a sampling on different places around the area.

A specific objective was to evaluate the quality of consumption water (for drinking and cleaning). The ten places that are chosen are the most important places where the locals' collect water in Ban Song Khwae. The samples were tested for five (5) physic-chemical characters.

When the level of these characters varies from the standard levels for water used in consumption, it can be considered as an indicator of some kind of pollution.

The standard values of water for consumption

ph level : 7-7.9. Electroconductivity : Major or equal to 200 microseconds per centimeter

Salinity: 0.1 mg/l.

Total Dissolved solid: (TDS) Major or equal to 180 mg/l (milligrams per liter)

Phosphate particles: The presence of phosphate means contamination for fertilizers

Places	pH	TDS(mg/l)	Salinity (%)	Electroconductivity(Us-cm)	Phosphate Particles presence (mg-l)
1.Tank of Water	8.26	134.1	0.1	268	0
2. End of the village	8.16	135.1	0.1	270	3
3.Baan Namtok (Household group)	8.45	121.1	0.1	242	0
4.Salai Head Water	7.67	154.1	0.2	308	0
5.Song Khaew School	8.55	121.0	0.1	242	0
6.Tank of Song Khaew School	8.46	120.5	0.1	241	0
7.Sanien Drinking water group	8.29	145.8	0.1	292	0
8.Water source from Sanien Creek	8.44	101.7	0.1	203	3
9.Tank for consumption of Baan Song Khwae	8.64	102.9	0.1	206	0
10. Household	8.35	133.8	0.1	268	0

Appendix 3 Stream water

QUALITY OF WATER IN THE SALAI AND SANIAN STREAMS

In Ban Song Khwae the main streams are the Salai and the Sanian, both of which flow through the area, including the area where the villagers' houses are concentrated, part of the forestall area, and the area with the most number of sites utilized for agriculture or the area with most pollution due to the concentration of farming practices.

In order to study the actual water quality in regards to extent of pollution, and to understand the influence of agricultural practices on the quality of these water bodies, seven points located in strategic areas were sampled and tested. These areas include the area before the village, the area near to the intensive agriculture, and the area after the end of the village. Testing of some basic parameters was carried out, such as testing for phosphate to find possible residues of fertilizers, variations on other significant chemical values, as well as pH, salinity and electroconductivity to detect the presence of alkalis, acids and/or salts and to determine their concentration. Amount of total dissolved solids was tested to determine the quantity of solid particles that are present in the water in question (such as grains of dust or sand, and other particles from surfaces washed and chemically carried in the water). The physical factor of flow was tested to determine speed of the current. These physical-chemical parameters together comprise specific indexes to describe the conditions of a water body. It is possible to compare and discuss these results with the standards of acceptability for stream water, which is sometimes used for drinking water as well in the area.

Bioindicators make up the other parameter that was measured. Due to their presence and abundance in population numbers, bioindicators can be used as indicators of good quality water, or in the opposite case, as indicators of pollution. This depends on the capacity of the animal to adapt to specific environment conditions.

Bioindicators groups:

Animals that need very clean water: B (Stonefly)

Animals that need clean water: F (Prawn), G (Dragonfly, Damselfly)
H (Mussel, Cokle)

Animals that can live in fairly dirty water: L (Shrimp, Frog), M (Snail)

Animals that can live in polluted water: O (Non-biting midge larvae)

Animals not bioindicators but the abundance of these means good biodiversity and good aquatic conditions: B+ (Crabs, trapdoors, whirligig, diving beetle)

Range of water quality:

- Excellent: E (Very high concentration of oxygen)
- Good: G (High concentration of oxygen)
- Average: A (Moderated concentration of oxygen)
- Poor: P (Low concentration of oxygen)
- Very Poor: VP (negligible concentration of oxygen)

Location		Description of the location	Salinity %	pH	EC $\mu\text{s/cm}$	TDS Mg/ L	PO ₄ Mg/L	Flow Cm /sec	Bio-indicators	
No.	Stream								Group/ Total Individuals	Range of water quality
1	Sanian	Area before the village. Interface between Upland and low land.	0.1	8.34	157.6	78.8	1.5	97	O/1, H/3 G/2, M/1 B+/7	P, G G, A
2	Sanian	Area of intensive agriculture located on Upland	0.1	8.48	193.5	96.8	0	80	F/1, M/1, L/1,G/2 B+/3	G, A A, G
3	Sanian	Area/Middle of the village. On upland. Store (accumulation) of domestic residues	0.1	8.42	206.0	103.2	0	4.3	Non animals	VP
4	Salai	Middle of the intensive farming area, poultry practices, and rearing of pigs (Stock of organic residues)	0.1	8.48	192.8	96.4	0	632	L/3, M/7 G/5,B+/5	A, A
5	Salai	Area before to the village. Interface between upland and low land.	0.1	8.37	184.1	92.0	2	1032	M/1, B+/6	A
6	Salai	Area at the end of the village. Semi lowland / interface Store of various residues in decomposition giving off bad smell.	0.1	8.42	184.3	92.3	3.0	283	Non animals	VP
7	Intersection Salai and Sanian	Area on lowland. Located in proximity to the conservation forest	0.0	8.48	195.3	97.6	2	420	G/1, F/1	G, G
Average Sanian/Salai 1			0.1 / 0.1	8.42/ 8.42	200/ 190.7	92.9/93.5		*	Sanian: Approx.60%A Salai: Approx.60%P	

¹ On the calculation of the average it was not included the point number 7. The results on point number 7 can be compare with the two averages below in the table.

* The big differences do not permit calculate the average.

EC $\mu\text{s/cm}$: Electroconductivity measured in microseonds per centimetre.

TDS Mg/ L: Total dissolved solid measured in milligrams per litter

PO₄: Phosphate measured in milligrams per litter by colorimetric test.

Range: 0 – 3 mg/l in according with Dr. Orathai M

Standard values for streams: Salinity: 0.1, p H: 5-8.3, EC: 200, TDS: 200

Sources - Standard for examination of water and wastewater. Pronouncement of National Environment Committee No.8 (1993). Published in the government document number 111 part 16 on February 1993.

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- Dr. Orathai Mingtipol, Dep. of Landscaping and Environmental Conservation, Faculty of Agricultural Production, MJU.

Appendix 4 Conservation community forest

Forest Conservation Inventory

Characterization of the forest

This area is located at an altitude below 800 m. It has a density of plants such as mature trees, seedlings and young trees and herbs. This is related to high moisture in the area, which permits the development of an integrated and mixed habitat. It provides habitats for different kinds of insects, birds, rodents, and snakes which live around some large outcrops of rock.

The diversity in plants is increasing because there is a large number of herbs and specific small plants in reproduction such as Zingiberaceas and ferns. The families of old timber trees are quite diverse.

