

De-agrarianization and Agricultural Intensification in Mae Ram Watershed (North-Western Thailand)



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DECLARATION

By signing this document, we certify that all members have reviewed and agreed that this is the final version of the study report. Moreover, we declare that the research is our own and all sources of information have been duly acknowledged.

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**SIGNED in Copenhagen on
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ABSTRACT

In the Mae Ram watershed (Chiang Mai province, Northern Thailand), rural transformations are principally two phenomena namely agricultural intensification and de-agrarianization. This study was carried out to determine the characterization and extent of these two phenomena, their causes, consequences (environmental, social, economic, cultural) as well as the conflicts arising from their impacts.

It was mainly found that these two trends affect differently the three agro-ecological sub-zones of this valley. The upper zone is mainly characterized by commercial agricultural intensification while middle and lower zone go mainly for de-agrarianisation and subsistence intensified agriculture.

Regarding agricultural intensification, it is characterized by use of fertilizers, pesticides and agricultural machinery as well as intensive labour. As for de-agrarianisation, it occurs through urban employments in Chiang Mai or Bangkok cities. In the area, it was found that these two trends are driven by the National park, the Royal project, restriction on farm land expansion, land ownership as well as urban proximity and urban employment availability.

Also, it has been noticed an improvement of household wealth and standard of living due to the phenomena. Furthermore, due to agricultural intensification, water availability and contamination remain an issue conflicting upper zone farmers and lower and middle zone villagers. It is worthy to mention that agricultural intensification and de-agrarianisation were found to have various impacts on forest even though during the last ten years, forest area remain in total stable.

Key-words: agricultural intensification; de-agrarianisation; water; conflicts; Mae Ram Watershed; Northern Thailand.

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Acronyms

BD	Bulk Density
Ca	Calcium
DO	Dissolved Oxygen
EC	Electric Conductivity
EU GAP	Europe Good Agricultural Practices
FGD	Focused Group Discussion
GAP	Good Agricultural Practices
GIS	Geographical Information System
GPS	Global Positioning Systems
Gvt	Government
K	Potassium
masl	Meters above sea level
Mg	Magnesium
N	Nitrogen
NGO	Non Governmental Organization
NO3	Nitrate
NTFP	Non Timber Forest Product
OSU	Oklahoma State University
P	Phosphorous
pH	Power of Hydrogen
PO4	Phosphate
ppm	Parts Per Million
PRA	Participatory Rural Appraisal
RFD	Royal Forest Department
RP	Royal Project

SOM	Soil Organic Matter
SSI	Semi Structured Interview
TAO	Tambon Administrative Office
TV	Television
USDA	United State Department of Agriculture

1 INTRODUCTION (Whole group)

1.1 Background and Problem statement

Thailand has undergone high rates of economic development since the past four decades and the country is characterised by migration, commercialization and infrastructural development (Walker, 2003 and Promphakping, 2008).

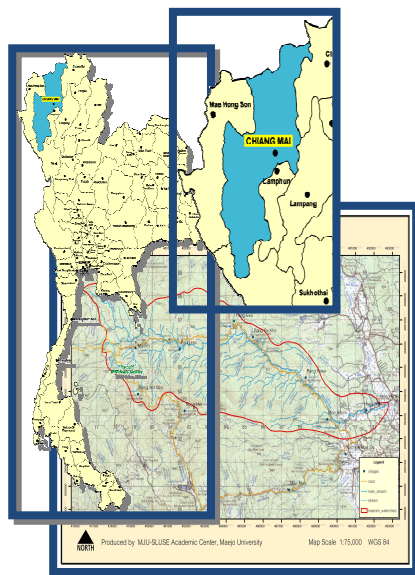
In line with these developments, there has been high incidence of rural industrialization in Northern Thailand providing an opportunity for young people to seek non-farm employment, middle-aged peasants to divide their time between farm and non-farm activities, and young women to become “factory daughters” (Wongtongson, 2008; Rigg and Nattapoolwat 2001). Also, Northern Thailand has undergone rapid agricultural transformation during the last few decades due to various factors including market penetration, cash crop promotion by the state, establishment of Royal Project Foundation and increased immigration of people from neighbouring countries (Latt, 2008). All these factors are contributing to increase mechanisation, use of fertilizers and agrochemicals in Northern Thailand (Nakagawa, 2008). Therefore agricultural intensification and de-agrarianization are part of the dynamics of rural transformation in Northern Thailand.

“Agricultural intensification can be defined as increases in labour or capital inputs per area unit; the creation of landesque capital (e.g. in the form of soil/water conservation structures or irrigation systems); and changes in land management for the purpose increasing output per unit area”. (Løvenbalk *et al.*, 2003). It can further be classified into labour, capital and land intensification. Labour intensification depends on increase use of labour per unit area while capital intensification refers to the higher use of capital input (e.g. fertilizer, pesticide, herbicide, machineries, draft power, irrigation) per unit area. Land intensification on the other hand depends on increased cropping intensity by intercropping, multiple cropping etc. (Nambiro, 2008) De-agrarianization¹ as defined by Bryceson (1994), refers to occupational

¹ In our study, de-agrarianization also include working as a labourer on the farm for another farmer

adjustment (livelihood), income-earning reorientation, social identification and spatial relocation of rural dwellers (resettlement) away from agricultural-based modes of livelihood.

The study area, Mae Ram is a sub-watershed of Mae Rim watershed located in the province of Chiang Mai; District Mae Rim and Sub district Mae Ram (see Figure 1). It is divided into three agro-ecological zones where the upper zone is dominated by



Hmong people, middle zone by the Karen and lower stream by Local Thai (Aumtong, 2009).

Agricultural intensification and de-agrarianization have been found as on-going process in the area. There is intensive production of cash crops by some households while others are dividing their time between farm and seasonal non-farm activities. The youth are however opting for permanent urban employment and appear less interested in farming (*ibid*).

Figure 1. Location of Mae Ram watershed

These two phenomena are not without impacts. Production of cash crops and shift from subsistence oriented economy to a mixed subsistence/market economy and engaging in non-farm activities such as urban migration have some socio economic and cultural consequences on rural households livelihood (Nambiro, 2008 and Bryceson, 1993). There are also environmental consequences from agricultural intensification. These include soil degradation resulting from toxicities, soil erosion and declining soil fertility; decrease in water availability from high use of water for irrigation; water quality deterioration through concentrations of nutrients and agrochemicals (Pingali et al. 1999 and Gregory et al 2001). Such environmental consequences often result in conflict of interests on natural resources utilization. There have been increasing reports of conflicts over water resources between lowland and upland communities caused by agricultural expansion and forest

clearing in upper-watershed areas in Northern Thailand in recent years (Walker et al, 1999 and Walker 2003).

This study was therefore, undertaken with the aim of finding out the characteristics and driving factors of agricultural intensification and de-agrarianization in Mae Ram watershed and assess their impacts on socio-economic, cultural and environmental conditions as well as on conflicting natural resources utilization issues that arise from these processes.

1.2 Research questions

Main research question

In the context of rural dynamics, what are the causes and consequences of de-agrarianization and agricultural intensification in Mae Ram Watershed?

Sub questions

- What are the characteristics and extent of agricultural intensification and de-agrarianization in the Mae Ram watershed?
- What are the pull and push factors driving the de-agrarianization and agricultural intensification?
- What are the socio-economic and cultural consequences of de-agrarianization and agricultural intensification?
- What are the environmental consequences² of de-agrarianization and agricultural intensification?
- Does de-agrarianization and/or agricultural intensification produce or reduce conflicts of interest over natural resources conservation or utilization? If so, how are these conflicts locally addressed?

² Environmental consequences in our study refer to the impact of agricultural intensification and de-agrarianization on forest, soil and water.

2 METHODOLOGY AND REFLECTION

To address our research questions, different methods were used namely literature review, questionnaire, semi structured interview, soil and water sampling and PRA tools that includes FGD, transect, seasonal activity calendar, water availability calendar and time line. The use of different methods also helped to triangulate the different information collected in order to increase the reliability and validity. The methods used and the problems encountered while using them are described below.

2.1 Questionnaire (Justice)

Questionnaire was administered to 42 households in the watershed to obtain information on their farm and non-farm activities, what drove them to engage in those activities and assets acquired and the standard of living. The households were selected based on the population of three villages selected in the watershed. We selected at least 10% of the households in each of the villages. A pre-test was carried out and the questionnaire was revised accordingly. The questionnaire is shown in appendix 1

Table 1: Number of households sampled

Village	Bam Mae Khi (Upper zone)	Ban Pang Eka (Middle zone)	Ban Pang Haew (Lower zone)	Total
Number of households	150	67	124	341
Sample selected	17	10	15	42

We initially planned to stratify based on agro-ecological zones, ethnic groups and wealth since the drivers and consequences of agricultural intensification and deagrarianization would be different for each strata but some adjustments were made. After identifying households from the different zones, we randomly selected 42 of them as we found that each village is dominated by one ethnic group. Also, it was difficult to classify the different households under different wealth class even with the help of a key informant. The results obtained for this study is therefore might not be representative of all the households in the watershed. Also, there was no definite

time when all the households started to engage in agricultural intensification or de-agrarianization so we could not set a particular year as before so we resorted to describing the two phenomena to the respondents and frequently used the phrase “after engaging in these phenomena, have you” to ask the questions. This makes some of the data we collected with the questionnaire less reliable.

2.2 Semi Structured Interview (Sebastien)

Individual semi-structured interviews were initially chosen as an investigating method:

- To get an in-depth understanding of the issues addressed by our study from the perspectives of key informants (selected for their knowledge and activities about and within the area).
- To address some sensitive issues, especially the potential conflicts arising from both de-agrarianization and agricultural intensification.

All SSI planned were conducted. However, some important information might have been lost through translation and the fact that we were relying on other group interpreters might also have had an effect on conveying main concept such as De-agrarianization to the interviewees.

2.3 Participatory Rural Appraisal (Destaalem and Deo-Gracias)

2.3.1 Resources map

Resource map was planned to be considered as a starter tool to have a spatial structure of natural resources, land use and land pattern as well as some information about households and the watershed as a whole. Since we could not find the key participants in the first days, we instead decided to use as a starter the basic information we have on the watershed, the land-use change map provided and particularly the tour we have had across the whole watershed, guided by one of the Thai teachers, a water expert, who has been working in the watershed for many

years. Thus without doing the resource map, we were able to start understanding the socio-economic and cultural stratification of the communities in terms of its resources, its distribution and management. Later on, through transect walk as an example, we have collaborated with the other groups living and studying the sub-zones to have a better knowledge of the watershed.

2.3.2 Transect

Transect has been used to explore the spatial dimensions of natural resources (forest, agriculture, others) and infrastructures in people's management of their environment. In total, four transect walks have been done, one in each agro-ecological zone and one in the forest. Since we didn't do the resource map, the different transect walk were led by our key-informants. That is a shortcoming in the sense they would have guided us to where they wish. To check that, we displayed later the transect line of the lower zone on a land-use map to check whether we have cut across successfully the village in reality. But in the middle and upper zones, due to some technical problems with the GPS, the transect tracking was not available. As for the forest walk, it went as planned. The different transects have been used during data analysis to notice and compare some socio-economic and environmental parameters and even conflicts indicators; including infrastructures, topography, land use systems, land tenure, vegetation, crops, seasonal usage, problems, opportunities and solutions applied by the villagers.

2.3.3 Time line

Time line was done with key-respondents, to explore and understand temporal dimensions of the changes in agricultural intensification and de-agrarianization practices that have been taking place in the watershed over the past years. The time line was challenging for our respondents regarding recall of years. Whenever that happens, we ask them questions like: were they married? How old was their elder child? Was tap water network installed at the time? Was the Royal project already in

the area? or was the National park known? etc. In general, the time line provided us reliable and consistent information but we are not confident as for the dates which thus might be less valid; they could only be used as indicators.

2.3.4 Seasonal activity calendar

Seasonal activity calendar was drawn in order to have an overview of the different crops produced, the time they are grown and the various non-farm activities in the agro-ecological zones. In the lower and middle zones, it has been done with farmers in the villages but in the upper zone, the farmers were not available in the village so we went to their farm land and managed to gather them on spot and the seasonal activity calendar was done. When we were asking questions about seasonal activity calendar, questions related to agricultural techniques as well as land-use system and NTFP collection were also touched upon.

2.3.5 Water availability calendar

Water availability calendar was drawn for each agro-ecological zone after seasonal activity calendar. This gave an idea of three specific types of water along the year: human consumption, crop production and livestock. We believe that it may have been very interesting and more detailed if we were able to diversify our respondents for the water availability calendar. For instance, members of water management committee of upper zone and water company managers may have been included. However, it doesn't affect as such reliability of the outcome. In practice, at the end of the FGD, availability of water for agriculture, livestock and human consumption as well as source of water has been assessed for every month of the year.

2.3.6 Focus Group Discussion (FGD)

One FGD was done in each zone. But instead of 10 – 12 participants as planned, due to personal reasons, some guests didn't show up and thus we gathered 4 -8 people

from different class of the community that includes: elders, youngsters and women with different sources of income (farm and non-farm). The selection criteria planned was ethnic group, wealth and gender. But ethnic group was not used as planned because people living in the villages are mainly from the same ethnic group. As for wealth, it was found that wealth will be difficult to assess and even our key-informant explained that there is no real difference between villagers' standard of living. It is only in the lower zone that there is a difference between poor and rich. But the rich of that zone don't live permanently in the area. Their properties are for holidays mainly and as such we couldn't find them. Despite those changes due to ground realities, the FGD provided us with reliable data.

2.3.7 Soil Sampling (Lensa)

To assess the impact of agricultural intensification on soil, stratified random sampling³ was used to choose sampling plots. Then composite sample⁴ was made from the samples of each stratum. We considered the three zones (upper, middle and lower) in the watershed as our primary strata and further divided each stratum into three sub-strata based on altitude (meaning upper, middle and lower altitude of each zone). A number of representative samples were then collected and mixed thoroughly to make eight composite samples. (soil sample map, figure 16).

More samples⁵ were taken from the upper zone than the others to cover the large area under intensification and an average value was then calculated to arrive at one value per sub stratum for a matter of comparison with the middle and lower zones. Since site information contribute a lot to evaluation and interpretation of soil test results, a careful observation and note was made during sampling activity for

³ Stratified sampling as stated by Crepin and Johnson, in Carter (1993) is used to analyse each stratum and to increase the precision of estimates over the whole area.

⁴ Composite sampling is appropriate to use when only an average value of the soil property is needed and it can also be used in combination with stratification (Crepin and Johnson, in Carter, 1993).

⁵ The number of samples to make a composite vary according to the variability of the property (Crepin and Johnson, in Carter, 1993)

cultivated crops and various agricultural practices (see table 2) apart from recording the coordinates with GPS and interview with farmers when they are around. However, we feel that interviewing all the farmers for each of our sampling site would have supported our analysis better. Sampling was done with an augur at 15 centimetres depth and the samples were labelled, air-dried under shade and ground into uniform size before they were sent to the laboratory for nutrient and pesticide test.

Undisturbed soil samples to analyse bulk density were also taken using cylindrical tubes where the soil was trimmed to the size of the cylinder and packed before labelling and sending to the laboratory for analysis. However, these samples could have been exposed to various degree of disturbance while transporting which might have affected the validity of the results.

Since our objective was to compare the impact of intensification on soil between the three zones in the watershed, samples were only taken from intensified fields. Hence, as there was no intensification in the upper altitude of the lower zone, no sample was taken from that stratum. However to investigate further and compare forest soil quality to agricultural soil, samples could have been taken from the forest as well.

Table 2. Soil sampling site description

No	Sample Site		Site Description
1	Upper Zone	Upper Altitude	Crops: Lettuce, cabbage, spinach, onion
			Slope: Steep slope
			Agri. practice: irrigation, terracing
		Middle Altitude	Crops: Lettuce, cabbage, potato
			Slope: Steep slope
			Agri. practice: irrigation, terracing
		Lower Altitude	Crops: Carrot, lettuce, cabbage, onion, marigold (cut flower)
			Slope: Gentle slope
			Agri. practice: irrigation, some terracing
2	Middle Zone	Upper Altitude	Crops: Lettuce, spinach
			Slope: Moderate slope
			Agri. practice: irrigation, terracing
		Middle Altitude	Crops: Lettuce, spinach
			Slope: Moderate slope
			Agri. practice: irrigation, terracing
		Lower Altitude	Crops: Soybean in harvested paddy rice field
			Slope: Gentle slope
			Agri. practice: irrigation in paddy, terracing
3	Lower Zone	Middle Altitude	Crops: Soybean in harvested paddy rice field
			Slope: Levelled/gentle slope
			Agri. practice: irrigation in paddy
		Lower Altitude	Crops: Harvested paddy rice
			Slope: Levelled/gentle slope
			Agri. practice: irrigation in paddy

Source: Primary data collected on site

2.3.8 Water Sampling (Julie)

To assess the impact of agricultural intensification on water, water and sediments samples were taken along the main stream of Mae Ram : headwater as reference for non-intensified area, at stream junctions and in streams located around intensified agriculture lands or coming from village's outlet (see table 3).

