Land use, livelihoods and the potential of the JoMPA approach in the Upper Mae Pae Watershed: the case of Ban Khun Pae



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Acronyms

CARE (Rak Thai): Cooperative for Assistance and Relief Everywhere DANIDA: Danish International Development Assistance DoNP: Department of National Parks, Wildlife and Plant Conservation FGD: Focus Group Discussion **GIS:** Geographical Information System GPS: Global Positioning System HH: Household HNCC: Highland Nature Conservation Chomthong IMPECT: Inter Mountain Peoples Education and Culture Thailand (association) JoMPA: Joint Management of Protected Areas LDP: Land Demarcation Process NGO: Non Government Organisation NP: National Park NPWC: National Park and Wildlife Conservation NR: Natural Resources NTFPs: Non Timber Forest Products PRA: Participatory Rural Appraisal **RFD: Royal Forest Department RP: Royal Project** SDF: Sustainable Development Foundation SLUSE: Sustainable Land use and natural resource management SUZ: Special Use Zones TAO: Tambon Administrative Office THB: Thai Baht UMPW: Upper Mae Pae Watershed WC: Watershed Committee

WU: Watershed Unit

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Abstract

The aim of this research is to investigate how land use in the Upper Mae Pae Watershed (UMPW) affects local livelihoods and the potential of the JoMPA approach. Due to local, national and global driving forces the land use has changed in Upper Mae Pae Watershed during the last 50 years. Local people's livelihood strategy has changed from shifting cultivation for subsistence to permanent cash cropping, and this agricultural intensification has degrading implications on the natural resources in the area. The main driving forces are the opium ban and conservation regulations in combination with the introduction of a modern lifestyle. While legislation has been the key push factor, the Royal Project and its introduction of cash crops has been the key pull factor for recent land use changes. Changes in land use in the UMPW affect local livelihoods, as people depend on agricultural income. Furthermore, the local people have limited incentives to invest in the production because of the absence of legal land tenure. JoMPA was initiated to include all stakeholders in the management of natural resources and one of the goals is to improve land tenure status. However, there is no guarantee for ratification of the JoMPA recommendations, which diminishes people's incentive for participation and the sustainability of the approach. Nevertheless, the project has created a forum where stakeholders can communicate and share knowledge, which is important for future decentralisation initiatives and prevention of conflicts.

Keywords: Land use, livelihood, JoMPA, sustainability, Upper Mae Pae Watershed

Introduction

Northern Thailand has experienced rapid changes in land use during the last 50 years, driven by local as well as national and global forces. Population growth, poverty, and commercial agriculture are the major local driving forces (Rerkasem K. and Rerkasem B., 1995; Neef *et al* 2003). Whereas government policies to promote nationalization, forest and watershed conservation, suppression of opium production and improvement of rural infrastructure are among the major national driving forces (Puginier O., 2001). Moreover, rising global concern over loss of biodiversity and deforestation has greatly influenced Thai policies along with the belief that the establishment of national parks without human habitation is the solution (Roth, 2004). Land use decisions at the farm level by smallholders are therefore influenced by a complex set of economic, political, biophysical and socio-cultural factors (Lambin *et al* 2001). To understand the layer cake of driving forces is thus essential to identify key constraints and opportunities that influence decision making on land use in a certain area (Puginier O., 2002).

Land use conflicts may arise when different interest groups compete over the use of scarce resources. For example, the extension of cash cropping among the highlanders, induced and supported by the opium substitution programs, has exacerbated conflicts between lowlanders and highlanders, specifically over land, forest and water resources (Buergin R., 2000). Furthermore, conflicts between local land use and conservation in the highlands of Northern Thailand have escalated through out the 1990s due to the designation of remaining forests as protected areas by the Royal Forest Department (RFD) (Roth R., 2004b; Laungaramsri, P., 2000)

One of these protected areas is the Ob Luang National Park, which was set up in 1991 with significant consequences to the local population and their livelihoods:

"The expansion of direct territorial control by the state through conservation policies imposed a new spatial restriction on the cultivation rights of upland and highland communities by outlawing non-state registered land and settlement. As a result, local practices such as swidden agriculture and fallow land are criminalized and local rights to forest use deemed illegal" (Laungaramsri, P., 2000, p.54). The underlying issue, which binds these processes together, is the crucial question of who should have control over Thailand's natural resources in the 21_{st} Century (Neef *et al.*, 2003). We therefore aim to investigate; firstly, how and why land use has changed over the last 50 years with an emphasis on the recent past and especially the present and its relationship with the local livelihood. Secondly, the compatibility of conservation of natural resources and development of local livelihoods in the Upper Mae Pae watershed. Finally, whether the new participatory approach to natural resource management, Joint Management of Protected Areas (JoMPA) is the way forward.

Objective and Research Questions

The objective of this report is to investigate:

"How do changes in Land use in the Upper Mae Pae Watershed affect the local livelihoods and what is the potential of the JoMPA approach - the case of Ban Khun Pae?"

To study this research question, 3 sub-questions have been identified:

I) What are the main land use changes and the main driving forces in Upper Mae Pae Watershed over the last 50 years?

> To get an overview of the current and past land use, and to understand the driving forces behind theses changes.

II) What is the relationship between livelihoods and protected areas?

Following the investigation of question 1 on driving forces, the question 2 will investigate the strategies adopted by the villagers to improve their livelihoods despite the protected area restrictions.

III) How are stakeholders involved in JoMPA?

To explore local participation in natural resource management and the potential of the new approach to link livelihood and land use in a sustainable manner.

Description of key terms

Land use: This term is brilliantly defined by Pedersen, M. (2007):

"Land use is the overall outcome of various activities in relation to natural resources and their management.... A total description of actual land use in any given area will include agricultural land along with forest land, urban areas, areas used for infrastructural services ect..."

In this report, there will be a strong link between land use and agriculture and access to forestland.

Livelihood: The term "livelihood" has many definitions and covers a broad range of elements. In this report, the following livelihood definition will be used:

"A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover form stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (DFID, 1999).

The reason for not only focusing on income but also other human needs is to enhance the understanding of what influences poor people, their situation and their actions. Poor peoples are vulnerable to changes in their environment, their livelihoods and the availability of assets are strongly affected by trends, shocks and seasonality over which they have little or no control. The livelihood approach is holistic and attempts to identify the most pressing constraints and opportunities to people. It is people centered and acknowledges multiple livelihood strategies and outcomes (DFID, 1999).

JoMPA: The acronym JoMPA stands for Joint Management of Protected Areas, and

is defined as:

"Joint Management (JM) is a collaborative effort between protected area authorities, local and non-local stakeholders that seek to achieve conservation in a fair and balanced way respecting conservation goals as well as interests of local communities and other stakeholders" (Danida, 2003).

Participation: Danida (2003) describes that participation implies "involvement in every stage of the implementation process, including decision making, planning, implementation as well as monitoring and evaluation".

Sustainability: The Brundtland report (1987) descirbes sustainability as "Meeting the needs of the present generation without compromising the ability of future generations to meet their needs."

Methodology

Study area description

The study was conducted in the Upper Mae Pae watershed in Ban Khun Pae, located about 110 km North-west of Chiang Mai. The village consists of 101 households (HHs). The total population of Ban Khun Pae is close to 400 (Mingtipol *et al.* 2007). All children and young go to school and majority of the population is between 15 and 60 years (Community Development Plan, 2006). The inhabitants are from the Karen hill tribe and majority of them are Christians.

The livelihood is mainly based on cash crop and subsistence farming with some off farm jobs – often as hired labour, or remittances from some part of the family who migrated to towns. The average income per person per year is 26.581 Thai Bath (THB), which is approx. 827 US Dollars (OANDA, 2007). It is estimated that 97 % of the households in the village have a saving account and many have a dept from agricultural loans (Community Development Plan, 2006).

The landscape in the area is covered with evergreen forests protecting the head of the water source. (Figure 1). The topography is mountainous, with elevations ranging from 1000-1567masl (Mingtipol *et al.* 2007).



Figure 1. Map of the study area, Ban Phun Pae village in relation to Mae Pae watershed.

Data required

The data required to answer the research questions was defined and several methods for data collection were chosen in the planning phase (table 1)

Sub-research Question	Data needed	Methods to collect data	Data source
1. What are the main land use changes and the main driving forces?	Current and past land use patterns. Main driving forces behind the changes.	Participatory Rural Appraisal (PRA): participatory mapping, time line, key informant interviews Transect walk with key informant. HH questionnaire survey. Aerial photo interpretation (scale 1:10.000), GIS and remote sensing	Group of farmers, households, GIS data base, aerial photo. Members of the village administration.
2. What is the relationship between livelihoods and protected areas?	Major income sources, household structures, demography, migration, education and assets. Access to land, forest and water.	HH questionnaire survey, focus group discussions (FGDs) and in-depth interview with key informant. PRA: Ranking of access to NR and constraints, seasonal calendar.	Sample households, key informants (from JoMPA, NP, RP, CARE) Group of farmers. FGD with group of women collecting Non timber forest products (NTFPs).
3. How are stakeholders involved in JoMPA?	Level of participation in land demarcation processes and local satisfaction with the results. Constraints and opportunities.	FGD and in-depth interviews with key informants. HH questionnaire survey.	Sample households, key informants (from JoMPA, NP, RP, CARE, TAO, IMPECT, HNCC, watershed and village committees). FGD with group of farmers.

Table 1. Data needed, methods and data source per research question

Methods

A combination of different methods were identified and employed to collect data relevant for answering the research questions in this report. To assure data triangulation and improve the validity and reliability of results different information sources were chosen to obtain data (Mikkelsen, B. 1995; Ackermann, 2001).

Primary data

Primary data was collected through a questionnaire survey with households, in-depth interviews with village members and stakeholders involved in JoMPA. Moreover, participatory mapping, a transect walk, a forest walk, focus group discussions, creation of a time line and seasonal calendar, were carried out with village members. Direct field observation and informal conversations were also employed.

Presentation of group objectives and answering questions

In the beginning an introductory meeting was held in the village to ease the data collection process. The meeting was held in the community hall where the village headman and village committee members were present. The objective of the meeting was to introduce ourselves and present our project to the village, as well as to create a forum where village members would have the opportunity to ask questions about our background and reasons for being in their village. Our aim was also to show our respect to the village and build trust.

Group discussions, time line, seasonal calendar and participatory mapping

A timeline focusing on the major events related to land use change was made with group of farmers. Group discussions were also held with another group of farmers to collect data on the current land use systems, constraints and identify major driving forces for the land use change in the area. A ranking exercise was conducted to rank the major driving forces in order of importance. In addition, a seasonal calendar was made with a group of respondents to get data on the different farm activities during the year.

Participatory mapping by a group of farmers was conducted in two phases: first the farmers were asked to draw the village and the different land uses and major physical land features. In the second phase the group delineate the different land uses including

common resource areas such as community forests, protected areas and major physical land features on aerial photo (scale 1:10000) of the area. Apart from the data collected, the participatory mapping sessions helped us to realize the farmers' perception about their area and give us general insight about the study area.

Transect walk and forest walks

The actual fieldwork began with a transect walk with the assistant village headman to get a general insight to our study area. Ground checkpoints were taken using GPS during the transect walk. Direct observation and informal interview with HNCC representative was conducted during the forest walk. Forests walk with women, to study their NTFP collection. Moreover pictures were taken during the walks.

In-depth interviews

Key informant interviews were conducted with the stakeholders involved in JoMPA, to generate information about the aim of the approach, the level of participation of the stakeholders and their satisfaction in the process. Interview guides were used for the purpose (see appendix 4).

Questionnaire survey

A questionnaire survey, with both closed and open ended questions was carried out with households of Ban Khun Pae covering a broad range of different aspects of landuse in the study area. The questionnaire covered changes in land use systems in the village and how these affect local livelihoods including a section covering the potentials of JoMPA in solving land use problems in the watershed. Other sections focused on household structure, income sources, cultivation practices and livestock and land holdings, forest utilization and participation in conservation practices. The questionnaire is attached in appendix 3.

Stratified random sampling was employed to select a representative sample of households in the study area. The list of all village households and their land holdings was obtained from Royal Project office (RP, 2005). The households were classified in to three strata based on the amount of land holding and 30 % of the households in

each stratum were surveyed after testing and modifying the questionnaire in the field (Table 2)

	stratum I	stratum II	stratum III	
(1 rai = 0,16 ha)	(1-11 rais)	(12-20 rais)	(21-38 rais)	Total no. of households
				surveyed
No. of sample				
households	13	9	7	29

Table 2. Number of sample households in the three land holding strata

Observation and informal conversations

A large part of information and key elements for our understanding of the study area was obtained through observations in the field and through informal conversations with villagers, Thai group members and interpreters. Although this information is not sited in the report, however it has helped us to understand some of the main issues in the area and made it easier to analyze and interpret the data collected.