Dipterocarpaceae, a tree used for timber, is dominant in the forest due to its presence as a large number of species and individuals in comparison with other groups. At the same time the BA is also higher, which means that is not a new generation and is representative of an old group of trees.

The number of Sterculiaceae individuals is also quite large and their BA is also high, which indicates that this family is also dominant in the area. However, is not possible to assess its value because no information was given by the key informant about the utilization of this group. The Leguminosae family is another representative group in the forest and it also has a high BA value, indicating that it represents a dominant group of trees. The *Xylia xylocarpa* species are also dominant groups and it is especially useful as timber for making furniture or soft structures, and also for making windows and house posts. For the Bignoniaceae group, we found different individuals but their BA values were quite low, which means that this group is successful in reproducing and is thus in the process of reproduction. The people sometimes use its young fruit and leaves for consumption. The group of Euphorbiaceae is also occasionally used for its edible fruit, and its leaves used for medicinal treatments.

The plant diversity is related to the conditions of the soil, which are characterised by good availability of basic nutrients and ability to retain moisture. Based on this description it is possible to recognise conditions that are typical of a semi-evergreen according to the classification of the Forest Trees of Northern Thailand (Gardner S, 2000).

Inventory tables

In a representative part of the forest which looks like a good example of the Evergreen Thai forest, we decided to demarcate a square measuring 40 m x 40 m and to make an inventory on four plots/areas as described in the chapter on Methodology.

The table shows the local name of the trees, the Diameter Breast

Height (DBH) that was obtained from measurements of the tree trunk at the breast level, the taxonomic family name, and the tree Basal Area (BA). Basal area means the cross-sectional area of the tree trunk expressed here in cm². Tree Basal Area (BA) was calculated using the equation $BA = \pi r^2$, where $\pi = 3.14$ constant, and r = radius of the tree trunk, obtained by dividing measurement of tree trunk diameter by two.

This appendix includes data describing the essential characteristics of the environment. The following data is shown: Number of seedlings; Slope gradient of the plot/area; Aspect of plot given by cardinal point. Names of other plants that were found in the plot area are also given, however their population numbers are very small.

The number of seedlings was counted, which is the youngest group of trees between approx. 15 to 100 cm tall. The reason for doing this was that the seedlings represent natural stock which will become a new generation of trees and play an important role in the maintenance of the soil by acting as a repository of organic matter and by helping the soil to retain moisture.

The Tables for the forest inventory for the conservation community forest is on the following pages.

PLOT No. 1

No.	Local Name/ Specie name (spp.)	DBH (cm)	Family	Basal Area(cm ²) (BA)
1	DoogChang/ Diospyros	39.9	Ebenaceae	1249.73
2	Sadau/ Azadirachta indica	6.5	Moraceae	33.16
3.	Deng / Xylixaylocarpa	41.5	Leguminoceae	1351.97
4.	Houi Ka Koong/Dongdam(Song nang)	9.5	Annonaceae	64.29
5.	Dipterocarpus *	65	Dipterocaraceae	3316.62
6	Deng/ Xylixaylocarpa	40	Leguminoceae	1256.00
7.	Baccourea *	46	Euphorbiaceae	16.61

According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand

* It was only found the name of the specie

DBH= Diameter Breast Height

BA= Basal Area, calculated per tree trunk area. ($BA = \pi r^2$, $\pi = 3.14$, $r =$ trunk radius)

Total DBH= 2.49 m

Total BA= 7288.38 cm²= 0.728 m²

Plot Area= 100 m²

Environment characteristics

Herbs observed: Zingiberaceae Fern, Tao, Aung Maiy Na, Banana

Total Seedlings = 124

Slope = 15%

Aspect = E

PLOT No.2

No.	Local Name/ Specie Name	DBH (cm)	Family	Basal Area(cm ²) (BA)
1	Unknown •	45	Unknown •	1589.62
2	Mai Lid Mai or Peka /Oroxylum indicum	6	Bignoniaceae	28.26
3	Unknown •	20.2	Unknown •	320.31
4.	Non tree/ P.Pterocarpum	17.4	Leguminoceae	237.66
5.	Doog Chang or Plu kao Diospyros	6	Ebenaceae	28.26
6.	Dong dam / Alphonsea boniana	9.7	Annonaceae	63.58
7.	Por / Sterculia urena	16	Sterculiaceae	200.96

According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand

- Big trees (representative for use as timber)

Environment characteristics

Herbs observed: Zingiberaceae Tao

Slope higher than or equal to 30%

Total Seedlings: 76

Aspect = E

Total DBH= 1.2 m

Total BA= 2468.65cm²= 0.246 m²

Plot Area = 100 m²

PLOT No. 3

No.	Local Name Species	DBH (cm)	Family	Basal Area(cm ²) (BA)
1	Lin / Sterculia balanghas	195	Sterculiaceae	29,849.62
2	Mangifera indica*	14	Anacardiaceae	153.86
3	Por Hoo Chang/ Pterospermum acerifolium	5.5	Sterculiaceae	23.74
4	Yang /Dypterocarpus retusus	37	Dipterocarpaceae	1074.66
5	Yang pai/ Polyalthia viridis	120.50	Dipterocarpaceae	11,398.39
6	Por / Sterculia urena	48	Sterculiaceae	1,808.64
7	Peka / Oroxylum indicum	48	Bignoniaceae	94.98

According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand

* It was only found the name of the specie

Environment characteristics

1 CRUMB OF RAI BAMBOO

diameter= 7.30 m

No. of stems = 39

Average diameter = $4+3.3+3$ cm
= 3.43 cm

Herbs observed: Zingiberaceae, Wai, Fern, Rai Bamboo, Kakopmai, Chaipaseeda.

Total Seedlings = 53

Slope: 20 %

Aspect = NE

Total DBH = 4.68 m

Total BA = 4.440389 m²

Plot Area = 100 m²

PLOT No. 4

No.	Local Name Species	DBH (cm)	Family	Basal Area(cm ²) (BA)
1	Mai Lid Mai or Peka/ Oroxylum indicum	11.8	Bignoniaceae	109.30
2	Garcenia speciosa •	7.5	Guttiferae	41.26
3	Unknown*	6.3	Unknown *	31.15
4	Unknown*	72.5	Unknown *	4,126.75
5	Forest Longan / Dimocarpus Longan	69	Sapindaceae	3,737.38
6	Yang /D. retusus	6.3	Dipterocarpaceae	31.15

According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand
* Big trees considered as representative for use as timber

Environment Characteristics

Herbs form =Zingiberaceae, Fern, Rai Bamboo

Slope = 30 %

Total Seedlings = 125

Aspect = E

Total DBH= 1.73 m

Total BA = 0.807699 m²

Plot Area = 100 m²

Total BA of Conservation forest

39.69 m² / 0.04 hectare = 39.69 m² / 0.25 Rai

Appendix 5 Utilization community forest

INVENTORY OF THE UTILISED PART OF THE FOREST

Characterization of the forest

This area lies at an altitude below 800 m. (between 500-700 m).