Table 3. Water sampling site description

Location	Name of the stream	Description
Upper 1 (U1)	Huay Mae Ki	headwater in the forest (agriculture purpose)
Upper 2 (U2)	Creck Mae Ki	headwater banana bush (consumption and agriculture)
Upper 3 (U3)	Huay Mae Ki	intensified agriculture (lettuce)
Upper 4 (U4)	Huay Mae Ki + Creck Mae Ki	junction,intensified agriculture
Upper 5 (U5)	Outlet of Huay Mae Ki	intensified agriculture (greenhouses)
Middle 1 (M1)	Mae Ram, outlet upper zone	outlet from the upper zone, forest area
Middle 2 (M2)	Huay Pang Eka	outlet from Ban Pang Eka village, forest area
Middle 3 (M3)	Mae Ram+ Huay Pang Eka	water junction, forest area
Lower 1 (L1)	Mae Ram, outlet middle zone	grazing in a orchard, outlet from the middle zone
Lower 2 (L2)	Huay Pong,	outlet from Ban Pang Haew village
Lower 3 (L3)	Mae Ram+ Huay Pong	water junction, village area

Water was controlled in eleven spots and ten sediments samples were taken in all three agro-ecological zone (see figure 16). Some parameters were taken in situ such as pH, EC, using electrometric measurement and using chemical test kits. Later the samples kept in bottles were sent for laboratory analysis at Chiang Mai University. To assess impact of agricultural intensification on water, the main parameters used are: pH, electrical conductivity, dissolved oxygen, nitrates and phosphates. Sediment

samples were taken to analyze pesticides residues (organophosphate and carbamate groups).

Due to some practical reasons, two water samples were lost and it results in the fact that we couldn't have PO₄ analyse from sampling point U1 and M1. Also no sediment sample was taken at L2 due to high velocity flow which leads to one missing result. Water and sediments sampling analysis results would have been much detailed and consistent if we have taken other water quality parameters as well as different soil layer sediments for analysis of chemical contamination. We couldn't apply such detailed methods due to materials, time and financial budget constraints. In addition a lack of sterile syringes, sampling cups and distilled water may have impact on our results because we have used only 2 syringes and water from the stream to clean the materials.

It is certainly worthy to point that the study was done in dry season when runoff of chemicals is low and hence we may not have clear result about water contamination. In order to cover water contamination issue during rainy season and be able to capture what is going on the whole year around, we took some water analysis results from our Thai student counterparts. We couldn't get enough details about their sampling method thus comparing the data may not be very consistent. However we rely on their data to be able to give some information about water quality during rainy season.

2.3.9 Forest cover assessment (Sebastien, Destaalem and Deo-Gracias)

Forest cover change has been assessed based on satellite images from LANDSAT 5 TM and secondary GIS data from Rutchadaporn (2008) and Aumtong *et al.*, (2009). Land use map of three period of time have been compared (1997, 2002 and 2008) to be able to analyze forest land area change in the watershed during the last twelve

years. The quantitative data on land use change drawn from those sources have been supported by different SSI with key-informants such as forest officers, elders and forest transect walk.

In order to better assess impact of de-agrarianisation and/or agricultural intensification on forest, it would have been more interesting to implement forest inventory and assess forest status in details. But those objectives cannot be met in the scope of our study due to time constraint. Also, the secondary data on forest cover doesn't seem very consistent as far as we are concerned. The reliability and even the validity are questionable. Actually we didn't know enough about the method use to draw the forest cover map and areas for the three periods (1997; 2001; 2008). Though we consider the data and analyse them in order to give an idea of the trends over time.

3 RESULTS AND DISCUSSIONS

3.1 General Introduction about Mae Ram Watershed (Whole group)

Mae Ram Watershed can be divided into three agro-ecologies namely upper, middle and lower zones. The upper zone (Ban Mae Khi) inhabited by the Hmong people is mainly featured by intensified agriculture whereas the lower zone (Ban Pang Haew inhabited by local Thai people) is mainly characterized by de-agrarianization. The middle zone (Ban Pang Eka) where the Karen people live is a mix of intensification and de-agrarianization. However, even though agricultural intensification is occurring in middle and lower zone, the objective is for household consumption while in the upper zone, it is more commercialized and market oriented. From the analysis of time line (see table 4), agricultural intensification in the upper zone dates back to 1984 where Lychee and vegetables were introduced by the royal project as a strategy to stop opium production. Intensive commercial production took off in 2002 with massive use of inputs and establishment of village fund which gradually replaced subsistence farming. It is now very common to observe greenhouses, and intensified fields in the area. After shifting cultivation of rice, farm land expansion and forest utilization in the middle zone were restricted by the establishment of the National Park in 1980, villagers gradually start to involve in nonfarm activities and to practice intensification. De-agrarianization which is a major feature of the lower zone originated when villagers started selling their farm land in 1979 and started involving in nonfarm activities instead of agriculture. Now only 4 farmers practice agriculture on their own land and de-agrarianization has become a main feature of households' livelihood strategy in the lower zone. From transect walks in each of the three sub-zones and through the forest, we were able to notice different land uses, vegetation cover, eroded sites, forest fires and agricultural encroachment. The following sub-chapters present a detailed analysis and discussion of major findings of our study.

Table 4. Time line in three villages of Mae ream watershed

	Major events		
Year	Upper zone (Ban Mae Khi)	Middle zone (Ban Pang Eka)	Lower zone(Ban Pang Haew)
1954	-upland rice, maize, opium production on slash and burn mode and - subsistence mode	-Village establishment with 2 HH -paddy rice production -Shifting cultivation of upland rice -subsistence production -forest utilization - land expansion	
1979			Land sale started
1980		-National park establishment -No officially allowed forest utilization -No land expansion -No shifting cultivation	
1984	-Creation of Royal project -Fighting against opium production -introduction of lychee, vegetable and permanent production plot - upland rice and maize maintained		
1985		-Forest concession for outsider only -water shortage due to deforestation	
1989		-The first outsider come to the village	-Electricity and road introduction
1990		Road construction	
1996		Start of most nonfarm activity	
1997	Lychee production failure due to -market price is low(too much supply) -one harvest time - poor extension service that leads poor quality production -water requirement not supplied	Electricity introduction	
1999	Introduction of green house culture	-Community forest movement started -Tap water for households	
2002	Start of the real intensification with massive inputs and this related with the creation of village fund(increase loan access for less favored farmers) -Through time increased use of chicken manure and reduced use of chemicals		
2003		Agricultural intensification	Tap water introduction
2004		-Water pollution -Tap water for drinking	
2006			Telecommunication

3.2 Characteristics and extent of agricultural intensification and de-agrarianization in Mae Ram Watershed. (Main authors: Julie, Lensa and Justice; Contributing authors: Sebastien, Destaalem and Deo-Gracias)

3.2.1 Stakeholders of agricultural intensification and de-agrarianization

Agriculture intensification is lead by different stakeholders of which the farmers, the Royal project and the Burmese employees in Hmong's farms are main actors. Also middlemen, fertilizers and pesticides retailers as well as farmers/local people who have know-how about irrigation system layout and cooperatives have a stake. On the other side is de-agrarianisation led by rich city dwellers who buy farm lands and build their holiday houses in the lower zone; farmers and youth of the middle and lower zones. In addition, tourism operators, employers in urban areas and tourists are also part of the stakeholders of de-agrarianisation in Mae Ram watershed.

3.2.2 Characteristics and extent of agricultural intensification

The extent of agricultural intensification varies considerably across the three zones in the watershed, being greater in the upper zone than the others. Statistical analysis as presented in table 5 indicates that all respondents (100%) in the upper zone practice agricultural intensification. Land, labour and capital intensification which constitute agricultural intensification in the watershed are describes in the subsequent sub-sections.



Picture: Intensified agricultural land in Ban Pang Eki (Upper zone) Maeram watershed

Table 5. Number of households practicing agricultural intensification and de-agrarianization

Name of village	Number of households involved in:		
	Agricultural Intensification only	De-agrarianization only	Both
Ban Mae Khi	14	0	3
Ban Pang Eka	0	2	8
Ban Pang Haew	0	10	5
Total	14	12	16

3.2.2.1 Land intensification

A typical land intensification strategy observed was the cultivation of vegetables for commercial purposes. The main vegetables grown are cabbage, Chinese cabbage, lettuce and tomato. Other vegetables grown include cauliflower, pumpkin, chilli and onion. The production of vegetables is mainly in Ban Mae Khi and is due to the strong promotion by the Royal Project as alternate cash crop to opium. Rice and soybean are grown mainly by farmers in Ban Pang Eka and Bang Pang Haew and

are mainly for subsistence purposes. Other crops cultivated by farmers in the watershed are lychee, longan, maize and peanut. The main crops cultivated are shown in table 6. Cabbage is the mostly grown crop and an average cabbage farm is 7 rai per household. Rice, Chinese cabbage and tomato are grown on about 4 rai farm size per household and the rest of the crops were less than 2 rai per household.

Table 6: Major crops cultivated by farmers

Crops	Number of farmers growing the listed crops in each zone			
	Ban Mai Khi	Ban Pang Eka	Ban Pang Haew	Total
Rice	1	8	3	12
Soybean	0	4	2	6
Cabbage	13	0	0	13
Lettuce	11	1	0	12
Chinese cabbage	11	0	0	11
Tomato	5	0	0	5
Lychee	5	1	0	6

Another land intensification strategy found was the practicing of multiple cropping mainly in Ban Mae Khi as shown in figure 2. About 88% of the farmers interviewed in this village practice multiple cropping. Most farmers in this village have access to irrigation hence are able to engage in double or continuous cropping in a year. The few farmers in Ban Pang Eka and Ban Pang Haew who practice multiple cropping mainly engage in double cropping by growing rice followed by soybean or peanut in a year.

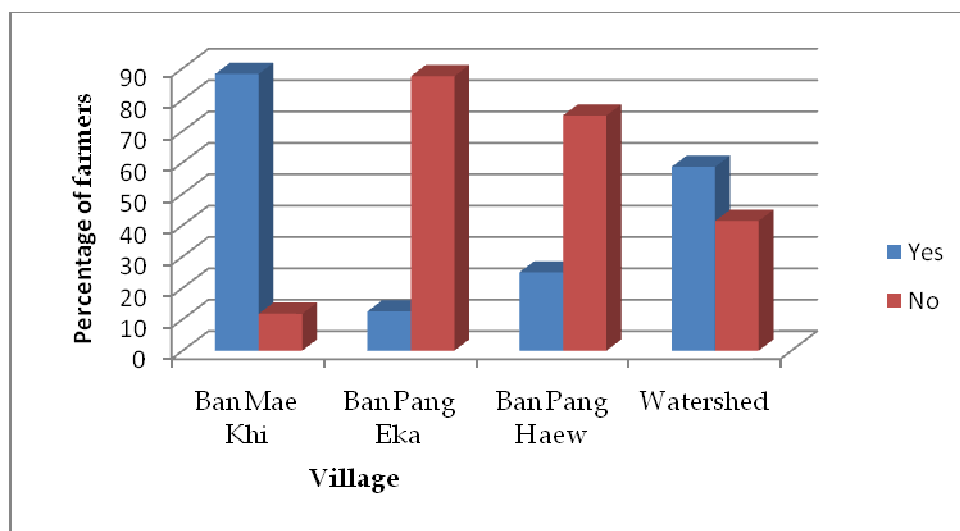


Figure 2: Practicing of multiple cropping by farmers

Fallow cultivation is another indicator of land intensification strategy found in the study area. As shown in figure 3, 70% of the farmers in the watershed were practicing fallow only for less than six months and it was only 4.17% of the farmers that were actually practicing fallow for more than one year. Accordingly, the fallow period was very short indicating a high degree of land intensification (Boserup, 1981). This can partly be attributed to the fact that farmers in the watershed do not have opportunity to expand their farm land and according to Nambiro (2008), the only possible way for farmers in this situation is to reduce their former fallow areas and shorten the fallow duration or periods.

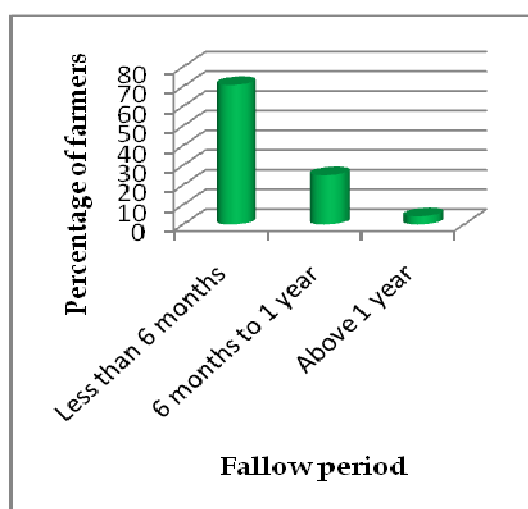


Figure 3. Length of fallow period

Another land intensive strategy studied was intercropping but it was found from observations that farmers in the study area mainly practice monocropping to grow vegetables and intercrop maize with peanut. Statistical analysis also indicates that about 80% of the farmers interviewed practice monocropping as shown in appendix 11.

3.2.2.2 Capital Intensification

Capital intensification as part of the overall agricultural intensification in Mae Ram watershed is mainly characterized by the use of various fertilizers (Urea and NPK), pesticides (Abamectine, Chlorpyrifos and Cypermethrin), improved seeds (vegetables and rice) and manure. It is furthermore, characterized by the use of irrigation system, tractor and conservation practices like terracing.

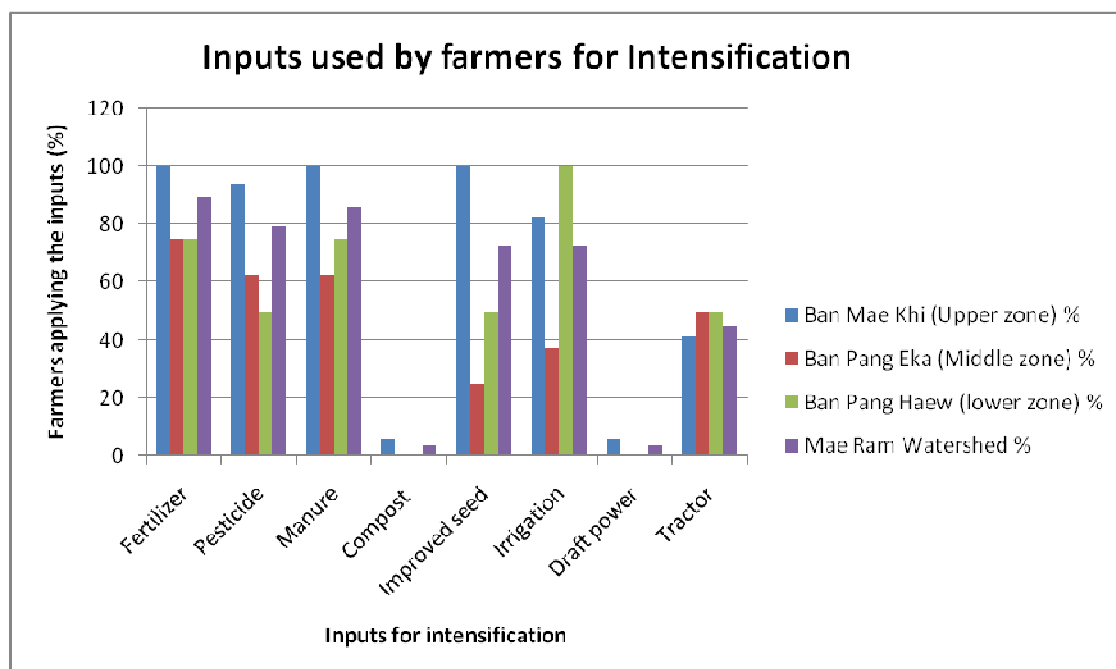


Fig 4. Inputs used by farmers for Intensification.

The royal project representative, royal project extension officer and agricultural cooperative president of the upper zone informed us and statistical analysis (see figure 4) further showed that (100%) farmers in the upper zone use fertilizer, manure and improved seeds. Similarly, 75% of the farmers in the middle and lower zone use fertilizers where as pesticides were used by 94, 62.5 and 50 percent of the upper, middle and lower zone farmers, respectively. But generally in the watershed, more than 70% of the farmers use fertilizer, pesticides, manure, improved seeds and irrigation for intensification.



Picture: Women back from pesticide application in Ban Mae Khi (upper zone) Maeram watershed

Box 1. Observation on intensification

Use of the various inputs was considerably high in the upper zone than the other two zones. In the upper zone fields, we have noticed old fertilizer bags and have seen huge stocks of chicken manure in most of the farms. While walking in most cabbage fields we have also smelled freshly sprayed pesticides. In fact at one occasion we have seen a farmer carrying a pesticide sprayer back home and even witnessed some farmers applying fertilizer.

Since most of the farmlands in the upper zone were on the hills with steep slopes, farmers construct terraces across the slope. Middle and lower zone farmers also use wider terraces for cultivation. Through statistical analysis, personal observations and water availability calendar we were able to see that irrigation is a key feature for

intensification especially making all year round cultivation possible for upper zone farmers. Accordingly, 82%, 37% and 100% of the farmers in the upper, middle and lower zone were using irrigation for agriculture, respectively. Irrigation was mainly in the form of sprinkler irrigation almost in all the farms and spaghetti drip irrigation in some greenhouses. Moreover, mechanization with tractor also constituted part of intensification for about 45% of the farmers in the watershed.