Presentation of preliminary results and farewell

A farewell meeting was organized in the village community hall the day before our departure. Many inhabitants of the village were present. We presented the information we collected and experiences gained from the village. In addition we told the participants about the similarities and differences of the village and villages from our home countries. The meeting was concluded with dances from different countries by group members and traditional songs by villagers and thanksgivings.

Secondary data

Secondary information from official documents was collected from local and district offices and NGOs. Digital spatial data, topographic maps and aerial photograph of the study area were also obtained from Chang Mai University.

Data analysis

Questionnaire data was analyzed using excel. The definition of DFID's 5 livelihood assets; *Human capital, Natural capital, Financial capital, Social capital* and *Physical*

capital were used to analyse the livelihood data collected (DFID, 1999). About 20 ground check waypoints were gathered using GPS during the transect walk for ground truth checking of the aerial photo. Interpretation of the different land use types was done by the way of visual interpretation. Finally, the areas of the different land use types were calculated using Arcview GIS 3.3 software after screen digitalizing the polygons.

Box 1. Reflection methods

In the following the strengths and limitations of the methods we employed in the field are presented:

Long time was spent in constructing a common and focused questionnaire with our Thai counterparts. This was mainly because each of the four Thai group members had one specific research question. At one point our questionnaire reached 9 pages (without space for answers), so to be able to keep the interview time down to a maximum of 1 hour many questions had to be deleted and the different issues were only touched upon briefly.

Another practical challenge was to locate respondents for the HH questionnaire. Another SLUSE group was also doing a questionnaire survey in the same village and there was some kind of competition for respondents between the groups. As a result, we only surveyed 29 HH though our intention was to have 30 respondents in our surveys.

An issue was missing answers, which probably stems from a lack of probing on behalf of the interviewer = interviewer bias. The fact that we had different areas of interest could lead to interviewers being less focused on obtaining answers for questions they did not find important

Language and cultural barriers were also constraints that limited the efficiency of our data collection and implementation of the different data collection methods. During the PRA sessions, such as participatory mapping and group discussions the responses were dominated by elder participants due to the Karen culture of respecting elders. In this way the ideas of the young people might not be represented in our data.

To be able to illustrate the land use change it would have been good to support the PRA data of past land uses with maps and remote sensing data. This would have made it possible to quantify the area changes between the different periods. Unfortunately we could not do the comparison due to lack of appropriate aerial photos from previous years.

Two group members got injured in the field and we where faced with less manpower than expected. This had an impact on the number of interviewers and the resulting amount of data collected (particularly in-depth interviews). Another limiting factor to possible number of interviews and the amount of data collected was the availability interpreters. For more reflections on group work and fieldwork see appendix 1.

Results and analysis

1. What are the main land use changes and main driving forces?

This section focus on land use history, the driving forces behind the land use changes, as well as the description of the current land use in the study area. Information on the land use history of the study area and the major driving forces was collected from the focus' group discussions; transect walk, questionnaire survey and timeline session. The findings are summarized in table 3. The description of the present agricultural land use and acquisition is based on the results from the household questionnaire survey, and focus group discussions. General description of the current land use and change dynamics is also given based on GIS database and aerial photo interpretation specific to our study village, Ban Khun Pae.

Land use history and major driving forces

The study area has undergone significant land use change, which can be divided into four periods, according to the major driving forces (table 3): I) Foundation of the village and subsistence agriculture, II) Introduction and expansion of opium cultivation, III) Establishment of the RP following the opium ban and introduction of cash crops, and IV) Creation of the NP.

Period	Population/ no. of HH	Constraints	Regulation	Livelihood strategy	Access to NR
I. Subsistence agriculture	35	None	None	Subsistence farming	Open access
II. Opium cultivation	159	None	None	Opium cultivation	Open access
III. Royal Project	250 (village splits into three)	Increased population scarcity of land for agricultural expansion, limitation of	National Forest Reserve and Watershed Classification National Park establishment	Cash crop production and intensification supported by the Royal Project	Semi Open access

 Table 3. Summary of cultivation practices and majors events of land use history

	water and forest use			
IV. National Park	Land scarcity Water scarcity Lack of tenure rights Loans - debt Higher consumption of modern goods	Conservation policies and National Park regulations Land Demarcation	Cash crop production Migration Family Planning	Restricted access

I. Pre-1947: Subsistence agriculture

There were around 35 households in the village and most of the land was covered by dense forest. Agricultural production was mainly subsistence paddy rice cultivation with some rotational farming in the upland fields. There was open access to natural resources, which meant that new agricultural land could be acquired by clearing of forestlands. Labour was the main limiting factor for expansion of agricultural land by slash and burn.

II. 1947-1983: Introduction and expansion of opium cultivation

The opium cultivation was introduced and spread in the village, with the Hmong impulsion, three patterns of cultivation appeared; Paddy rice fields situated on the lower slopes close to the river, which were permanently cultivated. Where as upland fields were under rotational cultivation with fallow periods of 5-7 years. Opium cultivation was concentrated on the hills. As explained by key informants, soil and water conditions were key factors for the decision to cultivate opium on the hills. At the beginning of this period, access to land was relatively open with some restrictions: farmlands should not be close to the head of the watershed and farmers should control fire when exercising slash and burn. Due to the shifting cultivation and opium cultivation, forests were fragmented during this period.

III. 1983: Establishment of RP following the opium ban and the introduction of cash crops

In this period, the population of the village increased (up to 250 households) and land as well as water became a scarce resource. Two major events occurred in this period that would affect land use in the area. The first is the opium eradication, which was made easier by the construction of roads to the village. Police destroyed opium fields, and the opium cultivation was gradually stopped in Ban Khun Pae village and by 1987 there was no more opium cultivation. Due to the opium ban, opium fields were abandoned and converted to secondary forests and plantations. The second major event was the establishment of RP and the promotion of cash crops to substitute opium cultivation and improve the livelihood of the hill tribe farmers.

IV. 1991 Creation of NP

The last event was the establishment of Ob Luang NP and forest reserve areas. This situation led to severe restrictions on the expansion of agricultural lands by forest clearing; hence shifting cultivation was no longer a viable option in the area. Instead, supported by the RP, farmers started an intensification of their cultivations to maximize the benefit from the land already available. Rotational cultivation areas in the upland fields shifted to a more permanent farming. This situation combined with an increase in population led to land shortage.

After the creation of the national park, more land was converted into forest because the areas previously used for opium and shifting cultivation were abandoned and converted into secondary forest. Secondly, forest that was fragmented before was now converted to continuous forest stands. From the questionnaire survey respectively 79% & 90% of the respondents perceived that an increase in forest area and density in the study area had occurred the last 20 years.

Current Land use

Three major land uses were identified in the field and the boundary of each land use was delineated on geo-referenced digital mosaic aerial photo. According to the GIS data, forest is the largest land use/cover type covering about 61 % of the total study area, followed by agricultural lands cover (35 %) (Table 4).

Land use	Area (rai)	%
RESIDENTIAL	243	4
Village	132	
Temple	15	
Royal Project	96	
AGRICULTURAL LAND	2414	35
Upland field	2070	
Paddy rice field	344	
FOREST LAND	4198	61
Community forest/Utilization	258	
Sacred forest	25	
Reserve Forest/Protection	3915	
TOTAL AREA	6855	100

 Table 4. Current land use of Ban Khun Pae

Clear land uses can be seen in the study area (Figure 2). Paddy rice fields are located in the lower plane areas close to main streams. Farmers constructed bench terraces and soil bunds on paddy fields to make the land level and retain water. The upland fields are composed of farmlands with upland rice production in rotation with vegetable/cash crop production in the dry season and orchards. Next to the upland fields is forestland.



Figure 2. Land use patterns in the study are

Forest Land: There are three types of forests in the study area. Forest reserve, for conservation purposes, constitutes 93 % of the total forest area in the village. A community forest for utilization purposes constitutes only 6 % of the total forest area.

The third is sacred forest with religious purposes, part of which is situated in the bordering village (Table 4, Figure 3). Access to these forests is presented in the second section.



Figure 3. Forest classification in the study area (n=29)

Agricultural land:

Moulded by years of change, the current land use is a mix of subsistence and cash crop farming. The interdiction of agricultural expansion through clearing of forest area is a clear brake to the traditional agricultural practices. The main constraint today is the land scarcity because of the population increase and the restrictions on expansions.



Figure 4. Current land use of the study area based on aerial photo (2006) interpretation

About 56% of the land belonging to the interviewed households is upland fields which are used for cultivation of upland rice and vegetables. These figures suggest that most of the farmlands are located in sloping areas. The paddy fields constitute 23% (Figure 5) of the land owned by the sample households, and represent the subsistence production of the farmers. 34 % of the respondents indicated that paddy rice production is the most valuable part of their production, as it is crucial to their food security.



Figure 5. Land use pattern (n=29)

There was not any significant correlation found between land holding and on farm tree planting. Only 25 % of the respondents in the questionnaire plant trees on their farmland. They mostly plant fruit trees for their own consumption, and diet variety and bamboo for construction and marking land boundaries.



Land acquisition and tenure security

Figure 6. Land acquisition (n=29)

The households in the village acquired agricultural lands by inheriting, buying, or clearing or free occupation of forest areas. A high proportion of land (76%) belonging to the sampled households was acquired by inheritance (Figure 6). This result is almost similar to the information of the FGD constraints. Participants of the FGD show that about 90 % of the land owned by farmers is obtained through inheritance and the rest (10%), either by clearing or purchase.



Figure 7. Proportion by land use of land tenure (n=29)

Land ownership security is a problem in the area. Indeed, only 25 % of the land owned by the sampled households has official ownership document. Paddy fields constitute the majority of the lands with official document (82% of the total land area with official document) (Figure 7, table 4). The focus group discussion participants also estimated that 20 % of farmers have SK1 documents for the fields.

Box 2.Legal documents

The Land Code of 1954 is the basis of land tenure in Thailand. Documents can be given by different governmental authorities. In this case, we focus on those given by the Department of Lands:

SK1: Claim of ownership based on possession or use of land before the implementation of the Code. Cannot be used as loan collateral.

NS3: Certificate of use, secure, allows selling, transfer or mortgage. Can be used as collateral for loans. Ownership can be disputed after 5 years of fallow.

NS3K: Exploitation testimonial, secure, allows selling, transfer or mortgage. The transfers' rights are flexible. Ownership can be disputed after 5 years of fallow.

NS4: Title deed. Most secure and unrestricted ownership. Fully negotiable, the ownership can be disputed after 10 years of fallow.

Source: Mingtipol O. et al, 2007

SK1 documents (46% of paddy fields) are the most possessed type of legal document. Before 1954, agriculture was mainly subsistence and farmers almost all possessed paddy rice field. The second most possessed legal document is the NS3 (18% of paddy fields). It was possible from 1954 to 1972 to convert a SK1 to this document. It is more secure than the SK1, allowing farmers to sell, transfer and mortgage lands. After 1972, if a SK1s was converted, it became NS3K or NS4, There are 12% of NS3K paddy rice fields. 14% of the paddy fields are legal, but their owners don't know under which type of claim. The same situation occurs with some upland fields (5%), and residential area (9%). The absence of NS4, the most secure title, is due to the absence of a complete accurate survey, which is currently on-process.

2. What is the relationship between livelihoods and protected areas?

Local livelihoods

Demography

The HH questionnaire survey included 29 HH's. The respondents in the HH survey were both men and women between 31 and 56 years. 48 % of the respondents from the HH survey had a son, daughter or a husband working or studying in a bigger city. Unemployment has pushed people from the village to the cities to work, but due to the current economic crisis people are now moving back to their home village (Community Development Plan, 2006 and Pers. Comm. TAO, 2007).

The fertility rate seems to have changed in the area, possibly due to a family planning policy in Thailand (Frazer, E., 1992) and other factors such as the influence by modern lifestyles and lack of agricultural land for sustaining a large family. The HH's in the survey with a head of HH above 45 years had in average 4,5 children, while the respondents who had a head of HH under the age 45 had only 2,6 children in average. 73 % of the couples with a head of HH under the age 45 had 2 or fewer children.

Income

The main income source in Ban Khun Pae comes from sale of agricultural products, such as cabbage and red onions. In the HH questionnaire survey, 52 % answered that their main income source is derived from agricultural production without irrigation, and 28 % answered that their main income is derived from agricultural production with irrigation. This implies that at least 80 % of the respondents derive their main income from agricultural production, as presented in table 5.