We gathered a general view of the forestry area in the specific utilized zone. On the area higher than the utilized zone the structure of the forest looks like dry dipterocarpus, on a steep slope (approx. 40%). We found a valley to the east where part of forest had some herbs, grasses and seedlings growing. This valley does not appear to have the usual number of trees for the area, which may be a possible result of disturbance due to landslides and possible human activities or use for the local people. Following this we found very tall trees that form an area of semi-canopy, but the density of the trees in general is lower than in the area below. Close to it there is a small area with a high density of bamboo. 500 meters further uphill the characteristics of the forest correspond to a dry forest, with very low moisture and the presence of various rocky areas. The slope of this area is approx. 48%.

The general characteristics we found after a transect walk around the entire area that is used for the local people are made up of a group of features. This specific area is located between a ridge and a stream that was quite dry due to the dry season. There is a part of young forest that is in the process of growing due to previous use of the area, and here approx. 35 % of the plants are seedlings and a few young trees. Therefore this area can be called secondary forest. There is an extensive area with a layer of leaves that come from deciduous trees. The layer of canopy forms 65% coverage and its height is about 25 m. The soil looks dryer than in the conservation area, which causes the moisture retained to be low and the forest looks generally drier. These conditions pertaining to the utilised zone - low moisture and low numbers of trees - give a picture of a simple forest area and it is possible to associate it with the deciduous and bamboo forests with intermediate moisture such as described in Gardner Simon.

This area is a good example of the influence of the phenomenon of disturbance. It influences the natural cycle of forest development and alters the climax type that could occur in the natural and particular conditions of the area. This phenomenon started in the area when the local people exhausted the resources of timber trees and then decided to start using bamboo, according to the data gathered from the first meeting with the headman. Representative species that tend to survive in areas such as this are *Xylia xylocarpa* and *Pterocarpus macrocarpus*, which we found in plot A. These species belong to the group of the five most valuable timber trees in Northern Thailand (Garner, 2002).

The area to be inventoried was divided into two plots, A and B, each of these plots is 20 x 20 meters. In Plot A, the population of bamboo is low, but there are some timber trees and herbs. In plot B, the population of bamboo is larger than in the first one, and the population of timber trees is thus lower. An indication that this area had been used was given by a large number of bamboo stems that were cut.

While conducting the inventory of the forest we were afforded the opportunity to be guided by a key informant (Mr. Yua Saeher) in the forest. Mr. Yua Saeher is local farmer. From his experience and knowledge about the forest and about the use that the local people make of this area we gathered specific information. Regarding the changing seasons in the forest, the people in Ban Song Kheaw harvest bamboo shoots during the dry season for selling and for their own consumption, while in the rainy season - around October - they collect mushrooms in the forest. The mushrooms are used for their own consumption.

There are four kinds of bamboo: “Pai Rai”- used in construction of houses and stables, “Sang” - used for building the floors and walls of houses, “Pai Kao Larm” - used for making rice sticks, and “Pai Bong” - used for making baskets, furniture, and chairs. The informer added that all kinds of bamboo are useful for bamboo shoots.

Regarding the use of the trees, for timber local people use Pradoo Pa and Dang, while koi and Pao are used as medicinal plants, using the leaves in infusions. Some people use the edible fruits from Makok and Kraton, and also Mango, which is a common tropical edible fruit.

Tables of inventory for plot A

Inventory of Bamboo (*Dendrocalamus strictus* sp.)*

Local Name	Total Number of trees/Plot	Extreme Cases				
		Individual/ No. Stems	Stem Diameter (cm)			
			D1	D2	D3	Diameter average
Sang	11	S1 / 11	5.0	4.7	5.0	4.9
		S2 / 13	4.0	4.7	5.1	4.6
		S3 / 20	3.5	4.4	5.2	4.3
Pai Kao Larm	1	K1 / 17	6.5	6.0	4.7	5.7
Pai Rai	1	R1 / 11	3.5	3.8	4.0	3.7

* According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand
The total of the average of the diameter = 23 cm = 0.23 m

Inventory of Tree species

Local Name	Total Number of trees/Plot	Individual	Species(sp.)	Family	DBH (cm)	BA (cm ²)
Pradoo Pa	5	P 1	Pterocarpus macrocarpus	Leguminosae	29.2	669.32
		P 2	Pterocarpus macrocarpus	Leguminosae	15.5	188.59
Koi	2	K 1	Streblus asper	Moraceae	6.8	36.30
Dang	6	D 1	Xylocarpa	Leguminosae	18.5	265.77
		D 2	Xylocarpa	Leguminosae	13.7	589.35
Makok	1	M 1	Spondias pinnata	Anacardiaceae	22.0	379.94
Ma Mounng Pa (Mango)	1	Mm1	Mangifera indica	Anacardiaceae	55.0	2041.78
Yang	2	Y 1	Polyalthia Viridis	Dipterocarpaceae	30.0	706.50
Pao	3	P 1		Euphorbiaceae	21.3	356.13

According to the taxonomic classification in Gardner Simon et al and the knowledge and guidance of Dr. Kriangsak. Dep. Of Landscape, Maejo University, Thailand

DBH : Diameter Breast Height Total DBH= 212 cm = 2.12 m

BA : Basal Area, calculated per tree trunk area. (BA = πr^2 , $\pi = 3.14$, r = trunk radius)

Total Basal Area= 52.3368 m²

Total plot area = 400 square meters

Tables of inventory of the plot B

Local Name	Total Number of Bamboo/Plot	Extreme Cases				
		Individual/ No. Stems	Stems Diameter (cm)			
			D1	D2	D3	Diameter average
Pai bong	12	B1 / 5	5.8	4.0	6.0	5.26
		B2 / 16	6.7	6.8	5.3	6.26
		B3 / 28	3.6	4.5	5.3	4.46
Pai Kao Larm	16	K1 / 31	7.8	5.3	4.8	5.96
		K2 / 18	5.2	5.8	5.0	5.33
		K3 / 7	6.5	5.0	6.8	6.10
Pai Rai	7	R1 / 12	3.8	4.0	4.2	4.00
		R2 / 7	3.0	3.5	4.3	3.26

* According to the taxonomic classification in Gardner Simon et al.
 Total of the average of the diameter = 40.63 cm = 0.4063 m

Inventory of Tree species

Local Name	Total Number of trees/Plot	Individual	Species(sp.)	Family	DBH (cm)	BA (cm ²)
Kraton	1	Kr 1	Sandoricum Koetjape	Meliaceae	16.8	221.59
Yang	1	Y 1	Polyalthia viridis	Dipterocarpaceae	11.2	98.47
Mai Doo	1	Md 1	Dalbergia	Leguminoceae	27.0	572.26

Total DBH = 55cm = 0.55 m Total BA = 892.32 cm² = 8.9232m²

Total BA of Utilised part of the Forest

11.74 m² / 0.16 hectare = 11.74 m² / 1 Rai

Appendix 6 Questionnaires guide

These are not included in the electronic version.