3.2.2.3 Labour intensification

Farmers in the watershed use labour intensive strategies. They used a combination of family, help (shared) and hired labour. Household labour constituted about 46 per cent of all the labour used in the watershed while hired and help labour provided about 34 and 20 per cent respectively as shown in figure 5.

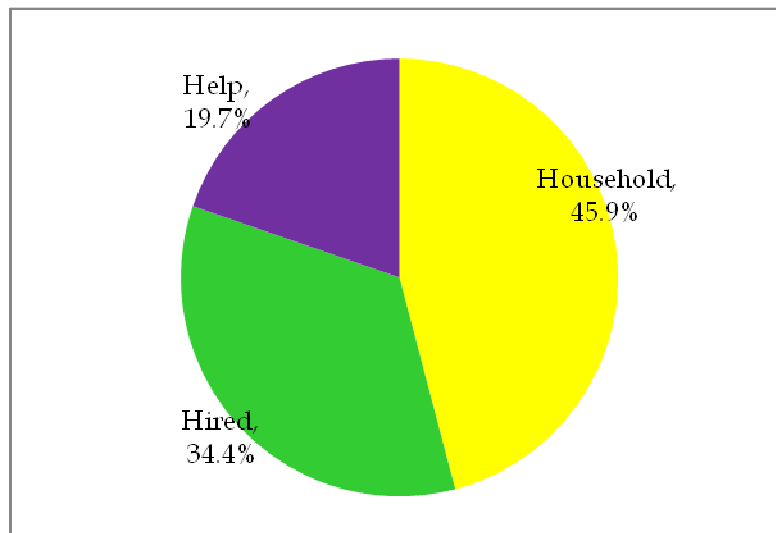


Figure 5. Sources of labour in the watershed

Labour is mainly used during land clearing, planting and harvesting. Some farmers engage labour for manual weeding. We found that on an average three household members are engaged in farming but mostly two which are mainly the parents as the children are attending school and work in the cities and only come to help during periods where intensive labour is needed such as harvesting.

We found that farmers in Ban Mae Khi mostly use intensive labour by supplementing household and hired labour as shown in figure 6. This village uses more hired than the other two villages. This can be attributed to the fact that agricultural intensification is mainly practiced in Ban Mae Khi and since irrigation facilitates multiple cropping during a calendar year, annual labour demand is expected to rise (Shively and Pagiola, 2004).

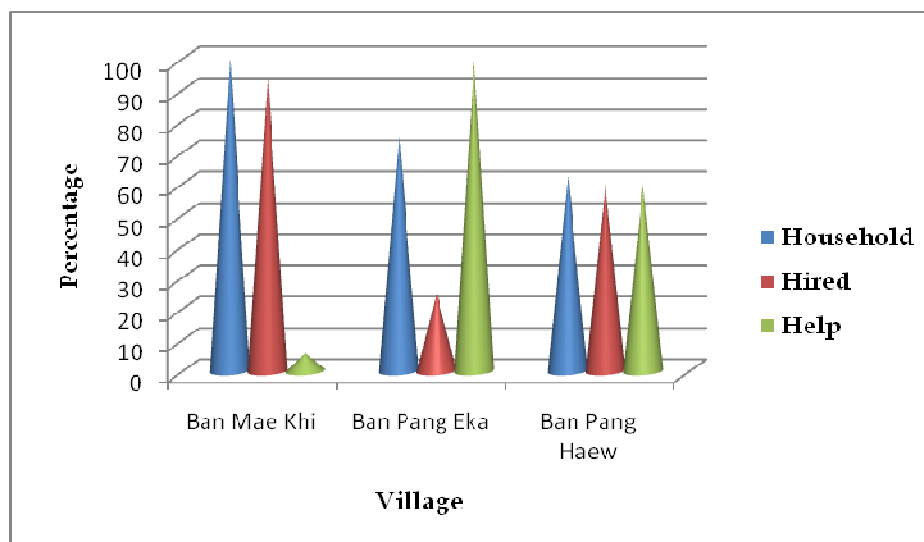


Figure 6. Source of labour for the villages in the watershed

With regard to hired labour, we found that on average five labourers are hired to work on a farm per growing season. A key informant discussion with a researcher at Chiang Mai University confirmed the use of hired labour mostly in Ban Mae Khi. She emphasised that most of the hired labourers are from Burma (Myanmar) and Laos who come to Thailand to make a living. The availability of these labourers has motivated some of the farmers to engage in labour intensification. An interview with one of the labourers is presented in box 2.

Box 2: Burmese labourer in Ban Mae Khi

Came to Thailand in 2004. Was initially working as a labourer at construction sites in cities where she earned 120 Baht a day. The standard of living is very high in the city so she spent the entire wage earned on buying food and paying rent.

Was advised by some Burmese labourers to leave the city and work in Ban Mae Khi. In 2007, she came here and started working as a farm labourer.

She is here with her husband and has two children who are in elementary school. She and her husband work on people's farm from 8am to 5pm with 1 hour break and earn 120 Baht each per day. They work for 20 days in a month. Although the wage is similar to what she earned from working in construction firms in the city, she is happy because here the living cost is low compare to the city and they get food at no cost from the farms they work in. Also, there is high demand for labourers here so they find job any day they want to work as the farmers cultivate throughout the year. Sometimes they work as caretakers of a farm until the crops are harvested.

They mainly engage in weeding and harvesting for vegetable farmers.

3.2.3 Characteristics of de-agrarianization in Mae Ram watershed

De-agrarianization is occurring throughout the watershed. Information obtained from the questionnaire indicates that the inhabitants of the watershed have been engaging in non-farm activities more than a decade ago. This supports the claim by Rigg (2001) and Rigg *et al.* (2001) that de-agrarianisation process has been taking place for a long period of time in Thailand and rural households are dividing their time between farm and non-farm activities. We found out through various interviews that de-agrarianization mainly occurs in Ban Pang Haew. For instance in Ban Mae Khi where there is intensive farming, non-farm activities contribute to less than 25% of the total income of all households engaged in it but in Ban Pang Haew, about 80% of the respondents mainly depends on de-agrarianization activities for their livelihood as shown in figure 7. This can be attributed to the fact that most of the residents in this village have sold their land hence lack land on which to engage in farming activities. This corroborates the assertion of Adams (1995) that the share of non farm income varies inversely with size of land owned.

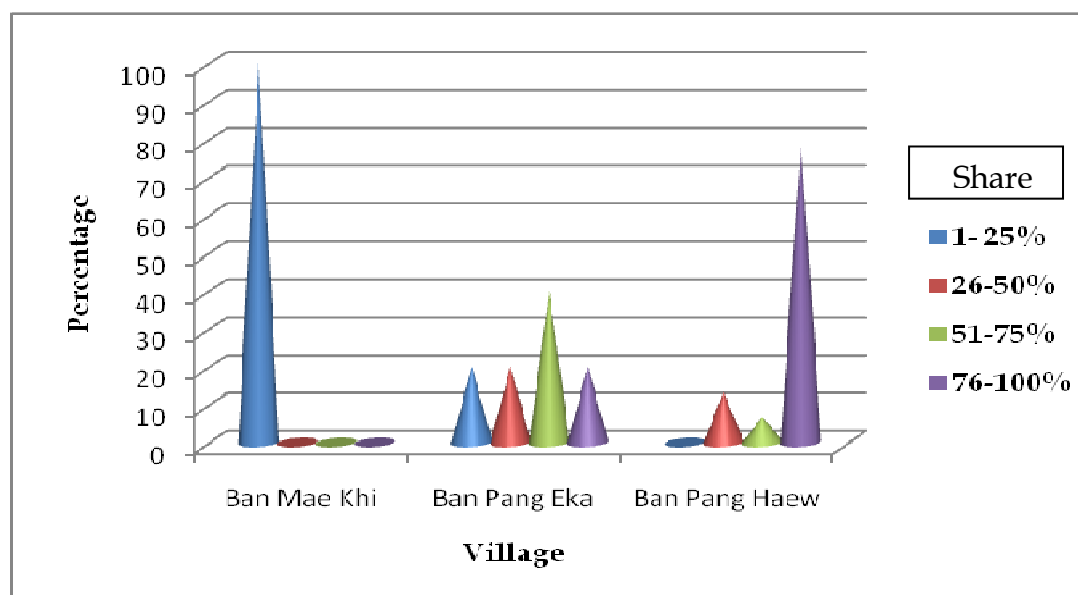


Figure 7. Share of income from de-agrarianization in total income

Some differences were found in the de-agrarianization process across the watershed. In Ban Mae Khi, households earn additional income from working as daily labourers in the farms of other farmers but in Ban Pang Eka, it is mainly seasonal non-farm activities as the inhabitants engage in farming during the rainy season and search for other jobs mainly after the harvest season. In Ban Pang Haew however it is dominated by household shifting from agriculture to non-farm activities by migrating to the cities. We also found out through various interviews that urban migration occurs throughout the watershed. Figure 8 below summarises the various de-agrarianization activities practiced by farmers in the watershed.

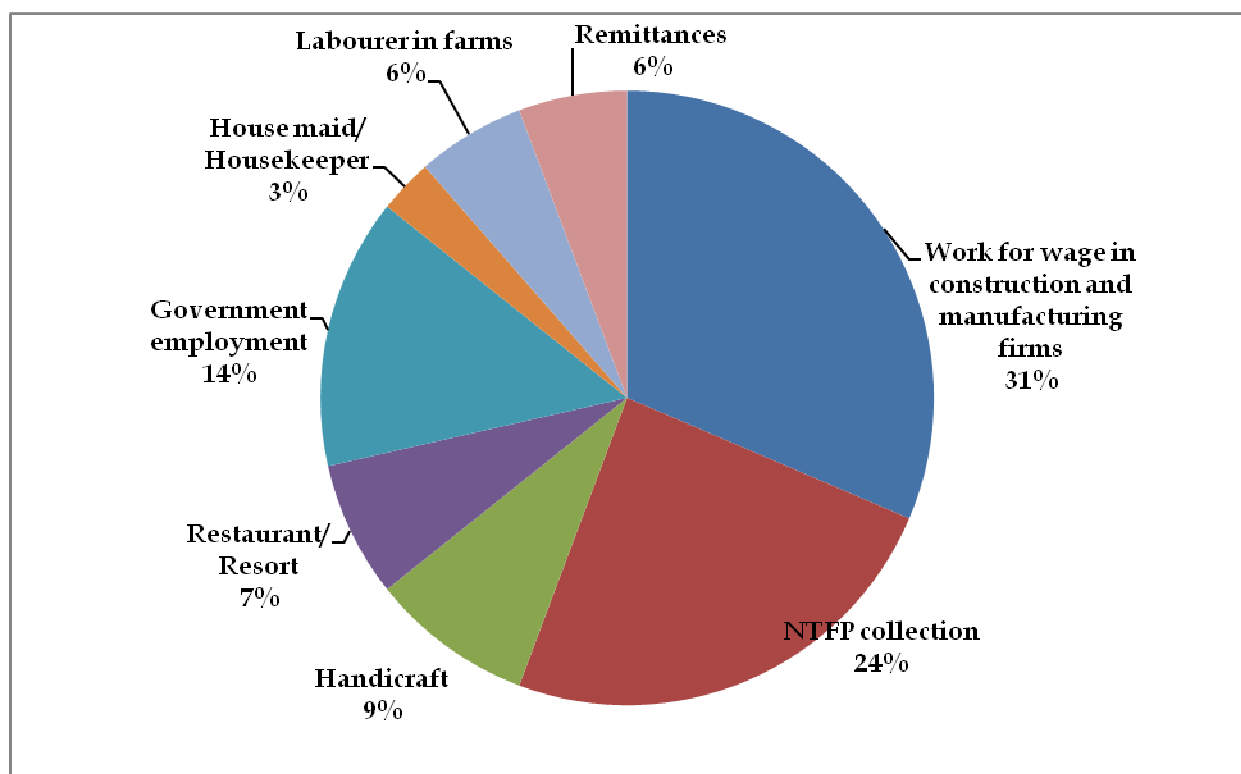


Figure 8. De-agrarianization activities practiced by villagers

Most of those engaged in non-farm activities derived their wage from working in the construction sites. Various interviews and FGD also confirmed this. This is because it is easy to find jobs in this sector as it does not require intensive training or experience. This activity is mostly carried out in the cities Mae Rim, Chiang Mai and Bangkok. Others work in temporal construction sites in the Ban Pang Haew.

Collection of NTFP is done for consumption and for sale. It is mainly collected by the elderly who do not have the strength to work in construction sites or engage in difficult work. NTFP are collected from the community forest and the National Park. We found that only few people collect NTFP in Ban Mae Khi. Mr Wichan, a respondent stressed *“I have so much work to be done on my farm that I don’t have the time to go to the forest to collect NTFP but rather purchase it from other collectors.”* Through seasonal calendar activity, we found that different types of NTFP are collected throughout the year. Different types of mushroom, bamboo shoots, ant eggs, other insects, vegetables and fruits are collected.

Handicraft such as beads and local cloths are made especially by women in all the villages. For instance the Women Association leader in Ban Mae Khi indicated that about 6 women in the village are engaged solely in handicraft and sell it in the cities. Some also sell it to middlemen.

Others are employed in the public sector. They work in hospitals, as policemen/women and teachers etc. These are mainly the young ones who have had education in the cities. Others work in restaurants and tourism resorts as waiter/waitress and cleaners. In Ban Pang Haew, few people are employed as housekeepers and housemaids in the rich city dwellers houses. Some households especially the aged depends on remittances from their children and relatives working. Mrs Yunam, a 70 year old woman indicated; *I and my husband receive 200 baht every month from our child in the city. It is not enough so we collect NTFP for sale to supplement it.*

3.3 Push and Pull factors that promote agricultural intensification and/or de-agrarianization (Main authors: Destaalem and Sebastien; Contributing authors:, Deo-Gracias, Julie, Lensa and Justice)

3.3.1 Push and Pull factors leading to agricultural intensification

Factors leading to agricultural intensification in the watershed can be categorized as pull or push factors which are interlinked. Figure 9 shows the number of times respondents mentioned a factor as cause of agricultural intensification. In total three factors; namely access to market, access to inputs and household size were mentioned more often than others (see Annex 7 for figures and comments).

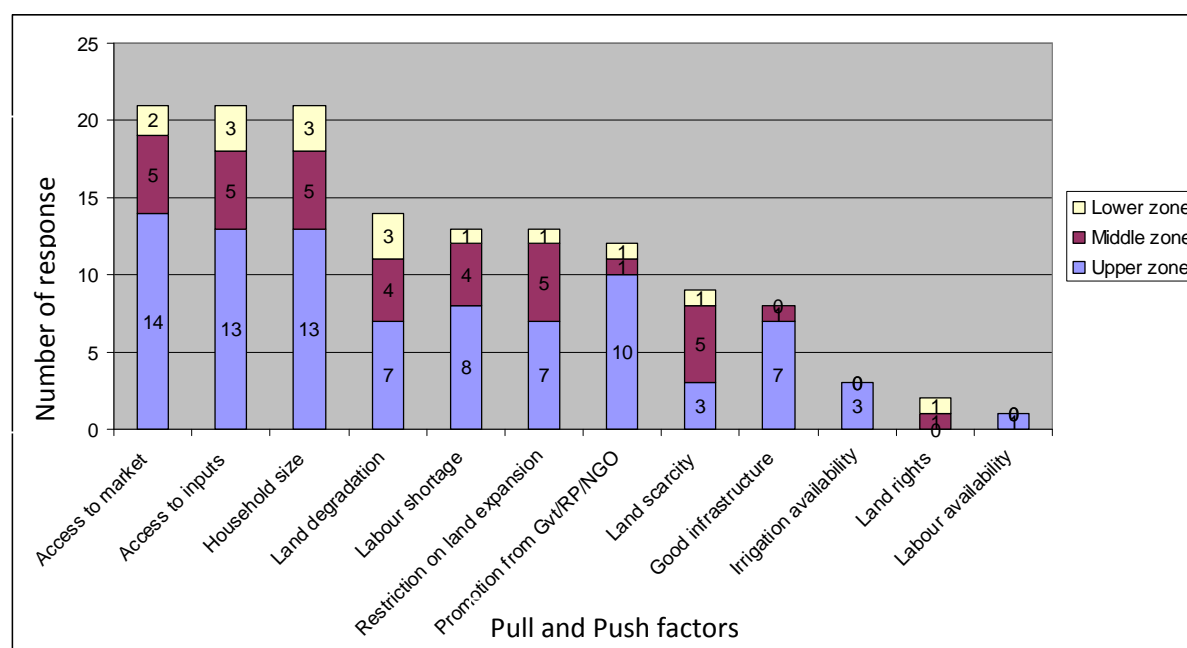


Figure 9. Frequency of push and pull factors in the watershed

From SSI and FGD, it was realized that the Royal Project, availability of financial capital and presence of good infrastructure are the main pull factors whereas restriction on land expansion land degradation are the main push factors of agricultural intensification in the watershed (see figure 10).