Table 5. Main medine sources from fiff survey (n=2).			
Main income source	% of HH		
Agricultural production, non irrigation	52		
Agricultural production, irrigation	28		
Forest products	0		
Off farm work	10		
Remittances	0		
Could not rank	10		

Table 5. Main income sources from HH survey (n=29).

Only 10 % of the respondents derive their main income from off-farm work, such as building houses or doing casual labour for other villagers. 10 % of the respondents found it difficult to rank which income source is most important to them. None of the respondents ranked remittances as their main income source, however 28 % of the respondents receive remittances on a regular basis from family members living and working in a city. From the HH's receiving remittances, 20 % rank remittances as the second most important income source, while 80 % of the respondents rank the remittances as less important than two other income sources.



Figure 8. Ranking of crops in accordance to importance to HH income (n=29).

The importance of different cash crops to the HH income can be seen in figure 8. The cash crops produced are ranked in accordance to importance for the HH income. Only crops mentioned by more than one HH are included in figure 8.

Some farmers only produce 1 or 2 crops and have therefore ranked only these as the most important. All HHs in the questionnaire survey produce rice for self consumption, in some cases this production is understood by the respondent as the most important to income - because they do not have to spend money on buying rice and due to traditional Karen beliefs. Ranking by importance is associated with difficulties and insecurity in the results.

A variety of non timber forest products (NTFP's) are collected by the HH's in the forests surrounding the village. These do not provide income to the HH's but are an important part of their diet and fuel wood requirements. Bamboo shoots and firewood were ranked as the most important for the HH's (Forest walk (a), 2007 and PRA seasonal calendar, 2007).

Access to natural resources in the area

Natural resources (NR) available to the villagers will here be limited to land, water and forest resources. The legislation covering these resources is complicated and in some areas different regulations overlap each other, making it difficult to understand the legislation and identifying the boundaries between different land use areas even for the ones living under these regulations (Pers. Comm. Pinkantayonk, P. 2007).

In the village the access regulations to land, water and forest are written down in the community law and controlled by the villagers themselves - however these areas are covered by laws on a higher level (by National conservation legislation) and overlap with the village NR conservation legislation.

The landscape today is covered by overlapping Government laws and Community laws. These different regulations among many others restrict and influence forest uses and agricultural production in the area. Figure 9 illustrates the different conservation legislation layers covering a random patch of forestland in the study area.



Figure 9. Community and Government legislations.

In the Forest Reserve, collection of NTFPs for own consumption is allowed, while in the NP, no collection of forest resources is allowed. The community forests are based on village regulations and Karen traditions (Pers. Comm. NP, 2007) and are divided into three categories; Community forest for conservation (no timber extraction allowed, only NTFPs), Community forest for utilization (NTFPs and timber extraction allowed) and Community forest for agriculture (very seldom land from these forests is allowed to be taken into agricultural use - only if a village member has severe land scarcity problems. NTFPs and timber collection is allowed). Within the Community forest NTFPs and timber can only be harvested for own consumption (Forest transect walk (a), 2007) and no trees can be cut around the head of the water source (Khun Pae village regulations, 2006).

Access to agricultural land is limited to the current land under cultivation. Expansion of agricultural land into the forest or the head of the water source is forbidden and land cannot be sold to people from outside the village (Khun Pae village regulations, 2006).

As mentioned previously, land tenure is limited in the area. The proportion of land with and without legal documents can be seen in table 6. From the HH survey, 75 % of the land utilized has no official documents; this means that the current users do not have legal rights to their agricultural land from where they derive their income.

	Area (rais)	%
Official document	75	25
No official documents	225	75

 Table 6. Land tenure of the land (n=29)

Apart from the tenure insecurity in itself, land tenure influences the farmers' access to credit as only full ownership documents can be used as collateral for a loan (Mingtipol O, et al., 2007). Khun Pae village is outside the NP boundaries, but the residents still do not have legal documents on their land. The establishment of the NP gave villagers even more restrictions on their possibilities to perform commercial cropping (FGD constraints, 2007). The general feeling about the conservation legislation is that their rights to their own land have been limited by some

governmental strangers. During the last years farmers have been requested to show official documents as part of land demarcation process, and respondents expect the government to give them legal rights to the land they actually use (FGD constraints, 2007). To have some sort of document as a proof for using the land highland villagers are eager to pay land taxes and get a tax certificate with the hope that it will help them to establish full legal right at a later stage (Mingtipol O, et al., 2007).

Water

The village regulations allow water usage for vegetable irrigation between November and February, the rest of the year cash crop production is dependent upon water from rainfall. Between March and October water can only be used for paddy rice irrigation and no other cultivation purposes (Khun Pae village regulations, 2006 and FGD constraints, 2007). Watersheds are classified into 5 conservation/restriction classes on a national level (Mingtipol O, et al., 2007), however these classifications are not mentioned in the village regulations where the main focus is on preserving the forest around the head of the water source (Khun Pae village regulations, 2006) (see map of watershed classifications, Appendix 6).

Grazing

Grazing of cattle takes place in the forest in the rainy season, from May to November. In the dry season, cattle graze on the dry paddy fields close to the village. Grazing by the villagers is allowed in the community forest areas, while grazing is "*de jure*" not allowed in the forests inside the NP, however it takes place. The grazing "permission" between the villagers and the NP is an informal agreement (FGD cattle, 2007).



Figure 10. Cattle grazing on the rice fields in the dry season.

Constraints and vulnerability

The RP provides the villagers with technical agricultural expertise, inputs and new cash crop varieties for them to diverse their agricultural income portfolio. The project introduced carrots but as the soil quality went down they changed to cabbage and red onion. The recently introduced crops by the RP are 7 types of lettuce and several herbs, such as; rosemary and oregano among others (Pers. Comm. RP, 2007). Even supported by the RP there are constraints associated with cash crop production in the area.

The current production constraints are weeds, insects, insufficient water, unstable prices, poor transportation (bad roads, especially in the rainy season), tenure and quality of product (influenced by soil quality, sloping fields, and rules of the RP which do not allow pesticides). To address some of these constraints the villagers have adapted the following (FGD constraint, 2007):

Weeds and insects: villagers are trying to lower their chemical inputs and rely more on organic fertilizers and use more manpower to remove weeds. However, pesticides are still used in smaller amounts even though they are forbidden and farmers hope that they will not get caught by the RP. **Water**: the village committee and TAO officials have helped build a dam, but it hasn't solved the water shortage as they say; *"if no rain no water in the dam!"* Even in the rainy season there is not enough water for the paddy rice. In the dry season, only 10% of villagers will grow cash crops due to insufficient water (FGD constraints, 2007). Irrigation of cash crops is however widely practiced in the dry season (Direct observations, 2007).

Resettlement: The RP creates a special "settlement protection" for the RP villages, as RP was created before the Ob Luang NP. The NP borders had to be drawn surrounding the areas were the RP was already working – in this way his Majesty's project "saved" the villages from resettlement (Pers. Comm. CARE, 2007). A study of Karen resource-use systems in another Karen village in the northern highlands indicate that Karen farmers want to be connected to the RP not only for agricultural and financial reasons, but also due to security reasons. Villagers living close to or within the NP boundaries feel protected from resettlement by the governmental authorities as long as the RP is in the area (Tomforde, M. 2003). This issue was not discussed with villagers in the field, however villagers from Ban Khun Pae might feel protected by the RP.

Unstable prices: villagers are in the process of setting up a cooperative to gain more negotiation power and benefit from common storage facilities. Nevertheless, it is difficult for them to deal with the problem of oversupply, as it is a nation wide problem. The cabbage price is very low and it cannot be stored for very long. They believe this problem has arisen due to a vicious circle; "this year the price is high, next year all grow cabbage and the price falls". Villagers help each other with farming activities such as sowing and harvesting reducing the costs in their production.



Figure 11. Irrigation of vegetables with sprinklers in dry season (March 2007).

Tenure: official documents are important for the villagers to be able to state their ownership. As respondents put it, *"Without official documents government officials might take our land"* (FGD constraints, 2007). Nevertheless this has not happened to anyone in the village yet.

When asking about the future villagers answer: "No agricultural land expansion will take place, the agricultural land will be the same as today, due to population growth the agricultural area will be divided into smaller plots and residential areas will probably occupy a larger share". Furthermore villagers expect that "soil quality will continue to decrease and they will need a second income, and many will migrate".

Involvement in conservation

The results from our questionnaire showed that close to 100% of the respondents are involved in conservation (28: yes, 0: no, 1: no answer). As seen in figure 12, fire control, plantation and participation in conservation related meetings are the top 3 conservation activities.



Figure 12. Participation in conservation activities (n=29).

Villagers get money from TAO to make firebreaks and plantations (Pers. Comm. TAO, 2007) The top 3 activities correspond with the customary practices supported by CARE to conserve the forests and head water sources by planting trees, making firebreaks and establishing check dams (Pers. Comm. CARE, 2007). The motivations for participating in these conservation activities are uncertain, as it was not asked for in the questionnaire survey.

3. How are the stakeholders involved in JoMPA?

Background for the JoMPA project

The JoMPA project was launched in Thailand only 3 years ago, but has been running in other Asian countries before (Danida, 2003, Pers. Comm. Havmøller, P. and Prabudhanitisarn, S. 2007). The decade leading up to the establishment of the JoMPA project was characterized by escalating conflict between the Thai government and the people regarding access to and utilization of the NR, and upstream-downstream water conflicts (Pers. Comm: CARE, Havmøller, P. and Prabudhanitisarn, S. 2007). The history of this power-struggle is one of the background factors for the establishment of the JoMPA project, which aims to create an environment for consensus or compromises (Pers. Comm. Prabudhanitisarn, S. 2007).

According to Mr. Thodsieng (National Park Wildlife Conservation (NPWF) superintendent) the main objective of the establishment of the Ob Luang NP is to conserve the natural resources, especially the forests¹. Mr. Thodsieng believes that if the NP had not been established, "*all the mountains would be covered with longan orchards today*". However, the NP did not receive a warm welcome in all quarters. One of the organizations that fought against the establishment of the NP was IMPECT, the association of hill tribes in the highland. They were concerned that the NP would have a negative effect on the people's livelihood when they no longer had access to the area within the NP boundaries. Mr. Charoenriyompai (IMPECT) recalls that they mainly fought for two things:

- 1. The right to use the land
- 2. The ratification of the community forest law

The outcome was that the government agreed to conduct a land demarcation process, which would allow people to live inside the park. However, throughout the 90s there was a succession of the government making commitments and then turning their back on them again.

¹ To protect a potential tourist attraction and to protect natural areas for research and education for the people were additional objectives.
From the interviews, it appears that the major problems in this area are the lack of water and the conflicts about access to the natural resources, and as Mr. Thodsieng stresses "*there are water use problems in every district in this area*".

In 1998 the upstream-downstream conflicts reached its climax, and the lowlanders blocked all the roads from the highland and ignited forest fires, which they then blamed the highlanders for (Pers. Comm. Charoenriyompai, U., 2007). According to Mr. Thodsieng the major problem between the highland and lowland people since the beginning of the park establishment has been misunderstandings. The lowlanders thought that the government was allowing the highlanders to use the land on the mountains and thereby destroying the water source, which would lead to decreasing availability of water in the lowlands. Lowlanders demanded the highlanders to move from the area around the head of the water source. This problem of misunderstandings is one they are still trying to solve by creating mutual acceptance between the lowlanders and the highlanders. One of their initiatives is JoMPA and IMPECT credit, JoMPA for the fact that conflicts in the area have calmed down.

Box 3. Explanation of the Land Demarcation Process (LDP) and identification of special Use Zone (SUZ)

One of the core activities of JoMPA is the Land Demarcation Process (LDP) followed by the establishment of Special Use Zones (SUZ). The first part aims at involving all the stakeholders in designating land use whereas the second part is more of a legal matter (Pers. Comm. Prabudhanitisarn, S. 2007). From Care we got the following overview of the LDP:

A three-thrust rocket:

- 1. Tag the forest area with GPS. In the process they must have a local hearing. All villagers are invited to these meetings, but only the users of the land negotiate about the final demarcation in the field.
- 2. IMPECT and the Watershed Unit will mark the boundary on a map (1:10.000). After finishing the map, IMPECT will make a "final" map of the agreed result.
- 3. Meeting between stakeholders to establish common property documents, which vest the land rights in the village = no individual tenure (this step is part of the identification of SUZ and the outcome is still unsure...)