Appendix 7 Questionnaire results

Regarding our questionnaire we have decided to take out the most important issues to go further into the issues in the in-depth interview.

To gather a more comprehensive knowledge of the data collected in the QN, the table below gives the average value of different social aspects within the stratification-groups. The respondents were mainly men (only one out of the 20 was a woman), within the age of 27-63 years old. All the respondents had an AU-card, which is a health insurance card that gives them access to hospital treatment. We also asked into the household economy in the QN, which can be seen in appendix 11. The numbers in the table below is either given in average, or in fraction – e.g. in other occupation for Many-rai 1 out of 6 respondents is doing other occupation, etc.

The table below shows thus the most relevant facts, we found, from the QN: the average number of household members within the different categories in relation to the amount of not contributing members. This gives the impression that the working members in general are few, compared to the non-working members – mainly children, and indicates that the respondents had relatively many children, around 5-7 per household.

The education level shows that Many-rai and Non-Thai's have a lack of education, whereas the Less-rai and non-farmers more are educated, normally having 4. or 6. Grade. An explanation for lack of education could be due age e.g. the high average age for the Many-rai or low possibility getting educated, e.g. the Non-Thai's, even though their children now are allowed to go to school without any fees.

Other occupations than farming are expressing the off-farm activities, such as knife-making, sewing etc, and does not included the non-farm practices. The respondents that labor for other farmers is high for less-rai and non-Thai's as seasonal and occasional work, when an extra income is needed. The NTFP is only the most common ones mentioned, and only for own consumption purpose. However, two Non-Thai's and one non-farmer did also sell some of their collected NTFP, mainly bamboo (incl. shoots), mushrooms and herbs, but in general the NTFP was for own consumption.

Table of the household results from the questionnaire survey is on the next page.

Table of household results, QN

Group	Age Average	Member of househ. Average	Non-contri.members, ave.	Education Level	Other occupation	Labor for others – in agriculture	NTFP		
							Bamb	Mush	Fuel
Many-rai	60	4.5	3.2	None edu	1/6	1/6	4/6	2/6	4/6
Less-rai	48	3.8	2.7	3/7 edu	2/7	4/7	5/7	2/7	3/7
Non-Thai	43	3.2	4.8	¼ edu	2/4	2/4	4/4	4/4	4/4
Nonfarm	41	4.3	2.8	¾ edu	None	None	¾	¼	¾

The data collected about agriculture is showing the trends in amount of landholdings and what is grown on these. In this table the two main crop tendencies are mentioned – namely rice, (highland rice), and orchards (mainly lynchee, and a few mango). Regarding the livestock (pigs and hens) it was mainly in the non-Thai groups, with a few exceptions in the many –and less rai-groups. Fertiliser is used mainly by the Many-rai and Less-rai groups, as the Non-Thai can in general not afford it, but pesticides are more commonly used among the Non-Thai’s and Non-farmers. The water supply to the fields comes mainly from rain-fed and some use pump-system.

Table of agriculture

Group	Plots nr. Averag	Rai Average	Rice (rai) Average	Orchards Average	Che. Input		Water supply	
					Fertiliser	Pesticides	Rainfed	Creek
Many rai	2.8	44,6	22,6	14.8	5/6	3/6	4/6	4/6
Less rai	1.7	11.4	6.5	3.8	5/7	5/7	6/7	3/7
Non-Thai	1.5	8.5	5.5	0	¼	¾	¾	¼
Off-farmer	1.75	17	4.8	2.5	¼	2/4	¾	0

From the QN data we found following facts:

- There are often many non-contributing members in the family to support – many children.
- Off-farm income is often a common income activity besides agriculture, especially in form of labor activities.
- The education level differs within the groups.
- Agriculture tendencies are mainly rice and orchards, and some maize.
- The use of fertilizer and pesticides are quiet common
- The water supply was mainly through rain-fed, but some also used pump system.
- The Non- Thai’s are most dependent of the products extracted from the C.F. (mainly; fuel-wood, mushrooms, bamboo shoots), due to the low income level see appendix 11.

Appendix 8 In-depth Interview guide

This will is not included in the electronic version.

Appendix 9 In-depth interview results

In-depth interview: The statements are quantified after different groups, many-rai, MR, less-rai, LR, off-farming, OF and Non-Thai, NT. As there are 2 in each group, the numbers behind the statements like e.g. LR ½ means 1 out of 2 in the less-rai group have uttered this statement. The statements are the answers we gather, however some questions were not answered, either due to interpretation or no comments of the question and we have not taken these answers into this statement paper.

Land use tendencies

Crops

Crops now:

- Rice for consumption MR: 2/2, LR: 2/2, OF: 2/2, , whereas rice on rented land for own consumption NT: 2/2
- Orchards (linchee, mango, rambutan, orange) for selling MR: 2/2, LR:2/2, OF 2/2.
- Fallow land MR ½, OF1/2
- Cucumber, ginger (for own consumption) and pumpkin (for sale, mixed crops) LR 1/2

Crops (Past):

- Cotton for selling LR ½, MR 1/2
- Rice LR 2/2 OF ½ NT 2/2
- Ginger OF 1/2
- Maize MR 2/2, 1/2
- Use the same crops LR 1/2

Reason for change

Less labour intensive, low yield, low soil quality – higher yield with new crops MR ½ LR 2/2 OF 1/2

Government recommended long term crop planting OF 1/2

Everybody plants linchee – plant rambutan instead OF 1/2

Other tendencies in off-farming activities

Noodle-shop in house OF 2/2

Selling agricultural labour, 100Bht/day LR ½, NT 2/2

Retired from government office OF 1/2

Knife-making LR 1/2

Yield

His fruit trees are too young to give fruit LR ½, OF 1/2

Good yield and productivity – fruit trees MR 2/2, OF 1/2

Soil fertility

The soil is degraded MR: 2/2, LR 2/2, OF 2/2, NT 2/2
He thinks it is too expensive to improve the soil LR 1/2
Rocky soil MR ½, OF 1/2
No problems MR 1/2
Have to add more and more fertilizer each year, due to the grass – take all nutrients
MR1/2
Same crops being cultivated – no possibility of shifting cultivation LR 1/2