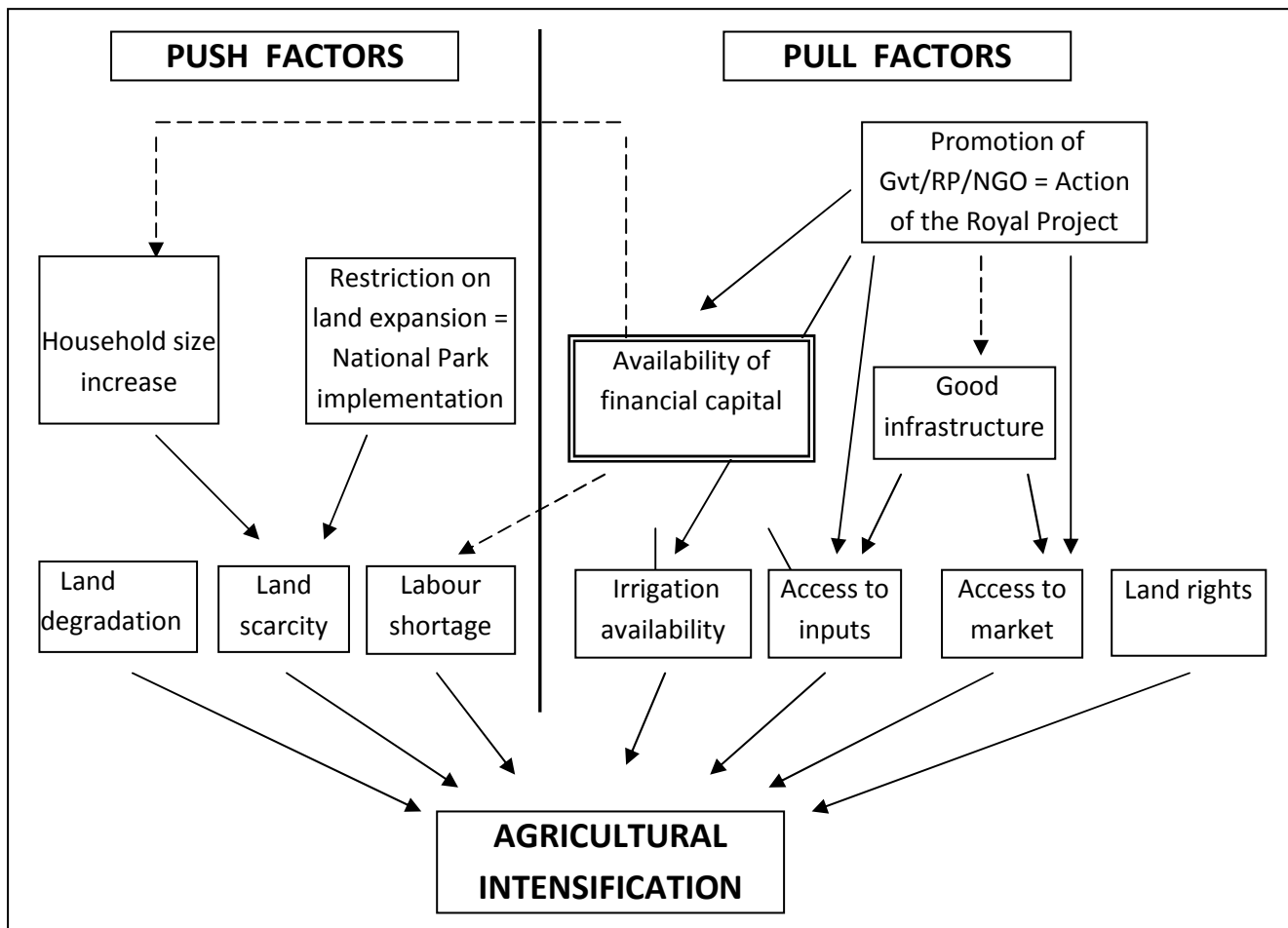


Figure 10. Push and Pull factors leading to agricultural intensification

The **Royal Project**, plays an important role as one of the pull factors, by promoting intensive agriculture (see Box 3) with the use of fertilizers, pesticides, improved seeds, agricultural machineries, to mention but a few. Financially speaking, the RP acted as a starting pump injecting capitals on an individual base for farmers' development to take off. For a majority of them income improved since the first harvests notably because inputs were "loaned" by the RP with no interest rate. Implementation of the RP in the field was followed by **infrastructural development** such as roads, connection to electricity in turn leading to better access to markets, inputs, schooling, medical care, etc.

In addition, the Village Fund was a **financial help** in place during the two Taksin governments (2001-2006) which provided individual loans with low interest rate to start small scale farming activities with irrigation equipment or at least inputs⁶. This micro-credit initiative targeted poor farmers with no access to bank loan and it enabled them to switch from subsistence farming to commercial cash crop. The cooperative system complements the action of the Village Fund (which no more exists) since it also give farmers access to a range of loans with preferential interest rates (compared to banks).

Since **restriction on land expansion** due to delimitation process by the Royal Project in the upper zone and the National Park in the middle has prevented agricultural land expansion, farmers are led to practice intensification (even if on the other hand illegal expansion still goes on).

⁶ This fact was pointed out at the end of the field stay and could not be investigate in depth because of the lack of external key informants. Despite this lack of evidence, we believe that this initiative usefully and strongly complemented the Royal Project as a booster for individual development. Representatives of Ban Mae Khi Hmong community correlated this fact by stating that intensification really started in 2002, not before.

Box 3: The Royal Project and its impact in the watershed

The Royal Project (RP) is a foundation launched by the King Rama IX in 1969, which consists mainly in a socio-economic initiative, originally aimed at eradicating opium culture in all Northern Thailand (the Thai part of the Golden Triangle) through implementing local development actions and providing with alternative agricultural options. The first stage of this operation affecting mainly Hmong farmers (the main growers of opium) was to propose them with new types of crops, helping them financially to switch from subsistence farming on a slash-and-burn mode to innovative and diversified productions on permanent plots.

Technically speaking this first involved the massive introduction of fruit tree, mainly lychee, but this orchard operation lasted only a dozen of years in the Mae Ram watershed and was abandoned for multiple reasons, leaving land unattended (this land is now progressively recovered for non-perennial crop farming. After 1997, new substitution crops were promoted, mainly vegetables, typical from temperate climate such as cabbage, lettuce and other brassicaceae. This shift induced, through extension activity and facilitated access to loan, the introduction of irrigation and mechanization, the use of intrants (mainly organic), an increased use of labour force, etc. But it impacted farmers owning small amounts of land (the context is different from the "Green Revolution" trend) and always on an individual base, not as a whole zonal scheme.

Even if the number of the RP members remain low, the initial incitation was strong enough to widespread the new agricultural practices. The impact of the RP is also visible through the living standards of the farmers which improved dramatically during the last ten years. For a majority of them income increased since the first haroests since vegetables are 2 to 3 times worthier than opium and inputs were "loaned" by the Royal Project with no interest rate. This enabled the farmers to quickly access new assets (car, mobile phone, etc) and schooling (an important consideration for Hmong people – Aumtong S. et al, 2008). Wealth creation and consumption power increase also lead to infrastructure development (road improvement, health network, etc) and intensified contacts with the rest of the country helped widening the choice of economic opportunities (various way to sell the products, to buy the intrants, etc).

Socially speaking, Hmong people are no more outcasts : Thai culture has now infiltrated their closed society through media (mainly TV, present in every household) and through contacts with the plain (mainly by moves by car or truck). The living conditions improvement has deeply rooted a faithfulness feeling and a quasi-religious respect toward the King's person (original initiator of the RP and great architect of the minorities integration).

3.3.2 Push and Pull factors leading to de-agrarianization

According to Yaro (2006), diversification is the creation of diversity as an ongoing social and economic process, reflecting factors of both pressure and opportunity that cause families to adopt increasingly intricate and diverse livelihood strategies. Through time line for major events, FGD and key informants interviews, the socioeconomic change in the watershed from shifting cultivation for subsistence production to intensified farming and nonfarm activities is promoted by different internal and external factors that can be categorized as push and pull factors. Barrett *et al.* (2001) indicates that push factors promoting diversification often are linked with risk reduction while pull factors refer to an effort by rural households to exploit strategic complementarities between activities.

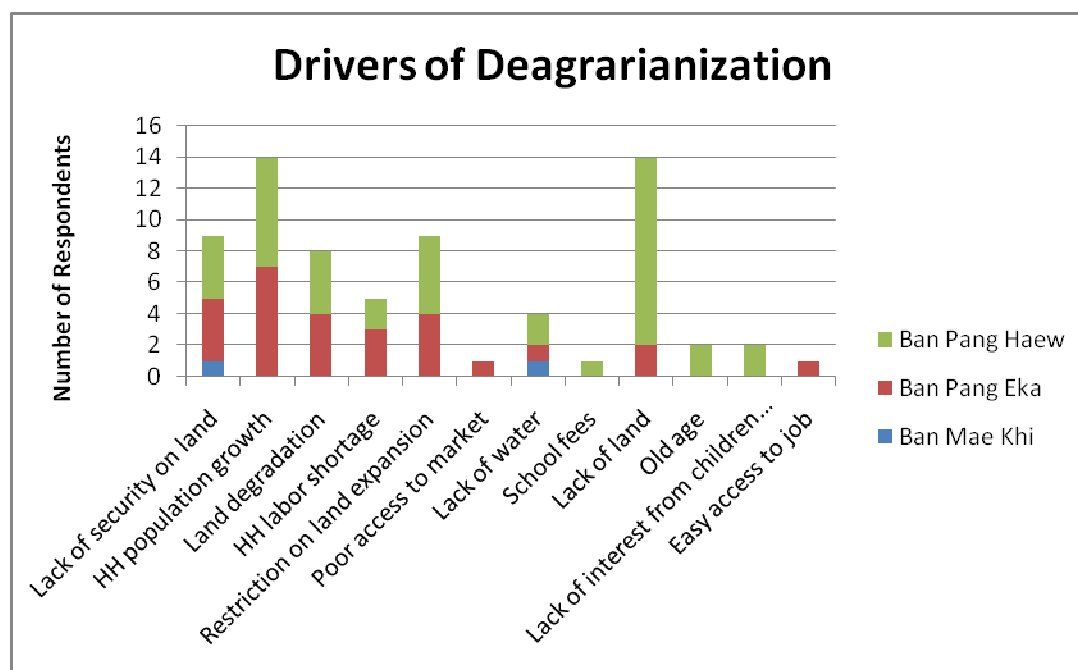


Figure 11. Internal and external factors that drives de-agrarianization

From the above figure, some of the most important internal factors which force or promote villagers to engage in nonfarm activities include lack of land, household population growth, and lack of security on land, land degradation and restriction on land expansion. Shortage of labour, shortage of finance, shortage of water, lack of interest from youngsters on farming and old age are also some other internal factors

which were mentioned by some of the respondents. The pushing or pulling effect of these internal factors to the villagers from their farming activities toward nonfarm activities is also aggravated by some more external factors.

According to the information from the FGD and SSI with key informants, some of the external factors that forces or promotes villagers to engage in nonfarm activities include infrastructural development, economic development, access to job, national park and RFD, increased land price, education, proximity to urban areas and urban influence on social aspiration. These factors have significant role on the socioeconomic change of the villagers from farming for subsistence to the nonfarm activities for more income generation in addition to that of internal factors.

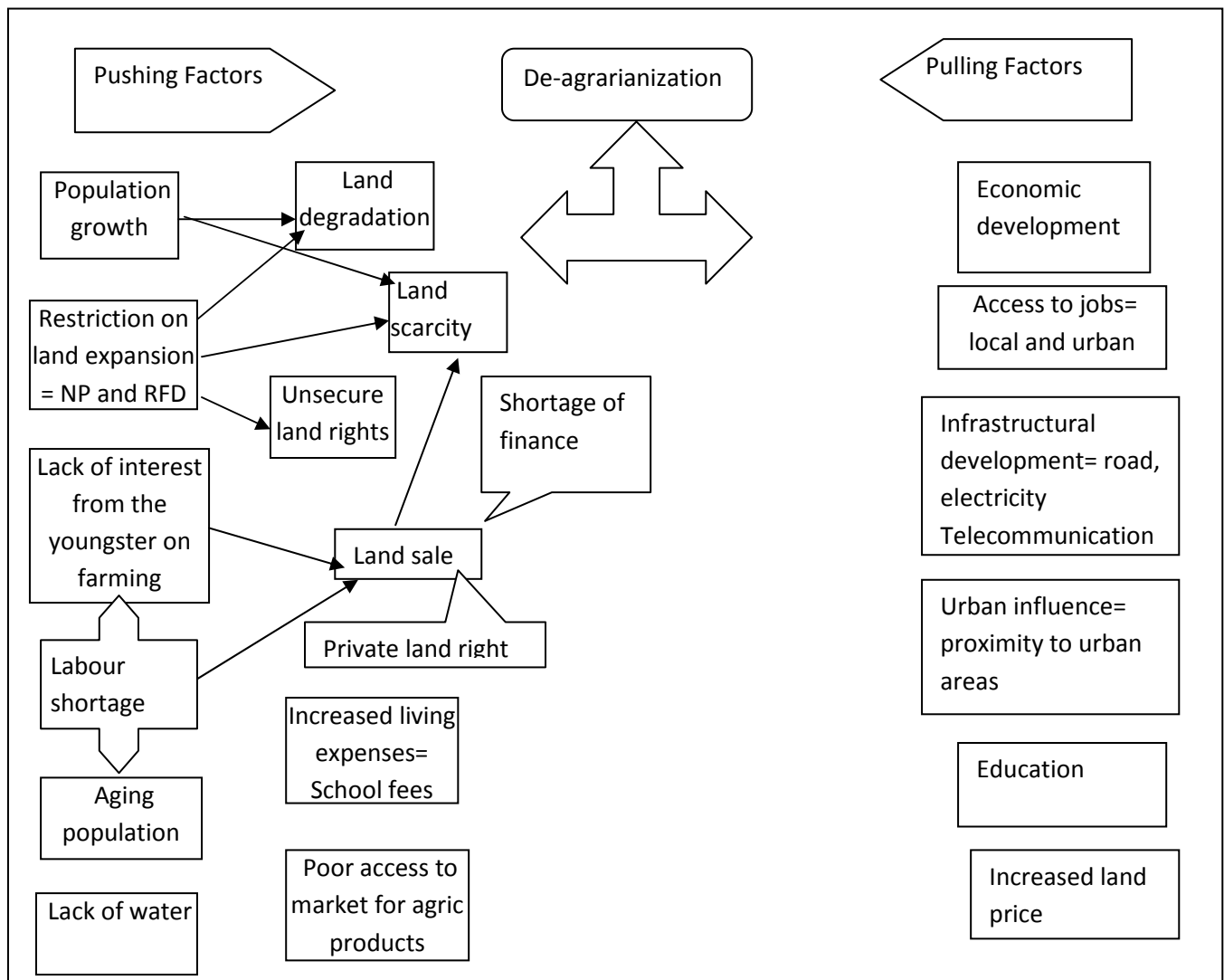


Figure 12. The push and pull effect of the internal and external factors toward de-agrarianization

As it is possible to understand from the villagers mainly in the middle zone and partly lower zone explanation, because of the limited land they have is not enough to produce as much as it is required to satisfy the demand of the increased household population within the time that living expenses is high, it is must to search for nonfarm activities to fulfil the increased demand. In addition to this since the establishment of the National park, expansion of land and shifting cultivation are not allowed, land degradation and shortage of land are main factors that forces villager especially youngsters to engage in nonfarm activities and to migrate for urban employment. Not only this but also the lack of interest from youngster on farming activities promotes nonfarm activities and also aggravates shortage of labour on farming. This situation is also aggravating the land sale for housing in the lower zone as the parents getting old.

In the lower zone the land right and increased price of land are the main factors that promote villagers to sell their land for urban dwellers. This is also makes the villagers and especially the youngster's to be land less and forces them to engage in nonfarm activities after they finish their capital from land sale. Youngster was inherited land from their family. But nowadays the land sale mainly in the lower zone and land shortage due to population growth and restriction for land expansion makes youngsters land less. This situation is aggravated mainly due to the ownership right for their land in the lower zone and the establishment of National park.

Infrastructural development by the government like roads, telecommunication and electricity in the watershed facilitates transportation, communication and use of machineries and some other electronic furniture in the rural areas. This situation increases the urban and rural interaction, social development, education, social aspiration of the rural community. In addition to this the economic development in the province or in the Nation as whole and Mae rim sub district that includes commercial agriculture and industrial investments creates more skilled and

unskilled job opportunities. This all promotes villagers to engage in nonfarm activities to generate more income to satisfy their increased individual and population demand of living expenses.

3.4 Socio-economic and cultural consequences of agricultural intensification and/or de-agrarianization (Main authors: Deo-Gracias and Justice; Contributing authors: Sebastien, Destaalem Julie, and Lensa)

3.4.1 Socio-economic consequences

Extensive review of literature suggests that there are several indicators for measuring socio-economic consequences. Notably among these indicators are changes in income, expenditure, productivity, savings, assets and living standard. (E.g. Beegle et al, 2008; Zeeler et al, 2003; Little, 2006). We realised that using income and expenditure would not give us the correct results because most households started engaging in the two phenomena more than a decade ago hence it will be difficult for them to recollect their income and expenditures during those years. We therefore decided to use household assets and living standard indicators with the assumption that the revenue generated from these two activities would be used to acquire assets or improve their standard of living.