The stakeholders in the JoMPA project

From the latest DANIDA report on the subject and from our interviews, the following stakeholders are involved (see table 7).

Key stakeholders	Secondary stakeholders						
Secretaries	Consultants						
• Ob Luang National Park office	Royal project						
• Impect	World vision						
• CARE	HNCC						
• The Watershed Unit	SLUSE						
	• Monks						
Consultants	• Elderly people						
• SDF							
Thammanart							
DoNP regional office							
Other important players							
TAO office							
• Other Governmental offices							
• District office, Chomtong							
• Local communities in the area							
• Affected nearby local communities							

Table 7. JoMPA stakeholders

The structure of JoMPA is rather complex, and figure 13 is constructed as a jigsaw with the information's from written material and interviews.



Figure 13. JoMPA structure.

The secretaries are primarily key stakeholders in the project and the consultants have an advisory role. The village headmen choose the members of the Watershed Committee (WC) working group among the villagers and the meeting chairman is the TAO officer (Pers. Comm. CARE and IMPECT, 2007). When the CARE representative was asked to draw the structure of the WC, he explained that it has approximately 70 members and that these come from sub WC, which the NP office has established in each village. A sub WC consists of 15 members: the village headman and the TAO representative and 13 villagers. Mr. Prabudhanitisarn further explains that the members of the sub WC are selected on meetings through discussion. The NP Ranger confirms the structure of the sub WC. He describes that the role of the committee is to implement the regulations of the NP and local regulations on forest protection.

The objective for the establishment of the WC was to create a forum where both lowlanders and highlanders could meet and manage their disagreements (Pers. Comm. Thodsieng, P. and CARE, 2007).

The local conditions for the JoMPA project

Who represent the local community and how?

Usually when a new project is set up in the village they set up a new committee, but 80% of the current people in those committees are the same. This could lead to the exclusion of marginalised people and elite capture. Mr. Prabudhanitisarn (2007) argues that it is one of SLUSE's jobs to recommend that all the affected stakeholders on the local level are included. However, there are no regulations that say who should be included in the projects. IMPECT brought it to our attention that upcoming changes to the WC structure will aim at ensuring broader participation by quotas for women and youth.

In the local Thai societies they have a high level of trust and the powerful families and people feel an obligation and responsibility to use their skills and position in favour of the whole community. Their position and wealth are often inherited and the western inspired democratization and cultural influence is running the risk of destroying the traditional Thai system

(Source: Pers. Comm. Prabudhanitisarn, S. and Havmøller, P, 2007).

Box 4. Different opinions on "good governance"

There is a high interest in the JoMPA activities, and according to the Ban Khun Pae assistant headman, around 70-80% of the villagers participate in the open meetings mainly motivated by their concerns of loosing land. The villagers are also directly involved in the Land Demarcation Process (LDP) and the identification of the Special Use Zones (SUZ) (see box 3). But only those who use land in the boundary areas are included directly in the demarcation and in the negotiations about the outline of the final border. As an indicator of the general villager's awareness of the JoMPA project, we asked in our questionnaire if they had heard of the LDP and the identification of the SUZ. The result was that 69% said yes and 31% said no. The participants in the committees are not paid for their work. They are only covered for their expenses in relation with the participation in the meetings, and this is financed by NGOs (Pers. Comm. CARE, 2007). It is considered the villager's duty to participate (Pers. Comm. assistant headman, 2007). The community fund is not used for payment of expenses or salaries and the fund is rather limited (7.000-10.000 BTH) (Pers. Comm. assistant headman, 2007)

The committee members are not democratically elected in a western sense, but are selected by the village headman. According to the assistant headman (2007) "*he knows who is suited for what job*". This is far from what we understand as "good governance" in a western sense, it increases the risk of elite capture and discrimination against minorities and "unpopular" opinions.

One precondition for participation is an effective information flow. According to the assistant headman (2007) they have meetings regarding JoMPA activities every third month, or if something urgent comes up. They announce it by local loudspeaker systems.

The access to information is another determining factor for the information flow. Absent villagers cannot access written documents from the meetings, either on the organization level or on the village committee level. They have to contact the committee members and some villagers find this structure limiting for their participation. The assistant headman explains that the information flow is sufficient because they have a high level of trust in the chosen committee members.

Capacity building

As stated in Danida's initial component report for JoMPA, one of the major obstacles for success is the rather weak institutional and human capacity to support the joint management approach (Danida, 2003). These obstacles are met by training of the governmental staff and "on ground" training of the village committee members in map interpretation etc. According to Mr. Prabudhanitisarn, "one of the primary objectives of JoMPA is to teach the government, to cooperate and include the local people in the management of the natural resources". On "the ground" we saw that the participants in our PRA mapping sessions were rather skilled in reading and understand maps. However, it is only a limited number of people that have these skills and we have not heard of any initiatives taken in the village to transfer of this knowledge to the rest of the people. As shown on figure 14, most of the questionnaire respondents consider mapping as a strong tool, however some also answered that they could not read the maps.



Figure 14. Mapping as a tool for land demarcation (n=29)

Previously, data created by only one stakeholder would often be challenged by other stakeholders. However, the data collected jointly through JoMPA is valid for all the stakeholders and is therefore usable in negotiations (Pers. Comm. Prabudhanitisarn, S. 2007). The Danida funded capacity building program in the JoMPA project has just stopped, even if there still was more money left to this component. The official reason is the political instability after the military coup in Thailand. The outcome of the reorientation initiatives the study trips for the institutional personnel, have been

limited, not all participants have the right attitude and reasoning for the participation in these activities (Pers. Comm. Havmøller, P, 2007).

Satisfaction with the JoMPA project

In our questionnaire we asked the respondents to rank their level of satisfaction with the LDP and SUZ (see figure 15)



Figure 15. Satisfaction in Land Demarcation Process and Special Use Zone

The result shows a high level of satisfaction for over 50% of the respondents. However, there are also a high number of no-answers, which makes analysis difficult. Nevertheless, there are approximately 10% who answered low which corresponds with the information we got from Mr. Tawilprai of the Watershed Unit who states that 90% of the villagers are satisfied with the land demarcation, and the remaining 10% are unhappy because they lost a part of their land. However, the background for the questionnaire answers might be biased by personal experience of the LDP. If one has lost land in the process, it might be less satisfied than if it has not lost any land. IMPECT's also believes that the LDP the right approach to solve land use problems. He describes the establishment of the National Park as a very top-down process with little local participation. As he puts it: *"There can be no conservation of natural resources if the locals do not appreciate it"*.

Sustainability of the JoMPA project

The JoMPA project is established as a research project. This was the only way they were able to work in and with the areas in the National Park (Danida 2003, Pers. Comm. Havmøller, P and Prabudhanitisarn, S. 2007). When the time frame for the project runs out, there is no guarantee for the future of it. This information might not be clear to the villagers, and according to the assistant headman of Khun Pae village, there is no scheduled ending date for the project. It was a main concern to IMPECT who fears that the approach has not had sufficient time to overcome many decades of top-down policy. According to the official plan it only runs till March 2008.

Discussion

The main axis of this discussion is the correlation between land use and local peoples' livelihoods and how changes have affected these based on our results. The livelihood of the population in the study area is mainly based on agriculture, which is closely linked to the natural resources in the area. Hence, the livelihood strategies, at different periods, had direct impact on the land use and vice versa. The DFID's Sustainable Livelihood Framework² will be referred to, but as it was not applied consistently during data collection it cannot be applied fully.

Land use changes

In the pre-opium era, the cultivation system was mainly subsistence agriculture. As a consequence, the impact on the environment was limited since the population was low. The traditional Karen agriculture of shifting cultivation, which was done with longer fallow periods (7-10 years), could be regarded as sustainable in restoring soil fertility and control of pests and weeds. However, with the introduction of opium, forest on steep slopes was cleared resulting in fragmentation of forests and effects on the head of the water sources. Although, the opium cultivation had negative environmental and social impacts (opium addiction) it created improvement for the local people by increasing their income, since there was a market for opium.

Due to an increase in population in the area, restrictions on natural resources, and the opium ban, traditional shifting cultivation was no longer a feasible option. Farmers therefore took one more step away from their traditional land use of subsistence farming and began agricultural intensification and cash crop production. The opium cultivation had already changed the traditional way of life in the community, due to the money it generated. This trend towards a more 'modern' lifestyle with a cash economy was entrenched with the arrival of the RP in the mid-eighties.

² Hereafter, unless otherwise indicated, all references to assets and capitals will be based on DFID's sustainable livelihood guidance sheets

Dependency on Agriculture

Today the RP still has a major impact on people's livelihood and the introduction of cash crops brought new possibilities, as well as limitations. On one hand, the RP provides a stable, if low, income, extension services and major infrastructure projects such as road building and electricity. On the other hand, the farming practice has led to increasing pressure on land and decreasing soil fertility.

With a modern lifestyle come new expenditures, which make the local people compelled to generate a larger output from their agricultural production. This need for money to sustain the new lifestyle, combined with the water dependent cropping form part of current livelihood constraints. The latter furthermore comprises a critical resource trend as upstream-downstream conflicts over access to water resources have created a tense climate between the involved communities.

Another unintended drawback from the RP is the fixed price system, where the farmers are promised a fixed price for their output. This contract farming system make them rely on "subsidies" and this makes them vulnerable in a future without the RP. However, an important aspect of the RP is that it opens the "outside world" to the farmers by introducing new crops and supplying them with inputs and new technology.

The RP, though it provides current income possibilities for the farmers also creates insecurity for their future as it is unknown how many years it will remain in the area. If the RP is terminated farmers will be left in a fragile position, as the current farming practices might be banned illegal and the locals relocated without the protection of the RP. This unclear lifespan of the RP and the critical position of the village on an "island" within the National Park is one of the threats to the local livelihoods of Ban Khun Pae.

Villagers are very dependent on their income from farming and this creates vulnerability, as many other income options are not available in the village today. Villagers are themselves trying to mitigate some of their faming constraints and insecurities. They are making improved irrigation systems and storage facilities, but these activities do not make them less dependent on income from farming...they are

just investing more capital into a sector with fluctuating and currently decreasing prices! The insecurity related to land tenure makes their vulnerability even worse.

Land tenure security is crucial for long term investments. The majority of the land under agricultural production (75 % of the land from the sample households) has no legal documents. This issue combined with the population pressure creates worries for the future. However, villagers expect that the land shortage will lead to an increase in migration, which could result in decreased demand for land and less farming dependency. At the moment, 28% of the HH in our survey receive remittances on a regular basis, with 20% ranking remittances as the second most important income source.

It's interesting to make a link between the location of the field and the tenure; paddy rice fields are the most legalized lands and are situated on the banks of the rivers. Upland fields, situated near the forest border, are only legalized by 6%. Analyzing the historical changes of the land use, combined with the legal documents possessed, it can be said that upland field are quite recent, and have been obtained though clearing or inheritance after an initial clearing, as they weren't possessed before the implementation of the Land Code of 1954 (when all cultivated areas gained a legal document). In fact, almost all the fields beside paddy rice are not legalized. The slash and burn agricultural practice is not compatible with the legal system that was implemented in 1954, and most of the new lands cleared since the initial survey of 1954 remain illegal until the LDP and SUZ is finished.

De jure and de facto land use

There is a discrepancy between de jure and de facto use of the land. As mentioned above, cultivation in the area generally takes place without any legal rights to do so. Moreover, the NP superintendent and the rangers actually break the law by allowing customary practices such as grazing of cattle and NTFP collection in the protected forest areas. Arguably this attitude of adapting official policies to the local context is largely responsible for the low level of conflicts between the villagers and the park officials. In addition, it stresses the importance of the personal characteristics of the

people involved in conservation and development and shows how practice is sometimes ahead of policy.

Nonetheless, during Thaksin's reign there appears to have been a shift from an ecocentric natural resource management to a more people oriented approach. An approach that attempts to embrace IMPECTS statement: "there can be no conservation if the locals do not see the value of it".

Natural resource protection

Simultaneously with the RP, the government passed and began the implementation of its legislation to conserve forests and protect the head of the water source. From a conservation perspective, these policies have been quite successful, as 79% of HH perceive that the forest cover has increased and 90% that forest density has improved. This will ultimately benefit the villagers' natural capital as water resources are secured in the long term. However, these gains should be compared with short term losses of natural capital. The restricted access to forest and the inability to expand agricultural land is an opportunity cost, and thereby loss of financial capital for the villagers.