Location of the plots

Upland MR 2/2, LR 2/2, OF 2/2
Upland [rented other peoples fallow land, Non-Thai's.) NT 2/2
Lowland also MR ½, OF1/2

Water accessibility

Mainly depending on rain fed MR ½, LR 2/2, OF ½, NT 1/2
Use pump system, MR ½, LR ½, OF 1/2
Owns pump system MR ½
Borrow pump occasionally, cannot afford to buy one, MR ½, NT 1/2

Consumption water

In the dry season there is a lack of drinking water MR 2/2, LR 2/2, NT 1/2
Clean water for drinking , NT1/2
Have no problem with water for consumption [live on the 'right' side of the road] OF 1/2

Soil improvements

Use fertilizers some times MR 2/2, LR 2/2, OF 1/2
Dick holes around the trees, so the fertilizer does not wash off the upland field. OF 1/2
No problems with erosion MR 1/2
Thinks more trees should be planted, and believe that in 5-10 years there will be and improvement in water accessibility and forest cover OF 1/2
Has erosion, don't do anything to stop or improve the soil 1/2 NT
Leaves the soil for 3 years, otherwise he don't do anything. 1/2 NT
Fertiliser applied can't soak into the soil. The farmers are dependent on the right amount of water when they apply fertilisers on their fields. Too much water washes off both the fertilisers and the top soil. Too little water at the fertilisers can't be absorbed. LR 1/2

Natural resource degradation/land Use

Decrease in:

- NTFP MR ½, LR 2/2, OF ½, NT ½
- drinking water supply MR 2/2, LR 2/2, NT 1/2
- Water in general hold by forest OF1/2
- amount of trees has decreased in surrounding forests MR 2/2, LR 2/2, OF 2/2, NT 1/2

Reasons

This is all due to the growing population. All 8/8
This is all due to cutting the forest in the past MR 2/2, OF 2/2

Soil is degraded due to lack of trees to shade OF 1/2
Less trees in the utilization c.f. 1/8
No problem with sharing the nat. res. between the two villages.[c.f. & water, land) LR 2/2
Would like more land if possible (to do shifting cultivation) MR 2/2, LR 2/2, OF 1/2
Are very dependent on NTFP and there is a lack of these, NT 2/2

Past:

Plenty of NTFP, MR 1/2, LR 1/2, OF 1/2
11 years ago they could extent their land LR 2/2

Land tenure

Cleared the land himself, and claimed it as his own. MR 1/2, LR 2/2
Bought the land LR 1/2, OF 1/2
Got the land from family MR 1/2, NT 1/2
Rents land, NT 2/2
Have tenure, NS-3 over 3rai MR 1/2
He would like to keep the land for future generation, MR 1/2, LR 2/2, OF 1/2, NT 1/2
Keep land for security LR 1/2, OF 1/2, NT 2/2
Not for selling MR 1/2, LR 1/2, NT 2/2
Want to own the land for selling, MR 1/2
Have not enough land to support the family NT 1/2

Reasons for and against agriculture livelihood

Hope that his children would continue a living in agriculture MR 1/2, LR 2/2
Thinks that high education is important for their children LR 1/2, OF 1/2, NT 1/2.
Don't want children to go into agriculture OF 2/2, NT 1/2
No other possibilities than farming [for them selves] (due to age or lack of education)
MR 1/2, LR 1/2, NT 1/2
Thinks that there are other opportunities than doing farming e.g. city work MR 1/2, OF 1/2
If they got the land they would improve the land/soil quality, LR 2/2, OF 1/2, NT 1/2.
Political problem – everybody wants tenure, NS-3 but government cannot give it them,
but perhaps SPK – restricted for selling OF 1/2

RFD

RFD helps LR 2/2, OF 2/2
– to make roads, to keep the forest [fire breaks) and to preserve and protect forest
But they don't listen to peoples needs, are very restrictive MR 1/2, LR 1/2, OF 1/2, NT 1/2

Rubber plantation

Has never heard about the rubber plantation project LR 2/2, OF 1/2, NT 2/2
Would like to but don't have Thai citizenship NT 1/2
Has heard about it MR 2/2, LR 1/2, OF 1/2
- and are in the process of applying for it on fallow land MR 1/2
- no one in the village has followed their plan LR 1/2

- Recommends other villagers to go into the rubber planting project OF 1/2

National Park

No possibility of extension of farm land MR 2/2, LR 2/2, OF ½, NT 1/2

N.P.B will go around their agricultural land trust headman negotiation process MR ½, LR 2/2, OF ½.

They can not go into the forest and take firewood, NTFP etc LR ½, OF 1/2

Are worried and believes that some of their farmland and fallow land is being taken MR ½, OF 1/2

Have never heard about the NPB, but will beg the government to keep the land NT 1/2

Some will be affected by NPB LR ½, OF 1/2.

He and most other people in B.S.K will loose land. NT ½

The headman has listened to his needs, but the N.P. officers haven't. NT 1/2

The N.P. officers have already put up signs in some areas where the boundary is going to be NT 1/2

C.F conservation

Want to keep it because

- Tradition LR 1/2
- They believe the nat. res. belongs to the community LR ½, OF 2/2
- Keep to future generations MR ½, LR 2/2, OF 1/2
- NTFP, fuel-wood etc. MR 1/2, OF ½, NT 2/2
- Herbs and medicine, NT 1/2

Decrease in trees in conservation c.f., due to overuse of the nat. res. OF 1/2

Are scared to use the conservation C.F because he is scared of doing something illegal [sign has been put]. NT 1/2

Think they will loose some of the cons. C.F, but will not be affected by this, as they don't use it (NTFP) LR 1/2

NGO

Don't know anything to Hug Muang Nan, MR ½, LR 2/2, NT 1/2

Listen to the Hug Muang Radio MR ½, OF 1/2

Heard they have helped with road-building and performing complaint-letter MR ½, NT 1/2

Helped to get budget to drinking water – pipe system - in the village MR ½.

Protect the forest and keep the capitalists out and education about hmong culture OF ½.

Notes and statements

Less-rai group comments

- Has two wives living in the same house. The minor wife has no thai citizen ship card. They lived in a nice brick house (9 years old). He has a big TV and stereo.
- New-comers shouldn't be aloud to get ID-card because there already now is a lack of nat. res. New-comers use to be humble and respectful, but now they just take the res.
- The villagers can get village loan from the rich people in the village – to 5 % i. rate/year – more expensive than bank loans and from village subsidy foundation.