3.4.1.1 Impact on asset acquisition

Considering socio-economic impacts on households in the watershed, we found that they owned lots of assets and the wealth status and living standards of households have improved after engaging in agricultural intensification and de-agrarianization.

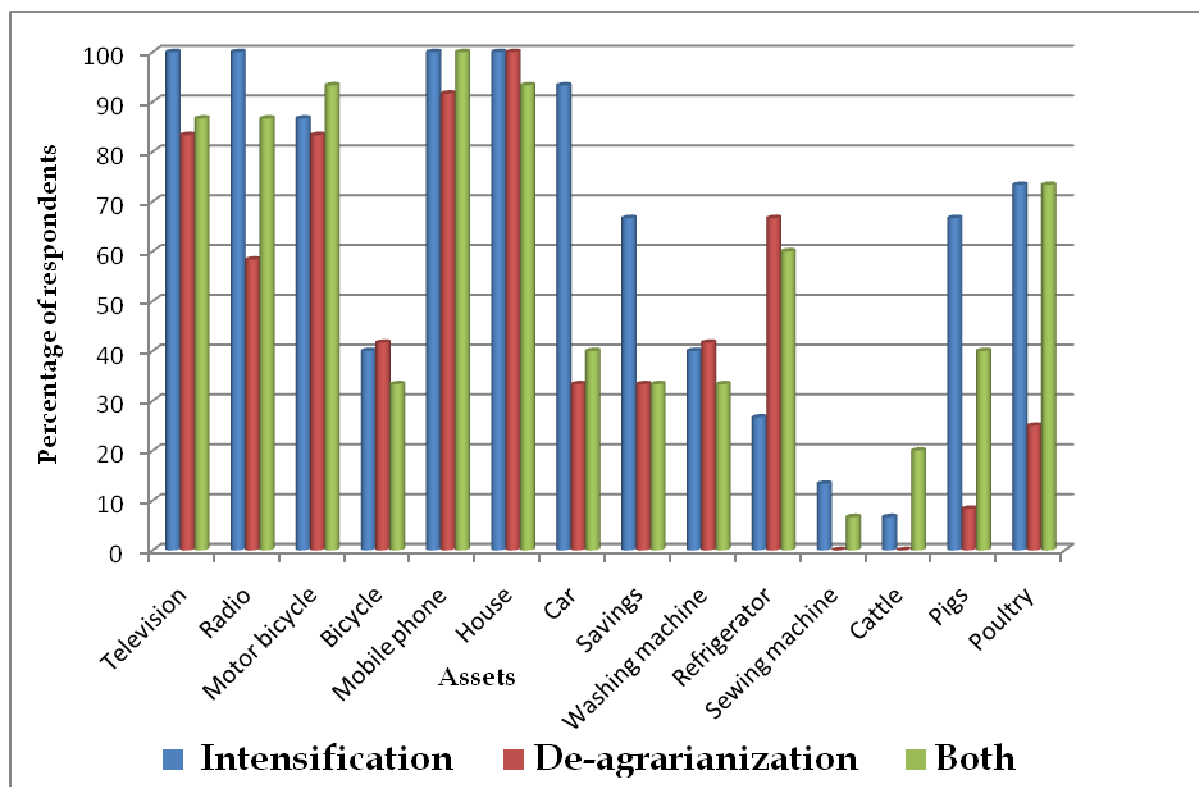


Figure 13: Assets owned by households

Figure 13 above indicates the assets owned and the percentage of households owning those assets. The percentages are based on 14 households for agricultural intensification, 12 households for de-agrarianization and 16 households for both. “Both” refers those who engage in agricultural intensification and at the same time have some households members involve in de-agrarianization. The assets owned mainly include television, house, motor bicycle, car, refrigerator, washing machine and savings at financial or local institutions as well as animals such as cattle, pigs and poultry. On an average, each household owned one of each of these assets but some own more especially motor bicycles. The current savings of households range from 50,000 to 600,000 baht. Only few farmers owned animals. For instance only 9.52% of the households interviewed owned cattle. For those having animals, the average number owned per household is 15, 4 and 15 for cattle, pigs and poultry respectively. From observations and the questionnaire results, we found that in all, those engaging in agricultural intensification which is mainly in Ban Mae Khi owned more assets compare to those engaging in de-agrarianization. For instance, 93.33%

and 66.67% of the households engaged in intensification owned cars and have savings respectively compare to 33.33% of those engaged in de-agrarianization for both cars and savings. This is can be partly explained by the fact that those engaged in intensification are mainly commercial farmers in Ban Mae Khi who used to cultivate opium which was lucrative hence could purchase many assets and with the current production of cash crops, other assets could be added. It was also found that those engaged in both intensification and de-agrarianization which is mainly those in the Bang Pang Eka are not better off compare to those engaging in intensification alone. This is because they are mainly subsistence farmers and only do part-time or off-agricultural season non-farm jobs to supplement household income.

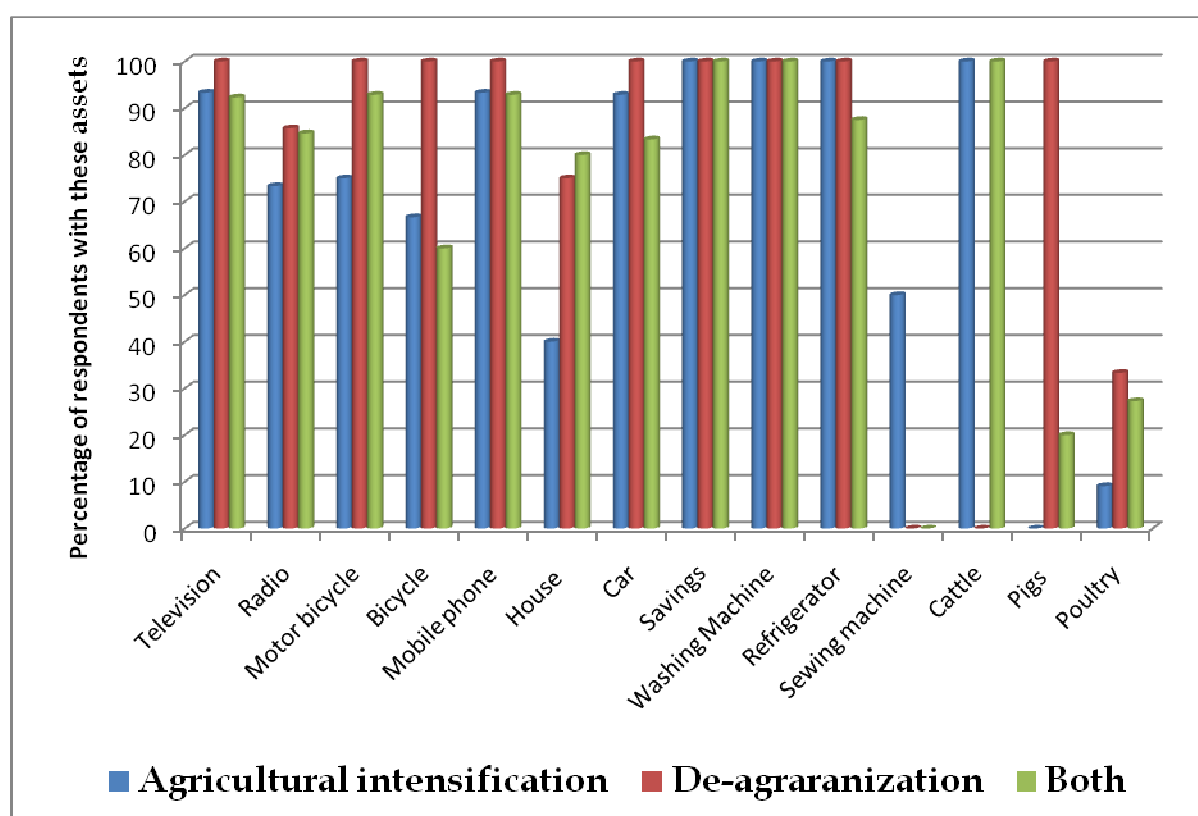


Figure 14. Acquisition of more assets from intensification and/or de-agrarianization

To find out if agricultural intensification and/or de-agrarianization had any impact on the acquisition of these assets, we use the words “more”, “same” and “less “. “More” indicates that households were able to acquire these assets or more of them after engaging in the two phenomena. “Same” indicates that there was no change in

the assets acquire while less indicates a reduction in the assets after intensification and/or de-agrarianization. The full result is shown in appendix 9.

It was found that for those who owned these assets, agricultural intensification and de-agrarianization have had a positive influence on their acquisition as household members acquired most and more of these assets as a result of engaging in these two phenomena as shown in figure 14. With regard to animals, the ownership was found to have decreased because household used to rear chicken cattle and pigs but after switching to intensification of farming and urban migration, they have less time to take care of them. It was found that households involved in de-agrarianization acquired more of their assets from the process than the households involved in intensification. This indicates that households involved in intensification already acquired some of their assets from previous activities mainly the production of opium.

3.4.1.2 Impact on standard of living

Appendix 10 indicates standard of living of households after engaging in agricultural intensification and de-agrarianization. Generally there has been an improvement in education, health, housing, access to food, clothing and potable water of most households as a result of agricultural intensification and de-agrarianization as shown in figure 15.

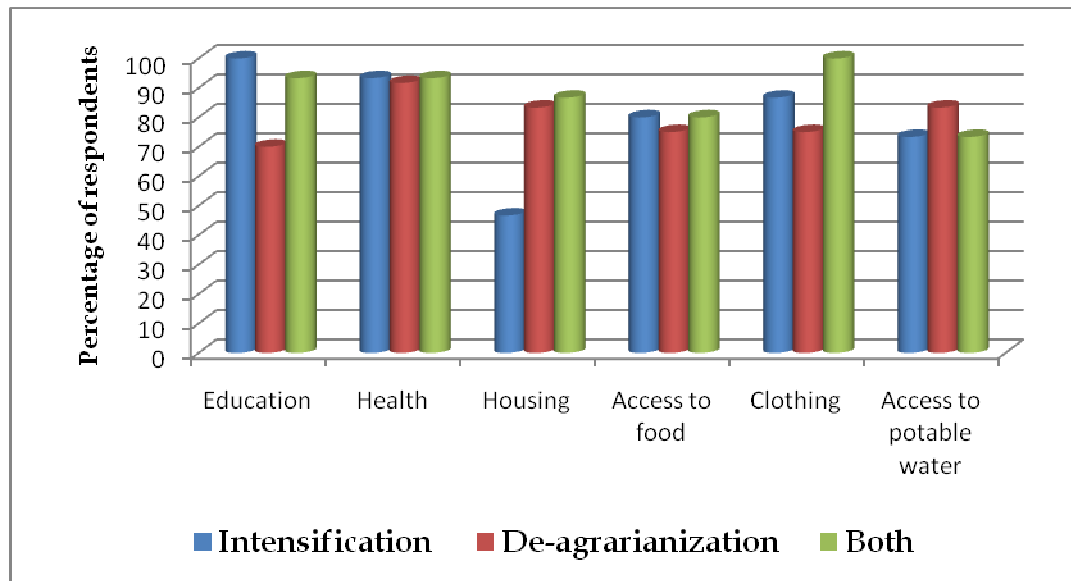


Figure 15. Improvement in living standard after intensification and/or de-agrarianization

Most households can now afford to send their children to school and some are even in tertiary institutions in the cities from money earned from these activities. Others are able to build new houses or repair old ones. Few however indicated negative change in their access to food and potable water. This was mainly attributed to the fact that because they spend part of their income on purchasing food which they use to produce themselves and drinking water which they were not buying. Those in the upper zone used to cultivate rice which is their main food (Aumtong, 2009) but with intensification, they have shifted to growing of commercial crops and with de-agrarianization in the lower zone, there is less farming hence they have to purchase food which is mainly rice. Regarding water, they used to drink water from the stream but with pollution of water due to application of chemicals, they now have to purchase water for drinking. Only few differences were obtained in the improvement in the standard of living for households involved in the two phenomena. For instance those involved in intensification are better off in terms of education of their household members than those involved in de-agrarianization but the opposite happens for access to housing.

3.4.1.3 Impact on infrastructural development

It was generally found that agricultural intensification has had an influence on the infrastructural development in the watershed. The infrastructures found in the watershed include electricity, public telephone and tarred road. Rehabilitation of the road was even noticed during our period of data collection. Through time line activities, we found that most of these infrastructures were constructed or provided after these two processes have taken place. It was found that Royal Project which is a key factor of agricultural intensification in Ban Mae Khi facilitated the improvement of infrastructure in the area as it has close link with the government which is the main actor in the development of the area. Various interviews and FGD however indicates that de-agrarianization has nothing to do with the infrastructural development in the watershed but it is rather as a result of the developmental activities being implemented by government administration of the area. It was generally agreed during FGD's that households have high income and are interested in acquiring lots of assets for themselves rather than helping in infrastructural development in the area.

3.4.2 Socio-cultural consequences

De-agrarianization and agricultural intensification as new trends have some social and cultural impacts on fundamental norms of people's life. Actually, it affects social network, women education, time devoted to temple activities, the use of medicinal plants.

Regarding social network, many associations exist nowadays, namely association of farmers, women and villagers to defend their own interests. With regard to farmer's associations/cooperatives, in the lower zone there is a cooperative of farmers with the objectives of helping farmers to access seeds, fertilizers, agricultural machines at low price. However, due to societal changes (de-agrarianization), the association broadened its activities to include loan at low interest rate, help farmers to access market with their goods, help members to access external credits, since there is less and less people involve in farming in the zone. In the middle zone, there was no

specific farmers' cooperative and that may be the result of subsistence agriculture and conflicts with National park area occurring in the area. As for the upper zone, the Royal Project assists members in the provision of seeds and the purchase of farmers' products. At the district level, there is one farmer cooperative that helps farmers to access input and sell the products on the market. In addition to those associations about agriculture, there are some women associations that hold the voice of women for some official celebrations. However, from SSI with women leader in the lower zone, they don't have any political activities. Also, it should be noticed that more women are educated now in the watershed and that result in their active contribution to household income and decision taking. While de-agrarianization and agricultural intensification are contributing to build up and strengthen social network in one hand, they are also losing family network in the other hand; in the sense that family members spend less time together and live now quite far away from one another for long period. For instance, most of elders met in lower zone have their children away from household and some even confess that they miss their relatives but they cannot prevent it. In the same perspective, help as a main type of labour in the past is hardly considered as such nowadays. It has been taken over by wage labour in agricultural activities.

Considering cultural impacts with regard to food and dressing, deep changes have occurred in many households. Actually in most families people eat processed food, more meat, fat in contrary to Thai traditional food habits. The same trend is noticed in dressing where Thai traditional dresses are no more worn. People and mainly women dress in a way to leave their thighs, arms to anyone's look. Those changes were mentioned by religious and women leaders during most of the SSI. As for impact on religion, it has been understood that in Mae Ram watershed, people's faith is not much disturbed by de-agrarianisation neither by agricultural intensification; but in some cases, they devote less time to go to temple, to worship or even fulfil some cultural festivals (see box).

Box 4: Opinion of a woman leader on cultural impact

As stressed by woman leader in the lower zone: "In the past there was a festival for forgiveness that takes place in April. Actually as the hottest month of the year in Thailand, April is a month for break and socialisation activities. During that festival, people go to elders to ask for forgiveness and it is a very nice practice. But nowadays people don't do that as such. They are very busy and most will go to temple with families just to pray and that's all. They no more go to elders".

As for medicinal plants, it has been observed less interest in their use for many reasons indeed. First of all, due to development of infrastructures (road and hospital) and the promotion of health insurance card (available for 30 baht) by the government, many people prefer going to hospitals and clinics. Secondly, youngsters and some adults are suspicious and afraid of medicinal plants. And it seems that with entrance of Christianity in middle zone, people shifting from animism consider medicinal plants use as not good for their faith. Those points have been supported by many respondents during questionnaire survey and also during SSI with women leaders in the lower middle and upper zones, farmer and NTFP collectors/housewife in the middle zone. Also, people's new occupations, either in intensified agricultural lands or in off-farm activities, they earn more money which make them better off and as such make health care fees affordable. The result is that many are very few traditional healers in the area and as such knowledge related to medicinal plants are disappearing. Elders met for interview and FGD as well as women leader in the upper zone raised the issue but there is a farmer in the middle zone who, during a SSI, complained about the fact that in the past, medicinal plants were not sold but nowadays they are sold and as that is the reason why some of them are over-exploited and even uprooted.

3.5 Consequences of agricultural intensification on environment (Main authors: Julie, Lensa, Justice, Sebastien, Destaalem and Deo-Gracias)

3.5.1 Impact on Soil Quality, Erosion, Flooding and Siltation

3.5.1.1 Impact on Soil Quality

In order to assess the impact of agricultural intensification on soil quality eight composite samples were taken across the watershed and soil quality indicators like pH; Electric Conductivity (EC); extractable Nitrogen (N), Phosphorous (P), Potassium (K); Soil organic Matter (SOM); Bulk Density (BD) and pesticide residue in the soil were measured. The result from the laboratory analysis has been summarised and presented in Table 8 where as Table 7 below shows various physical and chemical soil quality indicators and their relationships to soil quality.