Ban Khun Pae village is situated on an "island" surrounded by the Ob Luang National Park. Protected by the RP the village still exists, in spite of the watershed classification and the fact that the area is inside the forest reserve. Due to these surrounding protected areas expansion of agricultural land and thereby production is limited. Most of the land in Ban Khun Pae is under watershed classification 1A and 2 in which agricultural activities are prohibited by law and no harvest of forest products is allowed (in 1A).

It is no longer possible to generate income from the conservation area, as collection of products is solely for self consumption and timber and firewood for house hold use.

Future trends – migration and demography

The limited access to the protected areas, both in terms of forest and land, contributes to the transformation of traditional lifestyles. Villagers have to adapt and change their livelihood strategies. The initial solution to the restricted access and the opium ban was the agricultural intensification. However, despite diversification of cash crops to secure income, prices on crops are low and fluctuating. Often villagers take loans and accumulate debt, which leads to increased intensification to be able to pay back the loans. However, migration could be a future strategy as there are limited non-farm income opportunities locally.

Another important factor influencing the future sustainability in the area is demography. The population density has increased in the village while the birth rate appears to be decreasing. There are various possible reasons for this; family planning policies use the slogan "many children make you poor" and pray that having fewer children is a way of improving quality of life (Frazer, E., 1992). Another reason for having fewer children could be the concern of not having enough land to expand agricultural production and sustain a large family.

The reduced birth rate might have a positive impact on the share of livelihood assets available to each individual in the households. The channelling of a larger share of income into better education improves the human capital in the area.

How will migration and demographical trends affect land uses in the future? Potentially migration and fewer children per HH could lower the pressure on agricultural land as the population decreases and remittances increase. On the other hand the current intensive farming practices might continue as the production becomes more mechanical and farmers can afford to hire labour.

JoMPA

There appears to be a general satisfaction with JoMPA amongst all stakeholders, but to what extent have the local people actually been involved in JoMPA? And what benefits can they in reality get from JoMPA? According to Ribot (2002) a synergetic effect can be achieved between democratization and natural resource management through decentralisation. The synergetic effect depends on three key variables:

- Accountability (down or upwards)
- Powers (legislative, executive and judiciary to local authorities)
- Security (delegated privileges or secure rights)

Villagers are invited to join the project, and 70-80% of the people in Ban Khun Pae participate in the meetings, but their main motivation is the fear of loosing land. The preconditions for meaningful participation for the ordinary villager is rather limited, as the access to information is complicated and not transparent, which makes it difficult to follow the process and make objections. Moreover, 31% of the respondents said that they did not know about land demarcation, which implies insufficient publicity and involvement. The election of the participants in the committees is not democratically in a western sense, which blocks the downward accountability and makes the structure prone to corruption and elite capture (Ribot, J.C. 2002). However, this might be substituted by group pressure in a small village as Khun Pae. Moreover, it is difficult to assess whether there is a genuine lack of democracy or if it is valid to explain this with reference to cultural differences?

The process appears to be "3I" (Invite, Inform, Ignore) (Daniels S.E, and Walker G.B, 2001) as the villagers are informed and also participate in demarcation of land but they do not have any influence on the final border and they participate in making firebreaks. In the WC the highlanders and lowlanders have a forum for communicating and sharing knowledge related to NR management. If the participation is meaningful is difficult to say; the villagers or the local authorities do not have legislative, executive or judicial power, which is a core precondition for true participation. Nonetheless, bringing the stakeholders together can be an important step towards future decentralization and conflict- prevention. Furthermore, the establishment of a database with data all stakeholders have agreed upon can be useful for "principled negotiation", a situation where the framework is pre-defined and accepted by all (Fisher, R. et al, 1991).

There are no guarantees for how the result will benefit the villagers, and until now, no compensation for lost land during the LDP and identification of SUZ has been given or is planned to be. At the moment the villagers of Ban Khun Pae only have the privilege to live and cultivate the area due to the RP. The villagers, the NGOs and Mr. Prabudhanitisarn expect the outcome of JoMPA to be more secure rights to the land they occupy through tenure on the village level as well as influence on the management of the adjacent NR.

The main potential of JoMPA is better management of NR through involvement of all stakeholders and a more secure access to natural resources. Linking resources and stakeholder dependency is important because the physical characteristics of NRs are specific to the local area and therefore it is beneficial to utilize local knowledge of the resources in their management (Oakerson, R.J.1992).

The question remains whether the framework provided by JoMPA is enough to achieve better management of and access to NRs? Is there a need for further decentralization? According to Schlager and Ostrom (1992) a certain level of incentives has to be present for sustainable common pool resource management to take place: secure use rights, excludability and influence on management. While JoMPA attempts to provide these they are not yet present and the end date of the project is only a year away.

There exist no guarantee of implementation and ratification of the recommendations from JoMPA into Thai legislation and it is therefore unsure whether the approach will have a lasting impact on natural resource management and livelihoods. However, the community forest bill, which has been pending since the mid-nineties, is likely going to be ratified in June this year. Although we do not have any information on the content of the "new" community forest bill, this event could be an indicator of a policy environment that is supportive of decentralisation.

Conclusion

The main land use change in the Upper Mae Pae Watershed during the last 50 years is a shift from shifting cultivation for subsistence to permanent intensive cash crop farming. The main driving forces are the opium ban conservation regulations in combination with the introduction of a modern lifestyle. While legislation has been the key push factor, the Royal Project and its introduction of cash crops has been the key pull factor for recent land use changes.

Today the main agricultural land use is cash crop farming, which is the main income source to households in the area. This main income depends on land and water availability and is threatened by insecurity and constraints; severe restriction expansion of agricultural land and lack of legal tenure documents and decreasing water availability.

JoMPAs collaborative effort between protected area authorities, local and non-local stakeholders creates a forum for sharing of information between these. However, the collaborative effort between the stakeholders does not result in the inclusion of villagers in the decision making process. JoMPAs overall aim of "*seeking to achieve conservation by respecting interests of local communities*" appears to be limited to practical issues such as: using traditional Karen methods for fire control. In this way their traditions are included in the NR management, but their interests are not being respected, nor their decision power enhanced. Villagers wish to secure their livelihoods by possessing legal tenure documents and rights to manage their natural resources. This has so far not been accomplished. JoMPA is a step in the right direction, but there is still a long way to go.

Changes in land use in the UMPW affect the local livelihoods, as they are dependent on income from agriculture. The potentials of the JoMPA approach, in solving the current land use conflicts are limited. JoMPA creates a forum where the different parties can communicate – however the success of the approach depends very much on other factors. A key to success is giving the villagers legal documents on their land, and legal rights to manage their surrounding natural resources.

Perspectives

Globalization has serious impact on Thailand; it results in lower prices on agricultural crops and NR conservation legislation. The global therefore affects the local - like in Ban Khun Pae where villagers are affected by these outside trends (Tomforde, M. 2003 and Suthasupa, P. 2000).

The majority of villagers in Ban Khun Pae are dependent on the agricultural sector and receive agricultural extension services with the objective to improve their livelihoods. Organizations working in the area with the objective to improve local livelihoods and protect the forests seek both to conserve and develop, which results in a mediocre outcome.

If the Government and the RP really want to support the local livelihoods, assting the villagers to obtain legal rights to the land would be the first step. To improve local livelihoods further production of agricultural products and creation of farmer cooperatives could be a means to increase income and improve livelihoods. However, without legal tenure rights long term investment in the agricultural sector is a risky business.

Non agricultural based income is currently unrealistic in the area as there are not many other opportunities with the exception of eco – tourism (Nørgaard, L. 2005). This is, although a good idea, difficult to promote at the moment due to the poor road condition and lack of clean water (own observations). A shift away from the agricultural sector seems to be the best option for the villagers and many might choose migration, as seen in other areas of Northern Thailand (Rigg, J. 1993). How this affects the capitals of Ban Khun Pae is presented in box 5.

Overall, the Government does not seem to be wholeheartedly concerned about livelihoods in the area - or at least it does not consider that legal land documents are the key to improve rural livelihoods. As things are today villagers are slowly getting resettled - by their own effort. In other words; a peaceful way to kick people out of protected areas.

Box 5. Capitals of Ban Khun Pae



The human capital is mainly limited to agricultural knowledge and therefore vulnerable to a future with an evolution from agriculture. The villagers are financial vulnerable, due to a new modern lifestyle leading to debt, and fluctuating markets. The roads are bad, the irrigation system is insufficient but mobile communication is now possible. However, the social capital can substitute some of the others since the relationship and network within the community seems quite strong. In this perspective, the villagers in Ban Khun Pae are trapped in an unsustainable Royal Project while the impact of JoMPA still depends on secure tenure. Investment in human capital might be the most obvious way to prepare the villagers and their children for a future with limit land. It could also be better way to provide bilateral aid to focus on sustainable livelihoods.

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- Pers. Comm. WU 2007: Interview with WU Officer
- Pers. Comm. NP 2007: Interview with NP Ranger
- Forest walk (a) 2007: with group of women collecting NTFPs
- Forest walk (b) 2007: with former HNCC Officer
- Transect walk 2007: with assistant headman
- PRA Seasonal Calendar with 1 female and 5 male villagers, 2007
- PRA Mapping with 3 male villagers, 2007
- Introductory Village Group Meeting with village headman and villagers, 2007
- FGD constraints: Focus Group Discussion on constraints with 3 male villagers, 2007
- FGD cattle: Focus Group Discussion on cattle with 3 male villagers, 2007
- FGD maps: Focus Group Discussion on the importance of maps in land demarcation with 4 male villagers, 2007
- Own observations, 2007
- Time Line with 6 male villagers, 2007

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Cooperation and group work with Thai counterparts:

We kept our 'daily checklist' in mind and learnt something new about and from each other every day and more importantly, we learnt a lot about our selves! Our counterparts opened many a door for us and our work in the village was to a large extent at their mercy i.e. we would not have been able to gather people for all our activities so easily without them. Moreover, one of them (Waiying) is Karen himself, and another (Mong) had good interpersonal skills, which probably made the villagers more cooperative.

However, it was difficult to be in a group with people who are not used to group work. This was exacerbated by the fact that the Thai group members had their predefined research questions, which made it time consuming to agree on mutual research questions and questionnaire content. Furthermore, they seemed to be more interested in networking at various levels than actual data collection e.g. they have not shown any interest in the results from the questionnaire survey or the answers to key informant interviews they did not participate in. Perhaps if they were expected to make a similar report there would be more of a 'group feeling'.

Language was another barrier. The fact that practically all communication had to go through interpreters made it tiresome and too formal both in the group and between us and the villagers. In addition, our inter-group communication was poor, which led to some frustration...we had planned to hold group meetings every evening but it was after dinner that the villagers usually had time to see us so we ended up with ad hoc group meetings. At these meetings we shared information and planned new activities but schedules changed almost as soon as they were made so to ensure everyone was up to date was close to impossible.

Interpretation:

In general, our two interpreters did a great job and made a huge effort to understand what we were trying to do. However, information was lost through interpretation and interpreter bias is evident in our data. This was especially during the first questionnaire interviews when we had not practiced thoroughly enough and ensured that the interpreters understood the questions and their neutral role in obtaining answers.

Questionnaire:

Definition of key words such as "importance" when ranking in the questionnaire: Is a crop most important because they collect most of that crop, because it sustains their consumption needs or because they earn most money from that. Importance should have been defined before the ranking exercise. If we were asked; what is most important for you; your bicycle or your mobile phone? We would not know what to answer as they are both important to us and fulfil different needs- the bicycle provides transportation in our daily lives, while the mobile phone gives us the opportunity to communicate with people every day. So in this case the ranking exercise might not give us any clear answer to what is "most important"- rather it shows that different things are important to them to fulfil different needs in their daily lives. This kind of 'trial-and-error' is beyond what can be done from a desk at the university and one of the reasons why SLUSE has been such a big experience both academically and personally.

Another issue is missing answers, which probably stems from a lack of probing on behalf of the interviewer = interviewer bias. The fact that we had different areas of interest could lead to interviewers being less focused on obtaining answers for questions they did not find important.

Interviews and group meetings:

Difference in participation according to gender; in group meetings with both men and women present women kept quiet while the male participants answered our questions.

Differences in cultural norms and customs; when interviewing groups of women they where not shy to talk, rather they acted very independently and where not afraid of sharing their knowledge. In addition, our stay might have been too short to really get beneath the polite surface of the Thais.

We had planned to make some in-depth interviews with villagers to get a better understanding of their perception of JoMPA and other matters related to our project, however, we had to skip these due to insufficient manpower, which leaves a gap in our data.