Non-farmers groups comments

Ideas about new arrangement of the agricultural trends: 1-2% hill-tribe production, 10% less-land demanding crops e.g. chillies. The rest should make orchards and off-farm activities. Has presented this to headman and other villagers, think villagers should adopt the plan themselves, as the education is very important, and they should learn about other peoples situation/needs.

He thinks that it is important in relation to protection of the natural resources that both the local people and the government work together. Otherwise all the protection efforts will fail.

Non-Thai group comments

- Price on rented land varies depending on the quality/fertility of the soil.
- Would like to invest in lynchee because this is less labour intensive and a 'one' time investment that benefits for many years.
- Government project [solar powered pumping system] does not benefit people in the Non- Thai area. Only benefits people further up the mountain. The idea is to collect water in a reservoir for agricultural use].
- Non-Thai citizen are not allowed to participate in groups, not even Hmong cultural group and they are the latest arrivals in the village (our respondents had been there in 7-16 years)
- Is married to a man who has no Thai citizenship, but she has got herself. The man has to wives and she is the minor one. Remarried and have two kids with this man, but have more kids living in the village with relatives. She would like to live in the village again one day.

Addition from agriculture interview: In the agriculture interview, were asked into similar issues as in-depth household interviews, and many statements mentioned above was similar in this interview, e.g. farmers found the soil fertility low, most use fertiliser etc. however we gather additional information and statements regarding the farming activity through these interviews, which are listed below:

- Out from the amount of fertiliser used, it was discovered that some farmers do not always use the right amount of fertiliser, or apply in an optimal way at an optimal time of year. We talk with some farmers about this problem and found out that it was often a question about lack of know-how to use the fertiliser optimal.
- Some of the interviewees, 40% of them, that have plots for growing crops on upland ground experience problems with erosion. Some of them consider that this problem is due to the intensive use of the soil.
- For the control of pests on the crops they use Grammoxone. Some farmers have knowledge about the specific control that is required for the use of Grammoxone and about the effects it has on the soil which can increase the acidity of the soil.
- Regarding soil improvements, chemical fertilizer is commonly used, but they do not use alternative methods such as organic matter, nor any soil improving plants as legume-plants for providing the soil with nitrogen.
- Another alternative to improve the fertility of the soil is to fallow land, but this is not very common in the area due to limited area of land.

- Fungus in the soil can occur when growing ginger.
- They do not use natural or domestic alternatives in the control of animal and plant pests for biological control in the orchards. Use of plants that repel insects and use of other plants because of their bad smell, or no smell and thus attractive to animal pests, and they release a chemical substance into the soil that limits the growth of other species.
- There are functional problems with the pump irrigation system, as the pipes often get blocked by leaves and mud.
- The amount of drinking water is perceived as enough regarding the requirements for how much water is needed, but in the dry season it is insufficient. According to the responses regarding agriculture in the in-depth interviews, the majority (7) reported that the quality of the water is not very good due to its yellow colour and limestone sediment. Another problem concerns the quantity of the water that they receive, which they consider that is insufficient. This has been an ongoing problem since the installation of the tap water system in the village in 2001 it and continues today). People close to Sanian stream use the water from this source as an alternative in dry season more frequently.

Table of agriculture interviews

Farmer / Crop	Use of fertilizer		Last application	Chemical insecticide	Problem of erosion on the soil
	Chemical				
	Yes	No			
Mr. Wangya Saesong / Maiz	x		May / 2003	Grammoxone	Yes/It is in process
Mr.Panya Wisetkantrakhorn/Rice	x		May /2003	Grammoxone	Yes/It is in process
Mr.Yau Saeher/ Rice		X			Yes/Because intensive use of the soil
Mr.Yangao Saesong/Mango	x		June / 2003	Grammoxone	No
Mr.Wong Pitcham/ Mango	x		May / 2003	Grammoxone	No
Mr.Jakkapan Saesong Lychee	x		June / 2002	Grammoxone	No
Mr.Wang Saeher Lychee	x		May /2003	Grammoxone	No
Mr.Jang Saeher/Fallow					No

Appendix 10 Key-informant results

Headman interviews

First interview with the headman assistant of Ban song Kheaw Mr. Wang, Date: 16/01-2004.

Address: House-number: 44, village nr 5, Nan province, 50 years old, 4. Grade education. We used this first interview to gain general information about the village, especially concerning issues as history of village, facts about the village and facts concerning tendencies and problems in agriculture.

The history of the land starts for the present villagers for 27 years ago where the military forced the Hmongs away from their homes about 40 km north from Nan, because the military had to fight communism, coming from the borders to Laos and Burma. The Hmong people moved down south and settle in Ban Song Kheaw.

A man called Mr. Lang bought the households of the village, which was and still is a NS-3 certificate, which is around 20 rai and relatives to Mr Lang settled down here. The total amount of rai, belonging to the village, is around 15000 rai. Religion is mostly Buddhism but about 30 households are Christians, and most of them believe in spirits.

Most villagers have Thai citizenship, but approx. 30 households do not have it. As the Hmong hill-tribe of Thailand lived isolated in far north Thailand, the government never came up to register the Hmongs. This is the reason why they, as they came down to Ban Song Kheaw, didn't have Thai citizenship, but had to apply for it, as they are allowed to get Thai citizenship if they are born in Thailand. The non-Thai's have a greencard and if they behave well (don't do any crime) they can get an ID card. However, to get a citizenship when having ID card might take up to 20 years. The restrictions from not having citizenship are that they are not allowed to go outside the Nan province, they are only able to education up to 6. Grade, and they are not allowed to vote.

The soil quality in the household area is difficult to cultivate, as it is hard pan soil. The fields are spread along the river; in the highland the plant rice – sticky rice mainly – and in the lowland the grow maize. In the midland the only grow lychee. They also grow fruit trees, which are mainly planted in shady areas – mainly in the mid-lowland, where there is moisture soil, and gives most output/high yield. All the crops are thus planted where they give most output/yield.

Most households use fertilizer, the headman assistant uses 15-0-0, nitrate. He uses herbicides if there is a lot of grass two times, if only little grasses he only use 1 time.

Second interview with the headman mr. Jarod, Date: 18/01-04

We used this interview to gather more information about the agriculture in the village, where the fields were located by doing a social mapping, to hear headman's opinion on the problems in the village and to collect our target group.

The number of population was approx. 1685 people, with Thai citizenship there were 1447 (735 men, 712 women), and there were around 238 without ID card (and thus without Thai citizenship).

By making the social map, the headman explain that the village original was around 2500 people, but the village recently decided to spilt up into two villagers. The reason for this was that the village was too big for one headman to administrate and as well that the governmental support for development (for example governmental support to the fertiliser group in a village) would benefit more, if the village became two separate villages with different budgets.

According to the headman there are no conflicts between the two new villages in sharing the natural resource e.g. community forests, water resources. The village is divided where the river goes through and seems to be a quite natural boundary, see social map.