Table 7. Soil quality indicators and their relationship to soil quality

Soil quality indicators	Relationship to soil quality
Soil Organic Matter (SOM)	Soil fertility, structure, stability, nutrient retention, soil erosion, and available water capacity
Physical	
Bulk Density (BD)	Water movement, porosity, and workability
Chemical	
pH	Biological and nutrient availability
Electric Conductivity (EC)	Plant growth, microbial activity, and salt tolerance
Extractable Nitrogen (N), Phosphorous (P) and Potassium (K)	Plant available nutrients and potential for N and P loss

(Adopted from: Friedman *et. al.*, 2001)

Table 8. Soil laboratory result summary

Parameters	Upper Upper Altitude	Zone	Upper Middle Altitude	Zone	Upper Zone Lower Altitude	Middle Upper Altitude	Zone	Middle Middle Altitude	Zone	Middle Lower Altitude	Zone	Lower Middle Altitude	Zone	Lower Lower Altitude	Zone	
pH 1:1	6.35		5.95		5.56		5.2		4.96		5.16		5.66		5.41	
Analysis	Slightly acid		Moderately acid		Moderately acid		Strongly acid		Very acid strongly		Strongly acid		Moderately acid		Strongly acid	
EC 1:5 (dS/m)	0.23		0.26		0.18		0.27		0.04		0.04		0.04		0.04	
Analysis	Very Low		Very Low		Very Low		Very Low		Very Low		Very Low		Very Low		Very Low	
SOM (%)	3.87		3.85		4.16		3.71		2.68		2.47		3.2		1.96	
Analysis	Very High		Very High		Very High		Very High		High		Moderate		High		Moderate	
Bulk Density (g/cm³)	1.45		1.46		1.55		1.50		1.57		1.28		1.49		1.43	
Analysis	High		High		High		High		High		High		Close to ideal value		Close to ideal value	
NO3 (ppm)	18.3		39.3		28.77		30		4.9		9.6		8		4.7	
Analysis	Moderate		High		Moderate		Moderate		Low		Low		Low		Low	
Available P (ppm)	343.65		382		206.73		42.5		10.6		8.5		5.8		21.4	
Analysis	Very High		Very High		Very High		High		Low		Very Low		Very Low		Moderate	
K (ppm)	260.5		177.67		143.33		158		43		21		54		20	
Analysis	High		Moderate		Moderate		Moderate		Low		Very Low		Low		Very Low	
Pesticide (Organophosphates and carbamates)	+2		+1		0		0		+4		0		0		+4	
Analysis	Moderate contamination		Slight contamination		No contamination/Not detected		No contamination/Not detected		High contamination		No contamination/Not detected		No contamination/Not detected		High contamination	

(Source: Soil laboratory analysis for our samples) (See Annex 3,4,5&6 for standard ranges of the quality indicators used)

As discussed in the first section of the result chapter (i.e. Characteristics of agricultural intensification), the extent of agricultural intensification varied greatly among the three zones, and the soil analysis result also shows that the impact on soil varied accordingly.

As shown in table 8, the SOM (%) varied from very high (4.16%) to moderate (1.96%) across the watershed. High levels of SOM (3.85% – 4.16%) and moderate to high levels of NO₃ (18.3ppm – 39.3ppm) were found in the upper zone compared to the middle and lower zones. One reason could be the fact that all (100%) farmers in the upper zone (statistical analysis, Figure 4 in sub-section capital intensification) were applying chicken manure and fertilizers for year round production. It has also been well documented that application of animal manure slows down the depletion of SOM and supplies plant nutrients (OSU 1998).

As for the low concentration of NO₃ in the lower zone, it could be attributed to the fact that the samples were taken from harvested rice field and matured soybean field which at that stage will not require N fertilizer and thus resulting in lower concentrations of NO₃.

Mirsal (2004) divides soil pollutants into macro and micropollutants where macropollutants include fertilizers mainly P and N while micropollutants are those that are introduced in small amounts which include pesticides and heavy metals. The soil in the upper zone was highly contaminated by P having a concentration of 206 to 382ppm compared to 8.5-42.5ppm and 5.8-21.4ppm in the middle and lower zones, respectively. One underlying factor here could be the difference in the pH of the three zones. Soils with lower pH generally have low availability of calcium, magnesium, and phosphorus (USDA 1998). Since the pH of the middle and lower zones are strongly acidic compared to the upper zone, P could have easily been fixed resulting in very low values. Furthermore, overuse of animal manure as described in OSU (1998) can result in phosphorus accumulation as noticed in the upper zone.

Higher concentrations of NO₃ and contamination by P in these soils can be easily leached to the stream or ground water hence posing an impact on water quality.

As to the concentration of K, Whalen *et. al.* (2000) had indicated that application of manure results in an increase in pH which in turn results an increase of available P, K, Ca and Mg. Thus, the higher concentration of K in the upper zone than middle and lower can be explained by high inputs of manure which have an impact on pH which in turn affects availability of K not to mention the intensive use of NPK fertilizers by farmers. Even if all the samples across the watershed showed very low EC ranging from 0.04 to 0.27dS/m, when we compare the values among zones, the upper zone soils had relatively higher EC. As stated by Farahani *et. al.* (2007), a higher EC indicates higher organic matter and clay content and less sand content which was also supported by the higher SOM values shown in the laboratory analysis of the upper zone soils.

We chose Bulk Density (BD, g/cm³) as one of the quality indicators to assess impact of farm machineries (tractors) on soil. High bulk density indicates soil compaction and low soil porosity which will then reduce water infiltration leading to increased runoff and erosion (USDA 2008). The laboratory result (table 8) indicated that the samples from the upper zone were having higher BD when compared for example to the lower zone. We found that our samples (see Figure 16) from the upper zone were mainly from clay soils (see Annex 12 for soil types) where as from clay loam soils in the lower zone. When we compare our BD values with standard values for these soil types, we found that the soils in the upper zone were having higher BD (Ideal for clay soil is <1.1g/cm³ and samples had average 1.48g/cm³) indicating higher degree of compaction than the lower zone. In fact the lower zone soils had on average BD values of 1.46g/cm³ which was very close to the ideal BD value for clay loam/silty soils (<1.4g/cm³). This could be attributed to the more often use of tractor in the upper zone.

As mentioned above, another important quality indicator measured was pesticide residue in soil. The effect of pesticides will not actually be restricted to the soil but will also have a direct impact on water quality as residues in soil can easily leach to water bodies. Accordingly, the laboratory analysis shows slight to high levels of contamination by organophosphates and carbamates across the watershed. Contrary to what one might expect, the contamination level was lower (+1 and +2) in the upper zone which was rather characterized by a higher extent of agricultural intensification than the other two zones which exhibited high (+4) contamination level. One explanation could be washing away of pesticide residues by erosion from the upper to the middle and lower zones. Another reason for this could be because the upper zone farmers are mainly practicing commercial agriculture, they have to comply with the quality standards of Good Agricultural Practices (GAP), EU-GAP, Global GAP etc to sell their product as mentioned by the RP extension officer, hence they might be applying less pesticides or just the required amount as advised by royal project extension officers.

As a result of agricultural intensification, the soils of upper zone were found to contain higher concentration of NO_3 , SOM (%) and were found to be highly contaminated by P. But this contamination of soil cannot be seen separately from water as such contaminants especially in the rainy season can easily leach and pollute water bodies.

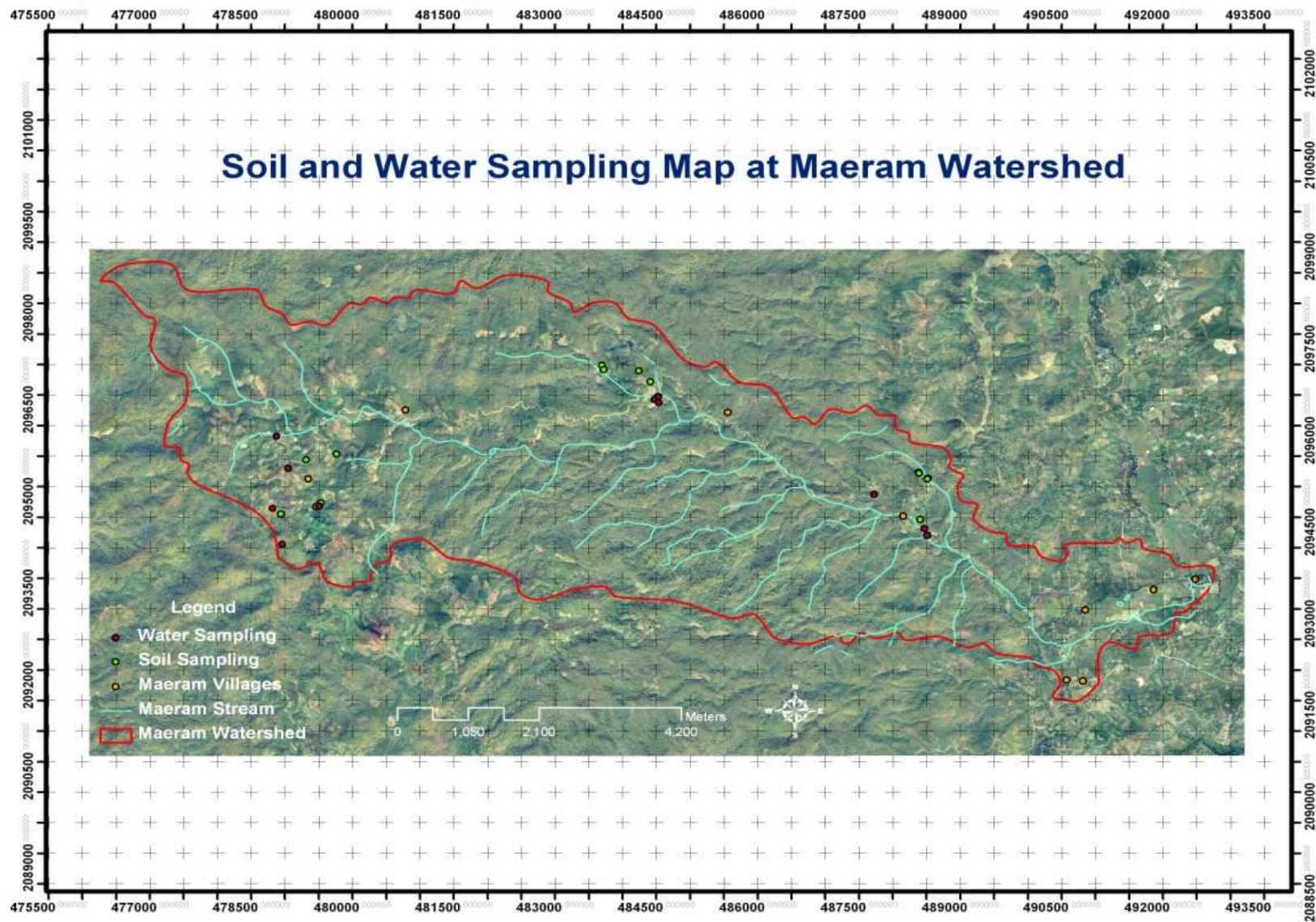


Figure 16. Soil and water sampling map in Mae Ram Watershed.

3.5.1.2 Impact on Erosion, Flooding and Siltation

“Accelerated soil erosion in the highland regions of Thailand due to increasing intensities of land use has long been identified as a serious problem “(Lal 1975; Liengsakul et. al., 1993 in Merritt et. al.). Associate Prof. Dr. Orathai Mingthipol, a

Box 5: Observation on forest fire and erosion

In our ten days stay in the watershed we have witnessed two forest fires; one sever and the other mild not to mention the ashes from old fires we have observed during our transect walks. Hence one can only imagine how many more will occur every now and then or even from the time we left the villages till now. In such cases, plant cover that could otherwise prevent soil erosion is lost through the forest fires which adversely affect the physical and chemical soil properties related to erodibility (Van-Camp et. al., 2004). This could aggravate the existing soil erosion and the associated flooding and siltation in the watershed apart from agricultural

researcher and lecturer in Maejo University who has closely studied the watershed, also identifies erosion as a problem in the watershed especially in the rainy season. From the slope and erosion maps (Figure 17 and 18, respectively), we were able to see that the upper and middle zones are dominated by highlands with steep slopes of 30-40% and a high erosion level (H4) when compared to the lower zones which is mainly dominated by low land with 0-10% slope and low erosion level (1&2). We found out from our key informants that, there is a serious problem of flooding and siltation in the lower zone. This may be attributed to the fact that the lower zone, as can be seen from the maps, is dominated by low land

and low slope range which result in a higher risk of flooding and siltation than the other zones. Our key informants further stressed that, villagers of middle and lower zone complain about erosion, flooding and siltation especially in the months of August and September where their fields are often flooded by water coming from the upper zone. As discussed in the previous sub-section, intensification in the upper zone has resulted in higher bulk density and compaction which in turn has reduced water infiltration resulting in runoff and erosion. We were also able to see, during our transect walk in the lower zone, mild to severe erosion approximately ranging

from 3m deep to 15m (Annex 14, transect walk drawing-lower zone). However, intensification does not stand as the only cause of erosion, flooding and siltation as topography and slope play an important role as well. Although there is higher erosion risk in the upper zone, we were able to find out from FGD that the problem of erosion is stable at present. Dr. Orathai also indicated that although the frequency of erosion, flooding and siltation is high in the watershed, the extent remains the same. One reason for this could be the practice of soil conservation techniques like terracing which might have counterbalanced the effect of erosion to some extent.

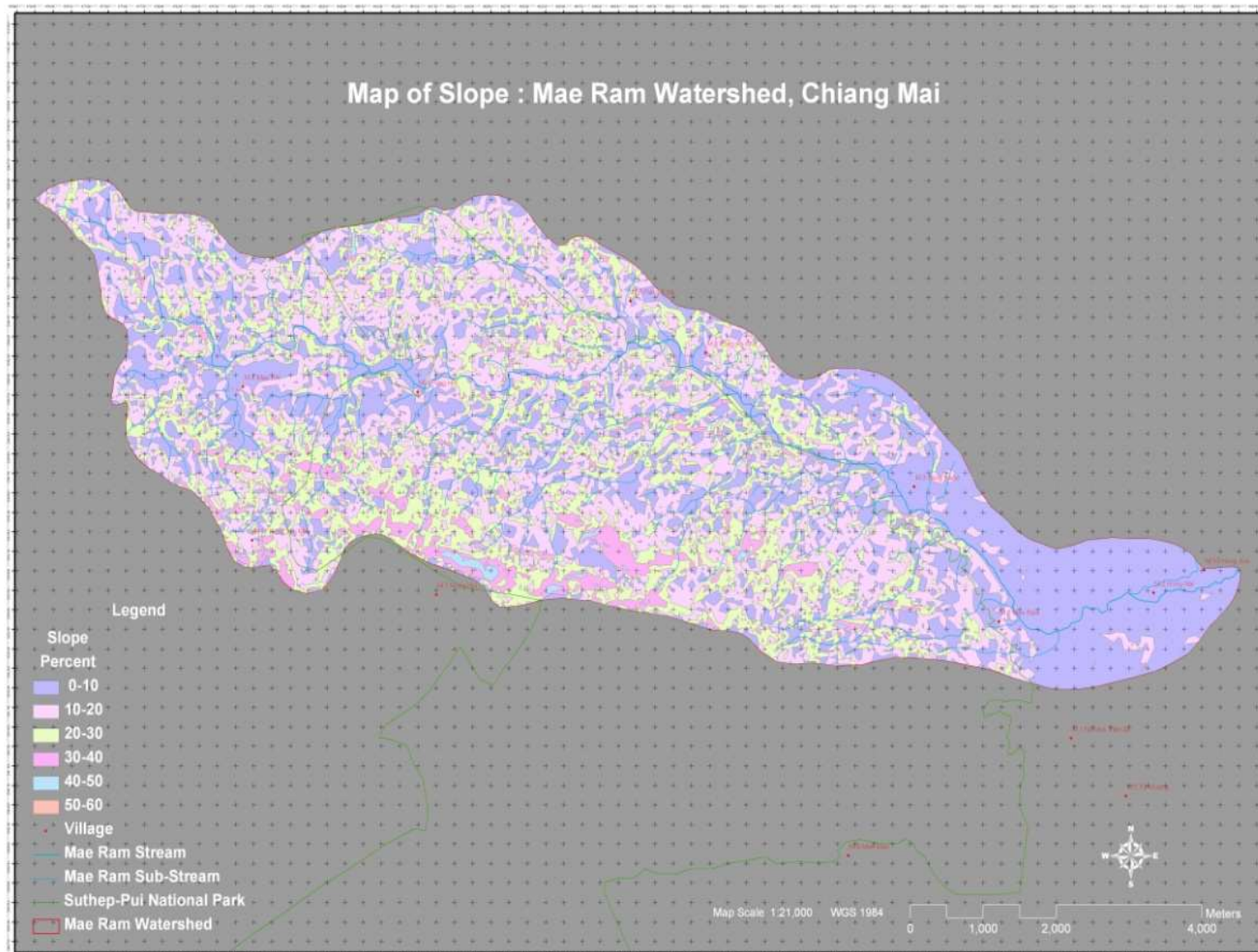


Figure 17. Slope map of Mae Ram watershed. (Source: Khun Khet Sripun, Chiang Mai University)