Unforeseen happenings:

Two injured group members = less manpower to collect data

A house burned in Ban Khun Pae, which made it impossible to interview the last days, out of respect and because the villagers were busy helping the affected family re-build their house.

What could we have done better?

A clear framework before leaving for the field e.g. DFID's sustainable livelihood approach: Analyse all information and divide into the 5 livelihood asset categories while in the field and divide the questionnaire into the 5 asset categories to make sure to ask into all important aspects of livelihood sustainability. Better utilization of other groups' findings in the field and data sharing after returning from the field. More gender separated activities.

Aspects which could be better, but which are not possible for us to improve:

Better cooperation and a feeling of making a "mutual project" with our Thai counterparts could have been easier if they did not have predefined research questions. Moreover, communication in the group would have been much easier if the Thai students' English qualifications were better. Finally, being non-specific location turned out to be more obstacle than blessing partly because we could not tailor our pre-field work to a specific context but mainly because there was a sense of ownership from the other group working in the village.

Appendix 2: Synopsis

To what extent is the official National Park conservation strategy compatible with local agriculture in the Upper Mae Pae Watershed?



Interdisciplinary Land Use and Natural Resource Management (ILUNRM) SLUSE Field Course

February – April 2007 University of Copenhagen and Roskilde University

Synopsis

Supervisors

Mogens Petersen, Torsten Treue, Mille Møllegaard, Santosh Rayamahji

Group 5. Land-use

ADK06024
EMS06002
EMS06010
SBK06013
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Background

The North of Thailand has experienced rapid changes in land use during the last 40 years, driven by internal and external forces. Population growth, poverty, commercial agriculture and migration are the major internal driving forces (Rerkasem K. and Rerkasem B., 1995; Neef *et al* 2003). Whereas government policies to promote nationalization, forest and watershed conservation, suppression of opium production and improvement of rural infrastructure are among the major external driving forces (Puginier O., 2001). Moreover, rising global concern over loss of biodiversity and deforestation has greatly influenced Thai policies along with the belief that the establishment of national parks without human habitation is the solution (Roth, 2004b). These internal and external forces appear to result in two seemingly contradictory land-use changes; Extensive farming systems that have been practiced in the highlands in the past when land and labour were abundant are replaced with intensive farming due to insecure land tenure and land shortage resulting from increasing population and conservation policies. On the other hand, there is a shift to de-intensification of farming practices due to the labour shortage and rising non-farm income associated with migration (Rigg J., 1993; Rigg J., 1998).

Land-use decisions at the farm level by smallholders are influenced by a complex set of economic, political, biophysical and socio-cultural factors. These are presented in our Analytical framework based on the paper by Lambin *et al* (2000), see figure 1. Thus, understanding internal and external drivers is essential to identify key constraints and opportunities that influence decision making on land use in a certain area (Puginier O., 2002).

Land use conflicts may arise when different interest groups compete over the use of scarce resources. For example, conflicts between local land use systems and conservation in the highlands of Northern Thailand are intensifying due to the designation of remaining forests as protected areas by the Royal Forest Department (RFD) (Roth R., 2004b; Laungaramsri, P., 2000). One of these protected areas is the Ob Luang National Park, which was set up in 1991 with significant consequences to the local population:

"The expansion of direct territorial control by the state through conservation policies imposed a new spatial restriction on the cultivation rights of upland and highland communities by outlawing non-state registered land and settlement. As a result, local practices such as swidden agriculture and fallow land are criminalized and local rights to forest use deemed illegal" (Laungaramsri, P., 2000, p.54) Furthermore, with the intrusion of Thai farmers into the Northern uplands and the extension of cash cropping among some hill tribe groups, induced and supported by the opium substitution programs, conflicts between ethnic Thai and hill tribes has increased since the 1980s, specifically over land, forest and water resources (Buergin R., 2000).

The underlying issue which binds these processes together is the crucial question of who should have control over Thailand's natural resources in the 21st Century (Neef *et al.*, 2003). By approaching this issue from the official National Park conservation strategy, we aim to investigate the compatibility of conservation of natural resources and development of local livelihoods in the Upper Mae Pae Watershed and gain an understanding of whether conflicts between land use systems are intensifying or de-escalating and why.

Scope of the study

The research project will be conducted at Upper Mae Pae watershed, located in Chomthong district, Chiang Mai Province, Northern Thailand, an area which has also contained Ob Luang National Park since 1991 (Laungaramsri P., 2000). Due to the broad and complex nature of the subject, the exact location of our data collection as well as refinement of the sub-research questions will be decided upon arrival in close collaboration with our Thai counterparts and the local stakeholders. However, while we designed the methodology we had in mind that the data collection would take place in one or two villages. It could be interesting to work in two villages if they had significantly different land use systems, for example as a result of their official registration within different land zones. During our first stay in Chiang Mai we will attempt to obtain official maps of the area from the RFD and visit Danida's Jompa project office (Danida, 2005) to see if they can provide us with useful information and maps of the area.



Figure 1

The figure is an analytical tool illustrating that land-use systems in the Northern Thailand are shaped by the internal and external socioeconomical and biophysical drivers. The drivers operate and change under human-environment interaction.

Objective and Research Questions

The main objective of the study is to investigate the following research question:

"To what extent is the official National Park conservation strategy compatible with local agriculture in the Upper Mae Pae Watershed?"

To answer this question, 3 sub-questions have been identified:

1. What are the current land-use systems and how is the access to natural resources in the area?

To get an overview of the land-use systems and whether there are discrepancies between official policy and the reality on the ground.

2. What is the relationship between livelihood strategies and the implementation of the National *Park*?

To investigate the strategies chosen by the villagers to improve their livelihoods and what effect this has on the way they cultivate the land.

3. How is the local population involved in conservation activities?

To identify official and local customary conservation strategies. To investigate, decentralization and participation of the local population in decisionmaking processes related to conservation.

To assess and analyze the potential land-use conflicts.

Methodology

In order to answer our research questions various methods will be employed based on the nature of the data to be collected and the source. PRA methods, such as: participatory mapping, transect walks, focus group discussion, ranking and a historical time line, will be used to collect data, which represents the participants own perception of the situation (Mikkelsen, B. 1995). A questionnaire survey and semi-structured interviews will also be employed to get an overview as well as in-depth

data (Carvalho, S. and White, H., 1997; Kvale, S., 1996). Moreover a vegetation assessment will be used to collect quantitative data from the forest. The use of different methods will enable us to triangulate our data and thereby improve the validity and reliability of our results (Mikkelsen, B. 1995; Ackermann, 2001). For obtaining data on sensitive issues, such as illegal resource use, wealth and conflicts, we will make use of triangulation of data and through building trust with the respondents (Gilham, B., 2000). For an overview of our preliminary research tasks and assumptions see the Logical Framework Matrix (LFM) in appendix 1.

Data Collection:

In the following, data required and methods used to obtain this will be listed for each of the subquestions.

1. What are the current land-use systems and how is the access to natural resources in the area?

To look into the current land use practices and access to natural resources (land, forest, water), data will be collected from key informants, sample farming households and groups of village members. Secondary data on current land use, extent and distribution of land use systems will be gathered from available official documents and maps from the RFD and Department of Land Development (DLD). If available, aerial photo interpretation will be used to assess the land-use patterns and forest fragmentation. Participatory land-use mapping and ranking by village members groups will be used to collect data on land-use patterns and tenure.

In-depth qualitative data on access to land and forest products, existing farming systems (dominant crops, intensification, agricultural constraints), tenure systems and changes in land uses will be obtained through semi-structured interviews and transect walks with key informants. While doing transect walks, GPS measurements on tenure and national park boundaries will be carried out to allow comparison with official documents. Moreover, a questionnaire survey with both closed and open ended questions will be used to collect household land holding, access to land and forest products, land-use, constraints and changes over time. The sampling strategy and intensity will be decided in the field.

Table 1: Summary of data required and methods employed for sub-question 1.

Data	Method
Current land-usesExtent and distribution of land use systems	Reviewing secondary dataAerial photo interpretation
• Constraints in land uses	Participatory mappingRanking
 Access to land and forest products Tenure system Changes in land uses (existing farming systems, dominant crops, intensification/extensification) Constraints in land use practices 	 Semi-structured interview Transect walk Questionnaire survey

2. What is the relationship between livelihood strategies and the implementation of the National *Park*?

Data on existing farming systems (subsistence/commercial), household structure, migration, major income sources, livelihood assets, land-use and changes in livelihood will be gathered through questionnaire surveys. In-depth qualitative data focusing primarily on livelihood changes and migration will be collected through semi-structured interviews and focus group discussions. The data collected will be complemented and triangulated using secondary data from literature and official documents covering our study area.

In addition, a vegetation assessment will be conducted in the park area to assess level of forest product utilization and encroachment by analyzing population structure and regeneration status of major tree species. Data will be collected from three randomly selected sample plots in stands exposed to different intensity of disturbance (Nath, P.C *et al*, 2005).

Table 2: Summary of data required and methods employed for sub-question 2.

Data	Method
 Farming system Demography and migration Household structure Changes in Livelihood Livelihood assets Land use Major income sources 	 Questionnaire survey Semi-structured interview Focus group discussion
DBH of major tree speciesRegeneration	• Vegetation assessment

3. How is the local population involved in conservation activities?

Data on official and customary conservation strategies, level of local community participation, decentralisation, and existing networks will be collected by semi-structured interviews with households and questionnaire surveys. Government and Non-governmental organizations (NGO's) working in the area will be key informants for the semi-structure interviews. Secondary data from official documents from the RFD, DLD and NGO's will be gathered to supplement the collected field data.

Table 3: Summary of data required and methods employed for sub-question 3.

Data	Method
 Perception on official and customary conservation strategies Local community participation Existing networks Current land use conflicts, their level and intensity and common grounds 	Semi-structured interviewQuestionnaire survey
Official conservation strategies	Secondary data collection

Data analysis:

Different data analysis techniques will be employed for the different data collected in the field .The qualitative data collected will be analysed by grouping, while cognitive mapping will be used to analyse conflicts. Data analysis in relation to conflict assessment will be done with many different conflict management tools, for example the Progress Triangle (ILUNRM course slides, Daniels, S.E. and Walker, G.B., 2001; Fisher, U. and Ury, W., 1982).

Results from the GPS mapping, aerial photos and participatory mapping will be interpreted and compared. Descriptive statistics will be used to analyse the quantitative data collected from the questionnaire survey. The relation between different factors related to livelihood and land-use will be analysed by Chi-square test (Fowler, J. *et al.*, 1990). Data from the vegetation assessment will be presented by plotting frequency diagram of diameter class distribution (Silvertown J.W. and Doust J.L., 1993).

Utilisation of Disciplines

In an interdisciplinary course like ILUNRM there are amble opportunities for using our various backgrounds to investigate the research topic from different angles and on different levels and thus obtain methodological pluralism and a holistic understanding.

Our areas of strength:

Michael (Biology/Agricultural Development): GPS mapping, conflict management, vegetation assessment, cognitive mapping, statistical analysis.

Asmamaw (Forestry): Agricultural systems, vegetation assessment, aerial photo-interpretation, quantitative data analysis.

Elodie (Forestry): Multi-resource management, GIS, conservation, overall effective research strategies.

Andrea (International Relations/Agricultural Development): Conservation land policies (global to local scale), management system, participatory methods.

Gry (Forestry): Economic analysis, conflict management, demographics and livelihood strategies, management policy.

Time schedule

ACTIVITY	DAY	1	2	3	4	5	6	7	8	9	10	KEY INFORMANTS
Testing of questionnaires			X									Thai counterparts + villagers
Recognition walk in the area		х										
Transect walk and GPS mapping			X	х								Village headman
Transect walk w. RFD official			X	X								RFD official
Informal discussions			X	х								Group of villagers
Participatory mapping					x	х						Group of villagers
Focus group discussion					X	X						Group of villagers
Semi-structured interviews					X	Х	х	х	х	X	х	Households in the village
Questionnaire survey							x	х	х	x	х	Households in the village
Vegetation assessment (plot)						X	х					With village member
Feedback group meeting										x		Group of villagers
Follow up interview										x	х	Households and RFD official
Team reflection (night)		X	X	X	X	X	x	X	х	X	x	

NB: For data collection in the field the group will split into two teams.