The natural resources: the forest resources; the headman finds it important to maintain the conservation C.F. for next generation, studying purpose and for extracting mushrooms, herbs and nat. medicine. The utilisation C.F should be maintained for NTFP use, except for logging purpose.

The water resources come from water shed in the conservation C.F the water is collected in a water tank that provides the village with water. There are 4 lines going to the village, which means that the pressure of the water consequently falls. If all the 4 pipes are open at the same time, the water tank will soon be emptied, so two water lines are open 2 hours, and then shifting to two other lines for two hours. This water system is open from 4 am to 10 pm. The pipeline system was donated by TAO in 1994. There is a problem with the size of pipes some places in the village, as the pipes here only are 1,5 inches instead of the optimal 2,5 inches. This gives problem with water supply for these households, and to solve this problem, new pipelines are needed. However the villages, as it is now, cannot afford to solve this problem alone, and plead for GO or NGO support.

Land resource: For an overview of the plots and crop tendencies, see appendix social mapping.

One problem with the land is the low soil fertility, which is a result of the limited amount of plots. The farmland is further degraded due to higher use of inputs as fertiliser, herbicides etc., which is used to get higher yield in the already degraded plots. The villagers don't wish to use a lot of inputs on the degraded plots, but as there is no possibility of extending the land, it is inevitable. In general the villagers would prefer more sustainable agriculture system, for example rubber plantation, but they need the government to support and develop these new farming methods.

The villagers have made a complaint letter to the government

TAO key-informant interview

We wanted to gather more information about the conflict of the National Park boundaries from a GO-view, as this could give us a comprehensive picture of the core issues. As mention below, TAO is in the middle of the negotiations between the government and villagers, but trying to be as neutral as possible.

TAO is the local government in Thailand, and with its decentralisation role it works as a communication link between the village and the government. TAO is financed by collecting taxes themselves and from the government; 25 % of GNP goes to share out between the TAO's, the amount is depending on size of TAO. This TAO is level 5, meaning that it is the smallest TAO-group, and receives the smallest amount of money.

In the context of the National Park, TAO has been involved with the process and negotiations, but only been working as a neutral linkage between the stakeholders (mainly the government and the village), and are in this context not able to make any comprehensive decisions.

The problems as TAO sees it, is that the government has problems with implementing new rules and laws in the village community, as the villagers often don't understand the reasons and necessity for these rules. For example, the villagers do not respect conventional rules or understand the government needs for modernising and educating the villagers. However the reason why the villagers don't respect the rules are often due to religious, tradition or cultural convictions, and it might be difficult to the government to change these convictions.

Regarding the implementing of National Park, the TAO believes that the government will agree to let the villagers continue farming their plots, but only farmers with long-term crops, like orchards, can be sure to keep the land for 10 years. Thus farmers with short-term crops, as rice and maize, can not be sure of keeping their land. There is no possibility of extending the land. The government will however be flexible in writing a document that confirms the villagers' right to farm, but this is only if there is a clear regulation. The government will be flexible regarding the NTFP collection in the NP – the villagers will be allowed to collect for own consumption. TAO confirms that some of the conservation C.F., which in the original map of the NP boundaries lies within the NP, is probably going to be taken from the villagers. The reason is that the government suspect illegal logging activity in the conservation C.F and to protect the villagers against themselves, this forest would be best protected as a part of the NP.

Another problem TAO have experienced is a general confusion about selling the land without appropriate certificates. There are no title deeds on the farmland of Ban Song Kheaw, but the villagers will wish for SPK or PBT-5 certificate, if ownership is impossible. SPK is not a formal title, cannot be sold or get loan security through this dokument (Basic info Paper), but 'lowest level' of having tenure. PBT-5 land is the first step towards official title deeds, which means that there is paid tax on the land, even though there is no ownership. NS-3 enables the farmer to sell, transfer and mortgage land – gives ownership of the land (Basic info Paper).

TAO has experienced that people from towns come from villages and want to pay tax on this recently acquired land as if they owned it, like a NS-3¹⁸ certificate. The farmers in the villages are thus begun to sell their plots, without the rights for selling. This can become a future problem, especially if the villagers sell to town-people, who wants to build resorts (e.g. hotels) on the land, as this will have a negative impact on the forest reserve area.

The RFD (Royal Forest Department) key-informant interview

The RFD is a GO department under the Ministry of Agriculture and Co-operatives, and is declaring the National Park (Basic info paper). The key informant we interviewed was from the watershed unit in RFD.

There are two kinds of regulations in relation to the National park: government/state restriction and community restriction. Whereas the first mentioned is already settle by the government, the community restrictions look at cultural, religious forest use and regulate to prevent people from illegal logging. The declaration of the park is supposed to be a joint process by government and villagers, but in reality the government is making it. There is some theoretically criteria for drawing the boundaries, such as demarcation and environment.

The process of drawing the boundaries: The villagers have to go to the RFD office to show how much land they are cultivating. The RFD has an investigation process to avoid the villagers claim more land than they actually 'had' before NPB were set, in order to extent the land.

In practise RFD are also trying to meet the villagers' need, by looking at:

- Cultural / livelihood in the community
- Individual needs – who is poor? What is the education level etc.
- Economics; income level and occupation
- Eco-system; how do the villagers utilise the land and community forests

After gaining this information, RFD analyse the situation in the village and try to meet some of their needs in respect to more education and information on how to protect the land and forest.

For example RFD has in some villages given fruit trees, which is a common strategy used by the government, as a subsidy way from short-term crops as rice, which degrades the land more. The RFD has a difficult task of changing the farmers' production habits, especially the older villagers, and education about intensification in a sustainable manner is very important. Shifting cultivation, using fallow plots, RFD finds as a bad idea as trees could have grown on this unused land instead, however the key-informant acknowledge the farmers' dilemma, with continually farming on the degraded plots. Despite the support for new farming tendencies, the population growth is another problem, the RFD must consider, resulting in the farmers are only allowed to hold maximum 5 plots of land.

Thus the government are supporting orchards, but earlier projects have not always succeeded – the government once encourages planting mango trees, but never came back and helped the villagers taken care of them. The lesson learned is that education and advise have thus to come along with the support. The government has also begun to recommend the villagers to plant rubber trees, giving 6000 Baht for supporting farmers in this direction. The rubber tree production used to take place in Southern Thailand, but as the labour is cheaper in Northern Thailand rubber trees could become a possibility. A new agreement between the rubber production countries, Malaysia, Indonesia and Thailand to co-operate instead of compete (establishing a cartel), could make the rubber price stable and provide a better income for the farmers.