Map of Erosion : Mae Ram Watershed, Chiang Mai

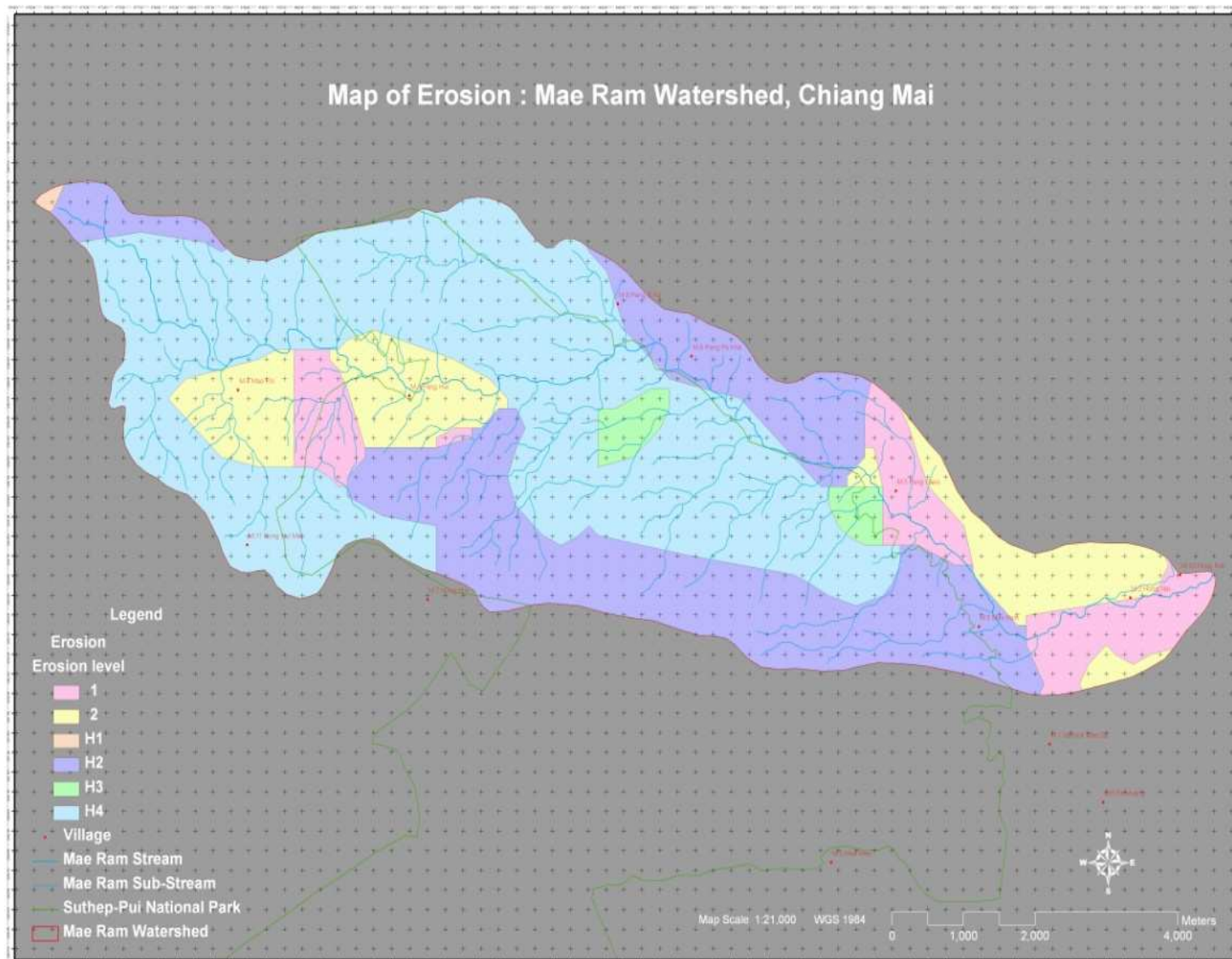


Figure 18. Erosion map of Mae Ram watershed. (Source: Khun Khet Sripun, Chiang Mai University)

3.5.2 Impacts of intensification on water quality and availability

3.5.2.1 Impacts on water quality

Water quality can be assessed by several parameters namely pH, EC, DO, available PO₄P and NO₃, pesticides residues. (Shelton, 1997) Based on those parameters, water and sediments samples have been analysed and the results summarized in table 9.

Table 9. Water and sediment contamination assessment results

Stations		Upper					Middle			Lower		
Quality parameters	Standard of surface water (Thai government's)	U1	U2	U 3	U4	U 5	M1	M2	M3	L1	L2	L 3
pH	6-9	6,07	6,5	7,1	7,2	7	8,5	7,81	7,88	8,12	7,9	7,81
		Normal										
Electrical Conductivity	≥ 200 (µs/cm)	320	300	270	107	160	180	110	130	100	200	100
		Normal						Low		Normal		low
Dissolved oxygen	>6 (ppm)	8	8	8	6	8	7	7	7	6	7	7
		Normal										
Available NO ₃	< 5 (mg/l)	0,5	1	1,75	0,25	0,1	0,05	0,1	0,1	0,5	0,5	0
		Normal										
Available PO ₄ -P(mg/kg)		-	0,08	0,38	0,13	0,05	0,08	-	0,08	0,12	-	0,06
Pesticides	<0,05	0	0	0	0	0	0	0	0	0	-	0

residues (organophosphate and carbamate group)	(mg/l)	Not detected in sediments
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The analysis of the results shows overall no water contamination based on the standard of surface water quality published by the Thai government. However season effect may have influence those results very much due to lower chemicals runoff in the dry period. But considering parameters like pH, even during rainy season, water in every agro-ecological zones shows normal values as in table 10 where it is only one point in the middle zone that shows pH=4.1, probably due to some station reasons.

Table 10. Results of the last rainy season according to the previous report of Thai students

Parameters	Upper midstream		Middle zone		Lower zone	
EC ($\mu\text{s}/\text{cm}$)	115	112	119	194	110	171
pH	7.2	7.5	7.5	4.1	7.6	7.6
DO (ppm)	6	8	2	4	4	2
Available NO ₃ (mg/l)	0.25	0.1	0.1	0.1	0.1	0.1

(in bold: values which do not correspond to the standards)

Considering electrical conductivity, the results in table 9 show low EC in some areas in middle and lower zones while values in upper zone are normal. Since EC stands for level of salinity, high values may result from agricultural run-off and express a lower water quality. (Michaud, 1991). Comparing data of the dry season to table 10, EC values lower which shows that during rainy season, salinity is lower and hence water quality is better considering EC parameter.

Dissolved oxygen is produced by photosynthesis and decomposition phenomena.(Mortimer, 1956) From our samples analysis, its values indicate a good quality of water in the area and ranges from 6 to 8 across the watershed. But table 10 shows decreasing DO values from upper (6-8) to middle and lower zones (2-4). This may be a consequence of stream flows, since DO of freshwater source is naturally higher, and also linked to sampling methods.

Higher NO₃ and PO₄ concentrations were found into intensified zones (upper 3 to 5) and then decrease through the watershed. Besides high P value found in the lower zone may result from proximity of a cattle grazing area from where cattle manure may enrich the water's nutrient concentration. These results could also be explained by intensive use of fertilizers in the upper zone. As documented by Carpenter et al.(1998), this provokes a surplus of nutrients which is firstly accumulated in the soil before being partly transported to downstream aquatic ecosystems. But household activities are also important sources of P and N due to the use of non-biodegradable detergents and the absence of sewage treatment.(Heath, 1995).

Further no pesticides residue were found in the sediment samples of the dry season and neither in the rainy season. This can be explained by the sandy texture of the sediments which cannot stock heavy metals and so increases nutrient leaching. That has been supported by a water expert during a SSI.

Even though water and sediments sample analysis didn't reveal any particular water contamination due to agricultural intensification, they are some qualitative statements got during different SSI which show that there is water contamination issue in the watershed. Hence there is need to in-depth investigations on water contamination in Maeram. To further assess the issue, more details are given on conflict related to water in the area.

3.5.2.2 Impact on availability of water for agriculture, livestock and human consumption

The analysis of figure 19 shows that water available for agricultural activities is rainfall as well as irrigation water in the three zones. But in the upper zone, water is available for irrigation the whole year round, apart from April. Actually farmers consider April as a holiday month and hence don't produce much in that period otherwise it is not due to water shortage. However in the two other zones, water for irrigation is mainly available during the rainy season and little (shortage indeed) available for the other period of the year due to intensive use in the upper zone.

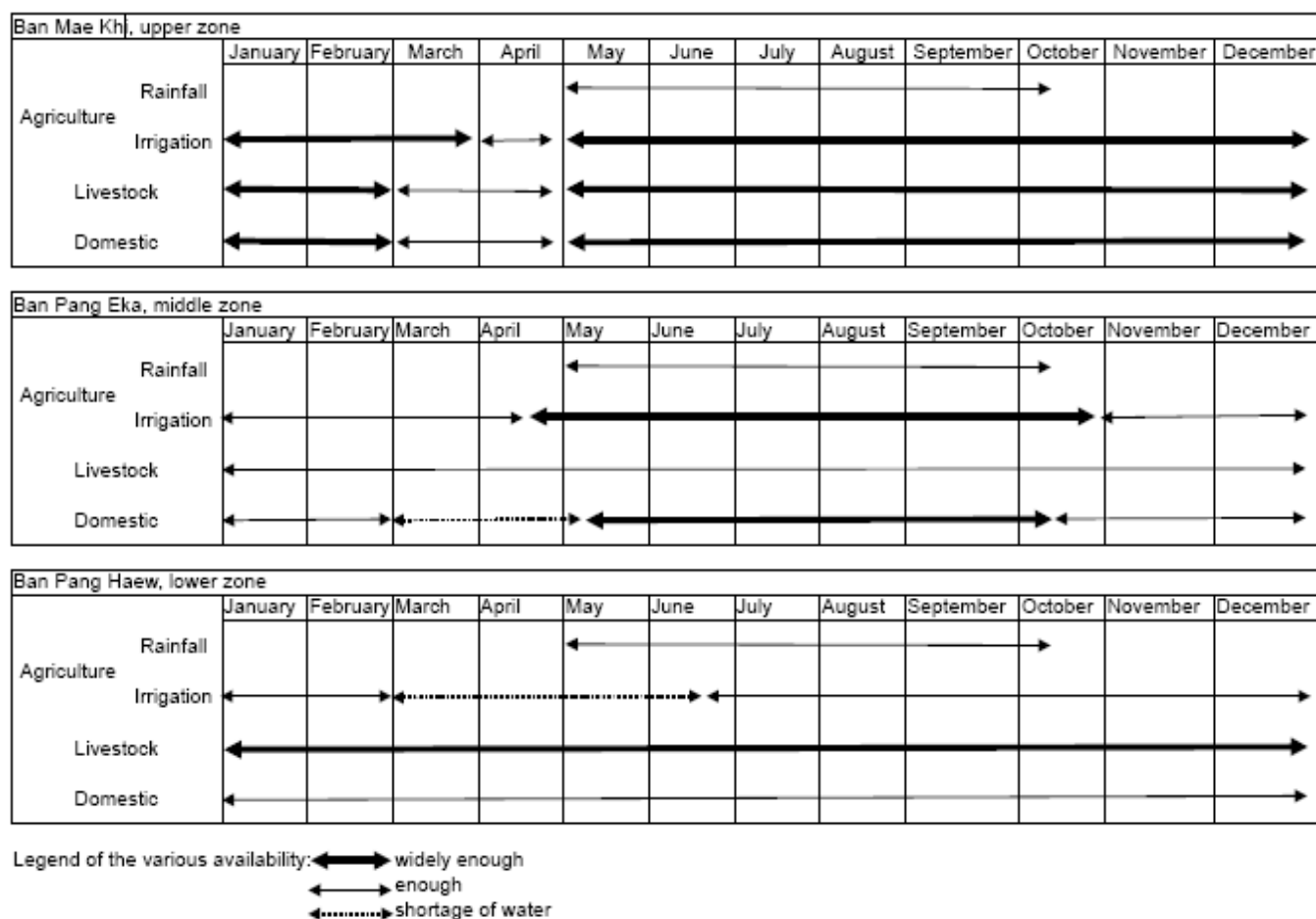


Figure 19. Water availability calendars in upper, middle and lower zones of Mae Ram watershed

Regarding water availability for livestock consumption, no shortage was noticed. However, villagers in the upper zone stress that it is only in March and April that animal may go further to find water to drink. It is important to stress that in Mae Ram watershed, livestock rearing is not an important agricultural activity and thus the issue of water for animal consumption is not difficult to address by villagers.

As far as water availability for domestic use is concerned, it is mainly from March to May (dry season) that a shortage is noticed in the watershed. From the analysis of water availability calendar, upper zone villagers don't face much water shortage problem. But middle zone villagers suffer more of shortage because some of the villagers still use

water from stream for consumption and other domestic use (washing, cooking, etc.) even though they prefer bottled water for drinking. In the lower zone, villagers use tap water for domestic needs and clean bottled water for drinking; so that they don't face any shortage. Nevertheless, some argue that due to water bill, they use stream water sometimes for washing clothes and dishes.

3.5.3 Impact of de-agrarianization and/ agriculture intensification on forest covert change

From the analysis of land use change areas in Mae Ram watershed from 1997 to 2008 (see figure 21) it can be noticed that two types of forest grow in the area: ever-green forest in all the agro-ecological zones and deciduous forest presents in the middle and the lower zones.

The analysis of table (see annex 8), shows the largest forest area in the middle zone and this may be explained by the National forest policy implemented in that zone. According to various interviews of key informants, there has been no significant change in forest cover since the establishment of the NP. The data coming from aerial photographs analysis (regarding land use change in the watershed in the last 10 years partially confirms these field indications.

In order to capture more details about the spatio-temporal change of forest cover, figure 20 was drawn.

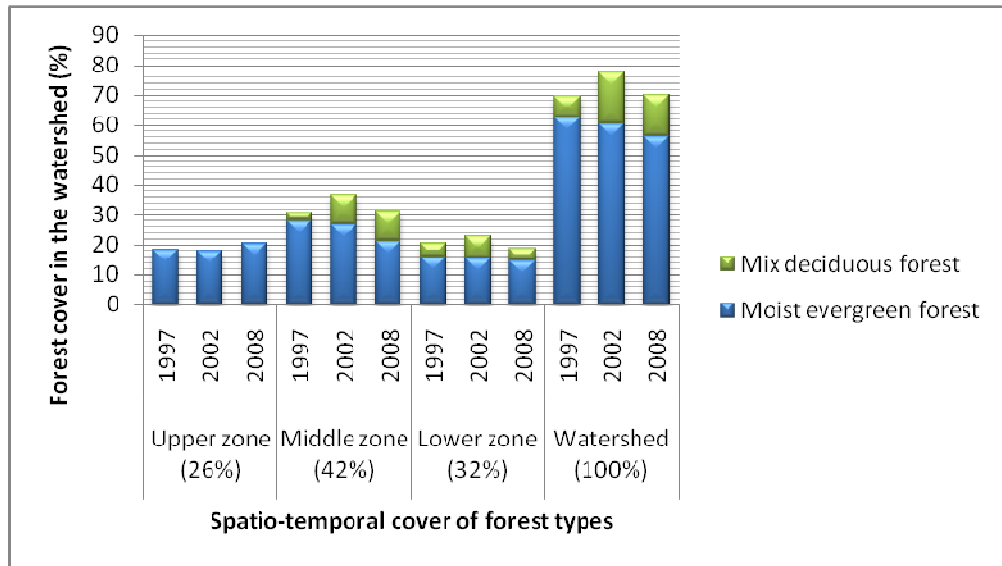


Figure 20. Evolution of the forest cover through time and per type of forest

It shows that since about ten years, the cover of moist evergreen forest is decreasing and little expansion occurring in the upper zone (definitive fallow, slash-and-burn ban) being compensated by the small loss in the lower zone (no protection status for the forest downstream). During the same period, the same surface (6.5%) have been transformed into mix deciduous forest, this type of land use compensating exactly the loss of moist evergreen forest. This “substitution” trend is typically illustrated by the situation in the middle zone. This could be explained by the fact that mix deciduous forest are closer to the main community (Ban Pang E Ka) and then more liable to be under the frequent control of the NP staff (replacing the RFD in that area). Forest closer to the village can therefore more easily reconstitute without being subject to new destructions due to slash-and-burn cultivation. On the other hand, encroachment is more liable to occur in the most remote places, where moist evergreen forest is to be found.



Picture: Forest fire in the Ban Pang Eka (middle zone) Mae Ram watershed



Picture: Agricultural encroachment within National park In Ban Pang Eka

Both the two types of forests did not follow the same evolution through time. The decrease of the moist evergreen forest cover has been regular during the past eleven years. On the other hand, the mix deciduous forest has recorded a large increase of its cover (more than the double) in the first years of the National Park, where slash-and-burn practice and new cultivation plot creation became forbidden. In 5 years, 10 percents of the watershed total surface (amongst which $\frac{3}{4}$ were in the middle zone) went back to this type of forest without major plantation scheme. But the six last years,

the trend inverted and the same surface of mix deciduous and moist evergreen forests were lost (4% of the total watershed surface for each of these two land use), mainly in the lower zone for the mix deciduous (land sale and housing expansion) and in the middle zone for moist evergreen forest (agricultural encroachment).