Team 1	
Team 2	
Team $1 + 2$ together	
Team 1 + 2 separately	
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	Intervention Logic	Indicators of Achievement	Sources and Means of Verification	Assumptions
Overall Objective	To investigate the compatibility of development and conservation strategies, and its impact on land-use	The achievement of the research	Final report	
Specific Objective Expected	To describe the land-use systems To investigate livelihood strategies To identify conservation strategies and analyze their dynamics To assess the decentralization/participation To analyze the potential conflicts	A assessment and a map of land-use Socio-economical factors and structure of households, A assessment of the lan- tenure A vegetation assessment A policy framework A schematic representation of the decentralization At least 20 interview and 60 questionnaires conducted in 2 villages,	Final report Supervision Progress reports Final report	we can have access to official documents and maps; The PRA facilitate a two-way learning process All the respondents answer truthfully Disponibility of the interviewee (officials, NGOs and locals) There is potentially land-use conflicts
Output	A linkage between livelihood strategies and land-use A conservation strategy framework Conflict understanding	land-uses (official and unofficial) A dynamic diagram of the livelihood strategies (linked to tenure and agricultural practices)	Supervision Progress reports Cognitive mapping Stakeholder analysis	respondents for the follow-up interviews
Activities	Literature review; Synopsis redaction Designing questionnaires, interviews, and PRA; Data Collection (Questionnaires, Interviews and Participatory methods); Data analysis; Final Report Writing	Inputs: The group members – 5 LIFE students, 5 Thai students Interpreters (2) Materials: Computers, tape-recorder, office stuff, means of transportation (plane, cars) Facilities (rooms)	Field Diary Monitoring Active collaboration between the students Payroll Bills	Timely availability of input; Disponibility of 1 or 2 interpretors All members of the group are prepared to do the necessary work No conflict with the thai conterparts

Appendix 1: Logical Framework Matrix

This LFA is based on the methods described in the "Logical Framework Approach" by Danida,

1996.

Appendix 3 Questionnaire

QUESTIONNAIRE FOR HH SURVEY

Basic information

Introduce the project and approximate time

Name of interviewer	Date		_
1. Head of the household		M	F
2. Name of respondent			
3. Age			
4. Gender M F			
5. Marital status Married Widow Separated Sing	gle		
6. Religion			
7. Citizenship			
8. Main occupation		<u>.</u>	
9. Educational status(Cannot read and write, elementary school, Hig	gh schoo	l, other)	_
10. For how long have you been living in years)	Ban Khu	ın Pae? (In	
11. Why did you move to the area?			
Income			
12. What are your main income sources?			
Income source	Rank*		
Agricultural production, irrigation			
Agricultural production, non irrigation			
Forest products			
Off farm work			
Remittances			
Other			
* 1=most important, $2=2^{nd}$ important, 3	$= 3^{rd} im$	portant.	
13. Family size:			
age Live in the Live outside the	Wł	nere	Why

		household	household	
Μ	<15			
	>15			
F	<15			
	>15			

14. How important is it for your household the remittances that you receive?

High	Medium	Low

Cultivation and land-use

15. What was the land use of your land last year?

Land use	Area (In	Area (In National	Rotational (R) or	Irrigated (I) Non	How did	Do you have	Do you have local
Total farmland:	Rai)	Park)	Permanent (P)	Irrigated (N)	you obtain the land?*	official documents on the land? Y/N	documents on the land? Y/N
Paddy Rice							
Vegetables							
Forest/plantation							
Grazing							
Fallow							
Fruit plantation							
Residence							
Other							

*Coding: R= rent, B= bought, I=Inheritance, C= Clearing, O=Other.

16. Specify, what did you cultivate last year?

Crop (rice, cabbage,	Yield last year	Price in	Proportion	Importance
corn, etc.?)		baht	sold	(Income)*

1= most important, $2=2^{nd}$ most important, $3=3^{rd}$ most important.

- 17. To whom do you sell if you sell?_____
- 18. What kind of farm help do you get?

Hire	Own family	Other family

1 = most important, $2 = 2^{nd} most important$, $3 = 3^{rd} most important$.

- 19. Do you receive any agricultural extension service?
- Y_____N____ 20. If yes, from whom?______.
- 21. Have your farming practice changed in your time as a farmer? Y_____N_____ 22. If yes, how?______.
- 23. Do you have a rice machine? Yes <u>No</u>.

Livestock

- 24. Do you have livestock? Yes No .
- 25. If yes: How many livestock do you have?

Animal	Number	Graze where (forest, farmland or others)

26. What do you feed your cattle with?

fresh grass	dried grass	rice straw	dried rice straw	others

27. Has the creation of protected areas affected your livestock husbandry? No effect some effect large effect .

Forest

28. Have the forest areas changed during the last 20 years? Increased _____ no change _____. 29. Why?

30. Has the	density of the f	orest decreased during the last	20 years?
Increased	decreased	no change	
31. Why?		_	

- 32. Have you noticed disappearance of some tree species during the last 20 years? Y N
- 33. If yes, which species?

Tree species	Why did it disappear?

34. Do you collect forest products? Y___N ___Buy them____.

JJ. II yes of buy, with	at type:		
Product	Y/N	Recollection place*	Ranking**
Firewood			
Construction wood			
Medicinal plants			
Bamboo shoots			
Mushrooms			
Fruits			
Honey			
Others:			

*O = own forest, C= community forest, P=Protected area, Others.....

** 1= most collected, $2=2^{nd}$ most collected, $3=3^{rd}$ most collected.

Participation

- 36. Were you involved in the establishment of the national park? Y____N
- 37. Are there any local organisations working with water distribution and forest protection in the area? Y_____N____
 38. If yes, which?

Organization	Water	Forest	I know it	I'm a member of it
		-		

- 39. Do you have influence in the organization you are member of?Y____N___ Don't know_____
- 40. Have you heard of the land demarcation process and the identification of special use zones? Y_______ if No, jump to question 45.

41. Did you participate directly in it? Y____N____

42. If no, which organizations participated in the process?

43. What are your level of satisfaction in the land demarcation process and the identification of special use-zones?

High	Medium	Low

44. If you are member of an organization, please evaluate your representative's performance:

	0		
Good	Average	Poor	No link

45. Why? ____

46. Are you involved in conservation? Y____N_____.

47. If yes, how?_____

- 48. Do you perceive mapping as a strong tool for land demarcation process? Y____N
- 49. Have you experienced any disadvantages from the establishment of the Ob Luang National park? Y_____N____
- 50. If yes: What have you experienced?

Thank you for your time and assistance - do you have any questions for us?

Appendix 4

Interview guide for STAKEHOLDERS involved in JoMPA

STAKEHOLDERS (CARE, DANIDA, Ob Luang NP, Watershed Unit, IMPECT, HNCC and Dr. Sidthinat)

What are the objective of "STAKEHOLDER" in general? What are "STAKEHOLDER"'s role in the Land Demarcation Process (LDP) and identification of Special Use Zone (SPZ)?

Does "STAKEHOLDER" have a strategy to encourage the villagers to participate in the LDP and SUZ?

What obstacles do "STAKEHOLDER" encounter in the process?

How does "STAKEHOLDER" handle these obstacles?

What is the level of satisfaction of the LDP and SUZ in "STAKEHOLDER"? What other activities does the "STAKEHOLDER" promote in the UMPW? What constraints does "STAKEHOLDER" encounter during the watershed classification?

Appendix 5

Time schedule of group members

Andrea: activities carried out during the field trip, March 2007

Dates	Activity
6 th of March	Arrival to the Base Camp. First meeting with village headman and villagers
(Elodie gets injured)	in Ban Khun Pae in the community hall. Introduction of our project
	objectives and our expected plans for the next 10 days in the village. PRA
	session: drawing of a village land –use map by the present village members.
7 th of March	Transect walk with village secretary and informal conversations with farmers
	on the way.
	Afternoon: Group meeting, writing up information
	At night: work on questionnaire guide in the group and interview guide.
8 th of March	Morning: Testing of questionnaire in the village with our interpreter
	Sutthipong and Gry. Afternoon: adjusting questionnaire, assist Sutthipong
	with translation of it, and prepare for the evening activities.
	At night: PRA session in the community hall with Gry; Ranking of land use
	changes and agricultural constraints. Followed by a Focus Group Discussion.
	The participants have so much to say that we decide to continue tomorrow
	evening!
9 th of March	Morning: Discuss survey sampling strategy w. group, select households.
	Type up data from last night and prepare Interview guide for Royal Project
	officer with Elodie
	Afternoon: we begin the questionnaire interviews and the villagers are very
	welcoming.
	Night: continue Focus Group Discussion.
10 th of March	Morning: I manage to slip in the grass and twist my anclego to Chomtong
	Hospital with Dr. Mogens and return with a cast on my strained ligaments : (
	Afternoon: Rest
	Night: presentation of information from the interviews Gry did in Chomtong
	with the National Park superintendent, TAO secretary and Agricultural
	extension officer TAO secretary, and the Time line Asmamaw, Michael and
	Mong did last night
11 th of March	Morning: We make the mid term presentation and Elodie presents it
	Afternoon: The pills make me ill and I stay at the house mainly sleeping
4	Evening: type up the rest of the Focus Group information
12 th of March	Morning and afternoon: Improve design of questionnaire data sheet with help
	from Dr. Santosh and Mong. Read articles.
	Night: group meeting in the base camp – sharing of information between
	team I and 2. Suddenly we are interrupted by the fire in the village. Half of
toth and t	the group rushes to the village to help.
13 th of March	Morning: questionnaire survey has to be cancelled for the day because of last
	nights the fire – respondents are busy helping the affected family. The group
	meeting cancelled last night -with sharing of information –continues.
14th CD4 1	Afternoon: start typing up completed questionnaires
14 th of March	Morning and Afternoon: Continue typing of questionnaires with Elodie
	Evening: suppose to finally go out to the village again but due to
	Insunderstandings blw. Mong and Yatying the Focus Group Discussion on
15 th of Moush	JONIPA is cancelled. To fate to re-schedule
15 of March	morning: Finish questionnaire typing with Elouie. On to the vinage with many students and teachers to hand over denotion to the courde whose house
	hum to the ground Our group and group 2 discuss how to say forewall and
	decide on a speech and some songs
	Afternoon: Interview with Care at Base Camp
	Evening: farewell meeting in the community hall, the hall is full and our
	supplies of biscuits, coce cole and hear is hardly anough. We hold a speech
	shortly describe what we have learned in the village and tell about the
	differences between their village and our homelands. Each group member
	presents a dance or a song from his country - the sublime winners of the
	dancing contest are the Mozambicans. The villagers sing traditional songs
	and the whole ceremony ends with thanksgivings and many smiles
16 th of March	Morning: leaving for Chiang Mai at 8.00 with a stop at Chomtong hospital