Regarding allocating land certificates to the villagers, RFD believes that the main motive of wanting the certificate is for the sake of selling it – possibly to capitalists, who will change the land into resorts etc. This will eventually lead to cutting down more forest, as the villagers will be left with no land, and eventually will have to clear some new land to support the family.

Therefore the government is more likely to accept and allow the villagers to cultivate on their land, and as the villagers already are able to get loans, the RFD don't see any reason for giving the villagers land certificate.

Concerning the C.F. the RFD is in general not interfering with the protection, but suggests and encourages the villagers to take care of it. For example if the villagers in Ban Song Kheaw wish to keep the conservation C.F they must come up with some objectives and needs for this C.F. However there are other problems in the village, concerning disputes between the families and illegal activities.

If the villagers are not accepting the future boundaries, the penalties will be fines or prison. If the majority of the villagers are continually breaking the same law, RFD will instead try with education and information.

Appendix 11 Household economics

Table: The total balance is the total income minus the total expenditure.

Household	Income agri. – baht/ year	Income off-farm baht/year	Total Income	Expenditure – Baht/year	Total balance
Many rai					
21.	30,000	No	30,000	45,000	-15,000
44.	11,000	4,000	15,000	19,550	-4,550
79.	410,000	72,000	482,000	91,500	+390,500
21/5.	–	–	–	–	–
43.	3,000	96,000	99,000	40,100	+58,900
65.	60,000	–	60,000	36,000	+24,000
Less rai					
75.	6,000	4,000	10,000	73,500	- 63,500
262.	13,000	–	13,000	12,250	+ 50
24.	20,000	–	20,000	20,600	- 600
250.	5,000	10,000	15,000	–	–
232.	60,000	–	60,000	41,150	+ 18,850
34.	15,000	–	15,000	16,300	- 1,300
132.	2,000	–	2,000	800	+ 1,200
Non-Thai					
24/*	Own cons.	15,000	15,000	37,200	- 22,200
6/*	Own cons.	12,000	12,000	20,850	- 8,850
59/*	Own cons.	8,400	8,400	–	–
45/*	Own cons.	7,000	7,000	9,000	- 2,000
Non-farm					
220.	Own consump.	72,000	72,000	–	–
164.	Sell in shop	294,000	294,000	26,840	+ 264,160
243.	Sell in shop	80,000	80,000	30,200	+ 49,800
3.	No	1,656,000	1,656,000	217,300	+ 1,438,700

The total balance does not give a very realistic picture, as the annual expenditures often exceeds the annual income level, in some cases so much that it seems unlikely to be

reliable. Some of the expenditure-numbers are missing, which was mostly due to the fact that a few respondents found it very difficult to answer the question.

The result on the income in the 4 groups differs a lot. It is thus complex to draw any general conclusion on these numbers and calculate the average, however we can indicate some trends of which group is worse and best off, by looking at how the income levels ranged in between the categories:

Many rai: Ranging from 15,000 – 482,000 Baht/year, here the average is not very representative due to this high difference in income level within the group.

Less rai: The income levels range a lot here as well - from 2,000 - 60,000 Baht/year, but taken out these two extremes (2,000 and 60,000) the average the income level is 14,600, which is near the assumed average of 20,000 Baht/year (joint information paper).

Non-Thai citizenship: The income level range from 7,000 – 15,000, and in average 10,600 Baht/year, which is the lowest income group. However, this seems to be the most reliable income group, as they don't range a lot and is most feasible in connection with expenditure – except of one respondent with very high deficit in the total balance.

Non-farming: the income here ranged a lot from 72,000 – 1,656,000 Baht/year, which is the highest income group, however the group are split up in relatively low income level (72,000 and 80,000 Baht/year) and very high income level, 294,000 and 1,656,000 Baht/year. This might indicate the years of off-farming activities, and that some of the off-farmers are better in running a shop and earning profit than others.

Many of the respondents had loans, mainly from the Villagers Subsidy Foundation, which was an organisation within the village, or from BAAC. The loans were easy to get and had low interests (around 1-2%) and thus many of the villagers took these loans for farming purposes, e.g. for changing from rice production to orchard production. The farmers did not need any form of land certificate to obtain loan from the Villages Subsidy Foundation, and the lack of tenure thus did not affect the loan possibilities. Some farmers also had savings in banks, which in general had higher return than the interests on the savings.

Appendix 12 Participatory map

This will is not included in the electronic version.

Appendix 13 Map of the Piang Pao watershed

This will is not included in the electronic version.

Appendix 14 Field work dairy

Date	Natural Science	Social science	Common assignments
13-15	Preparation in Base Camp	Preparation in Base Camp	Designing the questionnaires and the interview guides. Lectures and introduction to the teachers.
16	Had an informal talk with a group of farmers in the village (AG)	Arrange key informant interview. Pilot testing of the questionnaire and the in-depth interview (MP,CSK)	Interview with the headmans assistant. Group meeting
17	A transect walk in the conservation community forest with the headman (AG)	Got overview of the village (MP,CSK)	Key-informant community meeting. PRA. Group meeting
18	Water samples from the surrounding streams (AG)	Base camp to adjust the questionnaires (MP,CSK)	Group meeting
19	Water samples continued (AG)	Began to conduct questionnaires (MP,CSK). Started to analyse the conducted questionnaires in Base Camp (MP,CSK)	Group meeting
20	Pilot soil testing on plots (AG)	Continued to conduct questionnaires. Working with the in-depth interview guide (MP, CSK)	Group work - prepared the mid-term presentation
21		TAO interview, (MP) Analyses the data from the questionnaires (CSK)	Group work (CSK) (AG) Mid-term presentation
23	Soil samplings, all plots (AG) Agriculture interview (Thai-students)	RFD interview (MP) Analyses the data from the questionnaires (CSK)	Group meeting
24	Forest inventory, utilisation CF (AG)	In depth interviews (MP,CSK) Key-informant interview (MP)	Group meeting
25	Forest inventory, conservation CF (AG) Agriculture interviews (Thai-students)	In-depth interviews (MP,CSK) Key-informant interview (MP)	Groups meeting
26	Soil and water testing (AG)	In-depth interviews (MP,CSK) Analysing data (MP,CSK)	Group meeting
27	Consumption water samplings (Thai-students) Soil and water testing (AG)	Analysing data (MP,CSK) Debriefing paper (MP,CSK)	Group meeting
28	Last agriculture interview (AG) Community meeting (AG) Soil testing, Potasium (AG)	Debriefing paper (MP, CSK) Preparation for final presentation (MP,CSK)	Group work Preparation for the final presentation.
29	Final presentation (AG)	Final presentation (MP, CSK)	Final presentation

AG: Ana Lucía Gonzáles, CSK: Christina Schou Kofod, MP: Maria Petersen.