Date	
c th - f	Activity microact
6 01 March	Khun Pae in the community hall. Introduction of our project objectives and our expected plans for the next 10 days in the village. PRA session: drawing of a village land –use map by the present village members. Elodie gets injured with her neck.
	Night: Socializing with our Thai counterparts. They really like Whiskey!!! :0)
7 th of	Morning and afternoon: Transect walk with village assistant headman and informal conversations with farmers on the
March	way. Group meeting, writing up information Night: work on questionnaire guide in the group and interview guide.
8 th of	Morning: Testing of questionnaire in the village with our interpreter.
March	Afternoon: adjusting questionnaire, and prepare for the evenings timeline session. Typing data from transect walk. Night: Timeline session in the community hall with Asmamaw, "Mong" and "Pong".
9 th of Moreh	Morning: Discuss survey sampling strategy in the group, and with the supervisors. Typing data from timeline session.
March	Alternoon: we begin the questionnane interviews. Night: $PR \land$ mapping session on \land rial photo. The villagers where very enthusiastic
10 th of	Morning: Andrea slips on and twists her ankle. All us 7 doctors around her delivered quick support with ice and
March	elevation. But poor Andrea, she was really in Paine!
	Afternoon: We try to finalize the questionnaire. Almost 3 hours, and Gry was almost exploding at the end! Preparing
	interview guides. Typing data from mapping session.
	Night: presentation of information from the interviews Gry did in Chomtong with the National Park superintendent,
	TAO secretary and Agricultural extension officer TAO secretary, and the timeline Asmamaw, "Mong", "Pong" and I
	dia.
11 th of	Morning: Conducting questionnaires with "Sine". Informal discussion with Santos about how to identify the level and
March	preconditions for participation.
	Afternoon: We make the mid term presentation. The enthusiasm is incredible!? I think Pong was drunk, he slept in standing position with the head against the door (o) whiskey?
	Night: Gry and I went out for a run in the hills. We had to cross a field and Gry managed to say "sawadie kaa" and
	destroy the farmer's fence at the same time. Very elegant.
12 th of	Morning and afternoon: Conducting questionnaires with "Sine". Damn Gry is fast. She has a very nice tactic where she
March	arranges meetings with the villagers. Maybe I should have done the same? I spend 3 f hours just walking around in a
	ghost town! But "sine" was good company, so no problems. I made a spontaneous interview with the assistant headman
	Night: group meeting in the base camp $-$ sharing of information between team 1 and 2 (made one of the first days)
	Suddenly the fire in the village interrupts us. My debut as a fire fighter. No serious human injuries, but the house burned
	down to the ground.
13 th of	Morning: questionnaire survey has to be cancelled for the day because of last nights fire - respondents are busy helping
March	with the cleaning and construction of the new house. Impressive solidarity in the village. The group meeting cancelled
	last night continues.
	Night: Focus group interview with Waving. Pong. Mong and Asmamaw about water buffaloes. Was it a political
	propaganda meeting conducted by the member of the Karen Network, Waying or a part of our data collection? The style
	was not very participatory. A beer or two with the other students and supervisors.
14 th of	Morning: forest transect walk with HNCC member and Watershed Unit officer together with Asmamaw and Gry.
March	Afternoon: typing in data and preparing interviews.
	Evening: suppose to finally go out to the village again but due to misunderstandings blw. Mong and waying the focus aroun discussion on IoMPA is cancelled. To late to re-schedule. Damp, I really have looked forward to get some
	answers!
15 th of	Morning: Asmamaw and I were speculating on how to get information's on the villager's involvement in JoMPA. We
March	tried to get hold one the local watershed unit officer, but he was in the village helping with the re-building of the burned
	house. Off to the village with many students and teachers to hand over donation to the couple whose house burnt to the
	ground. Our group and group 2 discuss how to say farewell and decide on a speech and some songs.
	Atternoon: Interview with CAKE in the Base Camp Evening: farewell meeting in the community hall, the hall is full and we have not about supplies. Gru/big sister I told
	you we should have bought more beers and whiskey! We hold a speech, shortly describe what we have learned in the
	village and tell about the differences between their village and our homelands. Each group member presents a dance or a
	song from his country. Socializing with the other students in the base camp. We got a bit laud but it sounded really nice
4b	when we song "Kvinde min" translated to English. Maybe I should have been a singer instead!?
$16^{\rm m}$ of	Morning: leaving for Chiang Mai at 8.00.
March	

Michael: activities carried out during the field trip.

Elodie: activities carried out during the field trip, March 2007

Dates	Activity
6 th of March	Arrival to the Base Camp. First meeting with village headman and villagers
	in Ban Khun Pae in the community hall. Introduction of our project
	objectives and our expected plans for the next 10 days in the village.
	Presentation by the assistant headman of an overview of the village. PRA
	session: drawing of a village land –use map by the present village members.
	On the way, I managed to get injured.
7 th of March	Transect walk with village assistant headman and informal conversations
	with farmers on the way. At night: trip to Chom Thom hospital
8 th of March	Rest almost all day, as agreed! Preparation of the interview with the royal
	project, transcription of data and revision of some methodology and
	secondary data.
9 th of March	Morning: rest, and work with Andrea on Royal Project interview.
	Afternoon: first try at the questionnaire, with Asmamaw, Mong and Daw.
	Discussion afterward on the length and the difficulties of the questionnaire
10 th of March	Morning: I finally managed to get hold of the RP officer. I interview him
	with Sine. I cannot manage to ask him all the question prepared as he grew
	tired after 30 minutes. In the meanwhile, Andrea got injured and have to go
	to Chom Thom hospital. She comes back with crouchs.
	Afternoon: I begin to work on the mid-term presentation
	Night: Gry presents of information from the interviews in Chomtong
11 th of March	Morning : Andrea and I work and finish the mid-term presentation
	Afternoon : Midterm evaluation day. We listen to all the group presentation
	and I present our work.
12 th of March	Morning : I go with Gry and Daw to interview 2 households. I learn how the
	questionnaire is asked, to minimize the difference of interviewers. We have
	some really good informal interview on livelihood, and family
	planning.Afternoon: I interview 2 household with Daw. Night: group
	meeting in the base camp – sharing of information between team 1 and 2.
	Suddenly we are interrupted by the fire in the village. Half of the group
th	rushes to the village to help.
13 th of March	Morning : I had made an appointment to do a questionnaire the day before.
	Upon arrival, we learn that is is canceled because of the fire. Afternoon: We
	can't make any questionnaire survey, due to unavailability of respondent,
	busy with the afterwards of the fire. So I begin to enter data of the
	questionnaire in the file prepared by Andrea, and also works on
14th CD4 1	interviews preparation.
14 th of March	Morning: I continue to enter data of the questionnaires, and prepare for the
	PRA of the afternoon.
	Alternoon: In conadoration with group 2, we do a PKA seasonal calendar on
	and 7 will agers at the aburab. There was a source migunderstandings within
	and / vinagers at the church. There was a severe inisunderstandings within our own group (with our Thei group members) who made the PPA session
	very time consuming and gave a limited output
	Night: questionnaire typing and reflection on the field work including
	reflexions on the communication challenges with our Thai group members
15 th of March	Morning and afternoon: Encoding of questionnaire all day with a break to go
	in the village Almost all the student and professors are there and they give
	the money for the burned house (which is already being built again)
	Evening: farewell meeting in the community hall- the hall is full and our
	supplies of biscuits, coca cola and beer is hardly enough. We hold a speech.
	shortly describe what we have learned in the village and tell about the
	differences between their village and our homelands. We give picture of
	villagers who participate questionnaire survey. PRA Each group member
	presents a dance or a song from his country - the sublime winners of the
	dancing contest are the Mozambicans. The villagers sing traditional songs
	and the whole ceremony ends with thanksgivings and many smiles.
16 th of March	Morning: leaving for Chiang Mai at 8.00, with a stop at hospital.

Asmamaw: activities carried out during the field trip,

Date	Activities performed
6 th of March	Arrival to the Base Camp.
	Short meeting in the base camp-General information about Royal project
	activities in the study area was presented by the RP officer. First meeting
	with village headman and villagers in Ban Khun Pae in the community hall.
	Introduction of our project objectives and our expected plans for the next 10
	days in the village. PRA session: drawing of a village land –use map by the
	present village members.
7 th of March	Transect walk with village secretary and informal conversations with
	farmers on the way. GPS way-points were taken in the way.
	Night: work in group on refining questionnaire and interview guide.
8 th of March	Morning: PRA session in the community hall with Micheal, Pong, Mong
	and May Timeline-Group discussion with farmers' group focusing on land
	use history and changes over the past decades.
	Afternoon: encoding GPS waypoints in excel sheet.
4	Night: Continuing on the Timeline on land use history and change.
9 th of March	Morning: Discussing on sampling strategy and select sample households for
	the questionnaire survey.
	Afternoon: conduct one household questionnaire survey with Mong, Ealodi
	and Daw. The questionnaire was too long; it took more than 90 minutes.
	We discussed on the length and the difficulties of the questionnaire.
	Night: Participatory land use mapping. The participants really have nice
	perception of land uses in their village. They draw map of the village
toth and	boundary, physical features and different land uses on big sheet of paper.
10 th of March	Morning: Group discussion session at the base camp. May present his cattle
	data from the focus group discussion he conducted.
	Afternoon: The questionnaire was too long so we discussed to shorten and
	refine it. The discussion takes long time to reach on consensuses on the final
	structure and content of the questionnaire.
	Night: Group meeting – presentation of the data from the timeline with Michael and Mong and the interviews in Chemtona by Cry
11 th of Morah	Marring: Household questionnoire survey with Mana
11 Of March	A ftermoon, attending mid term evoluation presentation
	Night: Relaying with group members
	Designing excel spread sheet for questionnaire data encoding
12 th of March	Morning : Household questionnaire survey with Mong
	Afternoon: Household questionnaire survey with Mong
	Night: Group meeting in the base camp – sharing of information between
	team 1 and 2. Suddenly we are interrupted by the fire in the village.
13 th of March	Afternoon: interview with the national park ranger.
	Night: Group discussion with farmers on the change of ploughing by
	Buffalo to Rice machine
14 th of March	Morning: forest transect walk with HNCC member and Watershed Unit
	officer together with Michael and Gry.
	Afternoon: typing the note from the forest walk and informal interview with
	HNCC and watershed officer.
	Night: though we planned to have group discussion with the village
	committee, we were not able to misunderstanding between the Thai
	counterparts to organize the meeting.
15 th of March	Morning: Typing the information from the forest transect walk and
	interview with the national park ranger.
	Evening: Farewell meeting in the community hall. Our group and forest
	management present what we learn and did in our stay in the village. It was
	interesting evening interms of cultural exchange. Group members present
	songs of their home country and finally the villagers sing traditional Karen
	songs.
16 th of March	Morning: leaving for Chiang Mai at 8.00

Gry	: activities	carried	out during	g the	field to	rip, N	farch 200	07
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Dates	Activity
6 th of March	Arrival to the Base Camp. First meeting with village headman and villagers in Ban
(Elodie gets injured)	Khun Pae in the community hall. Introduction of our project objectives and our expected
	plans for the next 10 days in the village. PRA session: drawing of a village land –use
-th as a l	map by the present village members.
7 th of March	Transect walk with village secretary and informal conversations with farmers on the
8 th of Marah	Way. At hight, work on questionnaire guide in the gloup.
o or watch	Andrea Afternoon: adjusting questionnaire and identification of interview questions for
	National Park superintendent TAO secretary and Agricultural extension officer
	At night: PRA session in the community hall with Andrea and May: Ranking of land use
	changes and agricultural constraints. Creation of participatory map with cattle grazing
	areas for Mays sub-question.
9 th of March	Morning and afternoon: Travelling to Chomtong to interview National Park
	superintendent, TAO secretary and Agricultural extension officer with Dr. Santosh and
	Dr. Sidthinat and one group member from each group. Night: typing down interview.
10 th of March	Morning: Group discussion session at the base camp. May present his cattle data before
(critical day; Andrea	leaving for Chiang Mai for the rest of the weekend.
gets injured and is	Afternoon: Questionnaire discussion; very difficult and time consuming to agree on a
transported to	common questionnaire even though we have adjusted it 2 times before and have already
Chomtong, the rest of	tested it- apparently some group members have not read the questionnaire until them and
the group stays in the	demand many changesafter 3 hours discussion I get frustrated and impatient but Michaele negotiation skills help to provent a big argument and Lealm down and as for a
day long	Includes hegoliation skins help to prevent a organgument and i cann down and go for a
uay long)	Night: presentation of information from the interviews in Chomtong
11 th of March	Morning and afternoon: finally the questionnaire is ready and Sutthinong and I leave for
	the village to interview. It is great to be out interviewing- finally we are getting
	somewhere. We make 4 household interviews and arrange 4 more interviews for the
	next day. The rest of the group makes the mid term presentation- as I have made
	arrangements for interviews in the village the day before because we were told that the
	midterm meeting would be in the evening
the	Night: relax and drink a beer
12 th of March	Morning and afternoon: 2 household interviews with Sutthipong. Elodie comes along
	and takes over interviewing 2 households in the afternoon.
	Suddenly we are interrupted by the fire in the village. Half of the group rushes to the
	village to help
13 th of March	Morning and afternoon: questionnaire survey has to be cancelled for the day because of
	last nights the fire – respondents are busy helping the affected family. The group
	meeting cancelled last night -with sharing of information -continues. I get the
	opportunity to go to the forest with a group of women and group 2 and accept the offer.
	Night: typing of information from the forest walk
14 th of March	Morning: forest transect walk with HNCC member and Watershed Unit officer together
	with Asmamaw and Michael.
	Afternoon: PRA session in collaboration with group 2. Creation of a seasonal calendar
	villagers at the church. Misunderstandings within our own group (with our Thai group
	members) made the PRA session very time consuming and gave a limited output
	Night: data typing and reflecting on the days impressions, including reflexions on the
	communication challenges with our Thai group members.
15 th of March	Morning and afternoon: Last morning transect jogging at 6.30. Preparation and typing of
	speech for the village farewell meeting in collaboration with group 2. Identification of
	results to present - we opt for a more entertaining cultural-exchange farewell show.
	Evening: farewell meeting in the community hall- the hall is full and our supplies of
	biscuits, coca cola and beer is hardly enough. We hold a speech, shortly describe what
	we have learned in the village and tell about the differences between their village and
	our homelands. Each group member presents a dance or a song from his country - the
	sublime winners of the dancing contest are the Mozambicans. The villagers sing
16 th of March	Morning: leaving for Chiang Mai at 8.00
	1 morning, waving for Chang mar at 0.00

Appendix 6

Map of the watershed