To support aerial data analysis, we have found in the field that there are different threats on quality of forest namely litter fire, grazing, NTFPs collection and timber harvest.

Regarding the quantitative data on forest cover change in the watershed over time, the data analysis is not very consistent because it is not very realistic to have about 10% increase in a forest cover within 5 to 6 years. As it is not very well possible considering the forest growth, we think that the forest cover area being strange may be explain by some problems related to the method used to design the different maps (1997, 2002 and 2007). As such, the area considers for each of the three period might be different and that could explain the reason why forest area in the watershed increases so rapidly. All in all, in-depth investigation is needed to draw reliable and valid conclusion about forest cover in Maeram watershed.

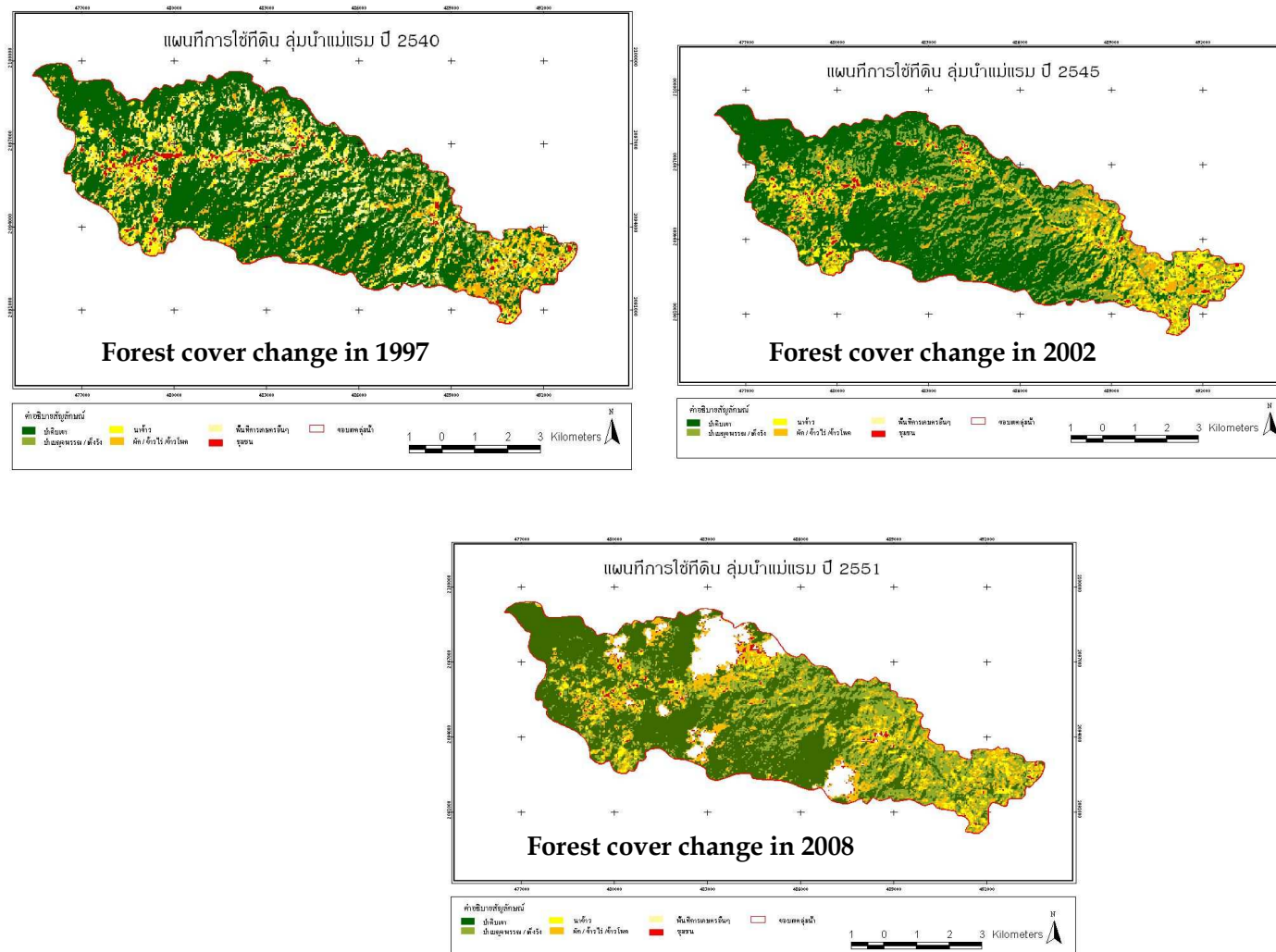


Figure 21. Forest cover change in 1997, 2002 and 2008

Litter fires are intentional and are believed by local people to have a positive effect on regeneration of ground mushroom, which are commonly consumed NTFPs in Northern Thailand. Fires are also a good help to kill little game such as rats and snakes, enabling an easy hunt. This practice is common (twice a year) and in certain place a significant part of the surface under the forest cover can be found burnt. On the other hand, no visible traces of serious (ie forest surface destroying) fires were noticeable. Another source of impact on forest quality, grazing, is practiced, sometimes with the cattle staying overnight in corrals. Many others NTFPs are also collected in the forest such as insects, snakes, bamboo shoots, medicinal plants, fuelwood, etc, most of them for household consumption, some for sale (e.g. bamboo shoots). Construction timber is harvested but this should in theory only affect dry dead wood. In practice, trees are ringed to make them die and the practice is still tolerated as far as it is to get wood and not to definitely clear a land from its trees (to enable encroachment).

It has to be noticed that none of these widespread activities are considered by the National Park staff as serious conflicts, even fires since it is accepted that some forest species necessitate fire to regenerate. The NP therefore do not try to prevent these activities but at least to know where they happen and to what extent (purpose of the patrols, conducted three times a week). According to them, the most serious threat to the forest remains the agricultural extension, which impact directly and more noticeably on the forest cover. The NP is indeed mainly responsible for the quantitative aspect rather than the qualitative one.

It is also important to mention that socioeconomic changes occurring in the villages have an impact on forest utilization. Since agricultural intensification started, improving the villagers' income, the pressure on forest seems to have had decreased. What is noticeable today is, according to the NP staff (SSI13), on a much lower level than in the past. This trend is particularly visible in the upper zone, where land tenure is also rigidified by the presence of the Royal Project. In the middle zone, encroachment into the forest remains a problem since the use of this forest is still claimed by the villagers. In the lower zone, forest is no more a source of conflict

since people are more and more engaged in non-farm activities, using their wages, as the farmers of the upper zone, to buy their food. At the end only farmers who did not shift to intensification (especially in the middle zone) still depend on forest encroachment and forest products harvesting.

3.6 Influence of de-agrarianization and/or agricultural intensification on conflict of interests on natural resource conservation or utilization (Main authors: Deo-Gracias and Destaalem Contributing authors: Julie, Lensa, Justice and Sebastien)

3.6.1 Major conflicts influenced by de-agrarianisation and/or agriculture intensification

In Maeram watershed, two major sources of conflicts have been identified and ranked as followed:

- ✓ Water availability and pollution
- ✓ National park delimitation overlapping the Karen village in middle zone.

The major conflict identification has been done from the analysis of different focus group discussions (FGD), Semi-structured interviews (SSI); transect walks and other direct observations. As for the ranking, it is done by the students themselves with support of respondents ranking on one hand and based on the extent of the problem (number of agro-ecological zones involved) in the watershed and how often it is considered as a source of conflict by respondents.

But we believe that there is a third underline conflict related to the lack of borders for each type of forest in the watershed (see box for more detail)

Water as a major source of conflict across the watershed, is also a source of conflict within agro-ecological zone (case of upper zone) referring to a SSI TAO agricultural extensionist and some informal interviews.

From the analysis of community meeting with headers in the lower zone, FGD for water availability and seasonal calendar, SSI TAO agricultural extensionist, problem related to water availability are mainly flooding, siltation (rainy season) and water

shortage (dry season). That point has been supported by the water expert during an interview where she pointed out that flooding, siltation and water shortage result from erosion that is a concern in some areas (see erosion map) enhance by agricultural intensification in the upper zone. In addition to erosion, there is the issue of water management by farmers of upper zone. Actually during dry season, upper zone farmers use more water from the stream to irrigate their intensified agriculture land. Some even build up water barrage or divert the streams to their farms which at the end prevent those in lower altitudes to have access to water. While lower and upper zone are mainly concerned with water issue, it is less the case in the middle zone because the main source used in Ban Pang Eka village is not the one flowing from upper zone but rather form another stream called Huang Eka that joins Mae Ram.

Regarding water quality, the issue is about water pollution, contamination by pesticides and fertilizers used in agriculture intensified lands located in upper zone. Water contamination has been experience by the Karen (middle zone) and the Lana (lower zone) through skin irritation, fish skin colour that change or are wounded, etc. Such clues were confirmed among others by respondents of FGD with elders, community meeting with village headers in the lower zone and also during a SSI with deputy village in the middle zone. Also fish species that indicate a good water quality cannot be found anymore according to the water expert. In contrary to those statements and testimonies of water contamination, the TAO during a SSI mentioned that water quality analyses made by Royal Project, Royal Forest Department, in collaboration with his office, shows no contamination during the last years. But we couldn't access those water analysis data.

That last point seems a bit contradictory but we believe that they have been some contamination issues which are reduced these last years due to different sensitization initiative, Good Agricultural Practices toward upper zone farmers and Royal project office. Such actions have actually been mentioned by the TAO, his extensionist and the Royal project coordinator during SSI.

National park area overlapping with the Karen village in the lower zone is seen as another major conflict in the watershed but the core source of that conflict is from the method used to define the national park area (remote images) where the Karen village was not considered. Thus, it is to be noticed that the conflict is not due to deagrarianization or agricultural intensification. In contrary, those two phenomena contribute to reduce the conflict and make the villagers sharing relatively the concept of National park and consider it in their livelihood strategy. Actually most of the households make money from the two phenomena and as such practice less slash-and-burn cultivation. In consequence the need to expand agricultural land is less and the conflict is relatively settled. Nevertheless, the issue is still lasting; in the sense that despite the land use right given to them, community forest paradigm implemented, middle zone villagers continue to claim their property right which is denied by the forest office. Actually this has been pointed by TAO, religious leader in the middle zone, national park guard coordinator during different SSI. Also, from the forest walk with forester and forest guards we observed that forest fire, loggings and agricultural encroachment are common activities.

3.6.2 Stakeholders and conflict resolution mechanism

Considering water as a source of conflict, the following stakeholders can be considered: the lower zone villagers (Lana), the middle zone dwellers (Karen) the upper zone farmers (Hmong) with their water management committee, the Royal project, the Burmese employees, TAO and Clean bottle water providers.

The number of stakeholders, their interests, needs and even position in the society, the water availability and pollution issue remain very complex and difficult to address as noticed by religious leader in the lower zone. Formally there is no resolution mechanism about the question but there are very often some informal meetings either among villagers or arranged by TAO at sub-district level if there is any strong complain.

At village level, the initiative is always taken by lower zone dwellers who goes to the Hmong (upper zone) and ask to reduce or control their use of pesticides, fertilizers

and also amount of water used for irrigation. However those approaches are vain according to the lower zone elders and local TAO during some FGD and SSI. Actually upper zone farmers shift responsibility to Royal Project and remind that they never use pesticides, fertilizers and irrigation in the past, when they used to grow opium. But it is the Royal project that stops them from growing opium and brought those chemical products and agricultural intensification techniques (like irrigation). As such, it is an everlasting problem where the lower and middle zone villagers seem to be powerless while upper zone farmers and Royal project are definitely the power holders. That point has been raised by the lower zone TAO sub-district representative, who said during a SSI that "... Hierarchy is an important concept in Thailand. Middle and lower zones have never had any answer from the Hmong, neither from the Royal project. It is only one-way communication." Apart from conflict of interest related to water, there are also some deep cultural differences among the three zones villagers that make hard to find room for conflict resolution. In addition to that is the lack of qualified human resources in the subject of conflict resolution, among TAO, Royal project and village headers. Those limitations have also been identified by the water expert during a SSI.

Despite the extend of water conflict, as far as students are concerned, de-agrarianization in the lower and middle zone contribute very much to reduce water conflict swelling in Maeram watershed. Actually it is only during rainy season that people practice mainly subsistence agriculture activity in those agro-ecological zones and as such there is not water shortage issue. Thus water conflict is limited to water for consumption (refer to water availability and seasonal calendar). The latter also is more or less solved now with availability of tap water and clean water sold in bottle for household consumption.

From all above, it can be said that lower and middle zones villagers adapt themselves to the different conflicts raised by flooding, siltation, water contamination due to agriculture intensification in the upper zone especially with de-agrarianisation. But when households adapt to water availability, the question of water contamination remains a concern for human being as well as for the

environment (atmosphere, aquatic fauna, plants, etc) as a whole. To control pesticides use and over-dose practices in intensified agriculture land, tax policy could be implemented for greenhouses, intensified agricultural lands, instead of land property tax currently used. Actually from the SSI with TAO, only property tax exists and that means soybean plot owners in the middle or lower zone pay the same tax as greenhouse and intensified vegetable owners who used pesticides along the whole year, in the upper zone. In addition to tax policy, pesticides control, water and soil quality analysis should keep going on, in order to aware farmers of environmental risk and damages due to their daily activity.

Considering National park area overlapping with the middle zone village settlement, the stakeholders are National park office, the villagers, TAO, Royal Forest Department, Religious leader and Conflict negotiation team in the middle zone.

To sort out that conflict, the middle zone villagers set a board who negotiated with the National park office and Royal Forest department to have right to work on their land and utilize the forest resources. As a result, there is a concept of community forest that is developed for the villagers to have land use and Non timber forest product (NTFP) collection right. But they have no right to sell land, to build any house in the farm lands, neither to cut trees without National park office permission. From their side, the National park office and RFD start working together with villagers on conservation and protection of the forest resource sharing common understanding of conservation objectives. With those initiatives, the illegal forest utilization activities are significantly reduced according to forest guards during transect walk in the forest. Currently, the risk of encroachment, protection of National park area, the wish of villagers to claim their land property right and expand their farm land is seen as an underline challenge for both parties. These issues are well supported by religious leader, youth leader in the middle zone as well as the Coordinator of National park guards during different SSI.

Box 6: An underline conflict: *Lack of borders for each type of forest land use in the watershed*

Regarding the borders of each type of forest land use (national park, conservation forest and community forest) it is a major source of conflict in the watershed but only at office level. In fact TAO is in charge of natural resources management in the watershed. But the reality is totally different because those resources are either managed by National park office, the Royal Forest Department, the Royal project or in collaboration with TAO. The lack of knowledge about the area of natural resources under the responsibility of TAO and the other offices (from different ministries) brings some complexity in resource management. The question has been stressed by the Tao during a SSI but we should also pointed that it is not an open conflict since the different stakeholders work together in one way or another for the sake of natural resources management.

The main stakeholders involved are: TAO, Royal Forest Department, National Park Office and Royal project and currently, there is no specific way of resolving that conflict. The complexity of the issue may even find its roots in the legislation, where different ministries are assigned tasks that overlap on the ground. Since there is collaboration in resources management among stakeholders, the question may last for a while from now onwards.

4 CONCLUSIONS

In Mae Ram watershed, two phenomena characterize household's source of income: agricultural intensification and/or de-agrarianization activities. Agricultural intensification is dominant in the upper zone of the watershed, where the Hmong ethnic group use land, labour as well as capital intensification to grow vegetables for commercial purpose throughout the year. To achieve this, they practice multiple cropping, monocropping, short fallows; use agro-chemicals, manure, improved seed (vegetables and rice), irrigation systems, tractor and soil conservation techniques such as terracing. In addition to that, hired foreigner labour (mainly from Burma and Laos) is a feature of agricultural intensification in the upper zone. As for de-agrarianization, it is mainly occurring in the lower zone (throughout the year) while the middle zone villagers undertake it mainly during the off-agricultural season. It consists of permanent non-farm employment in urban centres, seasonal non-farm activities and seasonal hired labour for farm activities. The main activities include wage job in construction and manufacturing firms, collection of NTFP for sale, making of handicrafts, working in resorts or restaurants as care taker, waiter or housemate.

Some of the most important factors that drive agricultural intensification include the Royal project in the upper zone, easy access to micro-credit, restriction on land expansion by national park policy, household size increasing and developments of infrastructural (roads). Regarding de-agrarianisation, it is driven by the possibility of owing land property right in the lower zone, restriction on land expansion by National park, lack of farm land, development of communication infrastructures, urban proximity and access to skilled and unskilled jobs, lack of interest from youngsters on farming activities.

In total, these societal changes improve households' standard of living in many ways. The wealth status and living standard of households have generally improved after engaging in agricultural intensification and de-agrarianization. Most people can now afford good access to education, health, and food, clothing, housing and

potable water. Those engaging in agricultural intensification seem to own more assets than those involved in de-agrarianization or in both. However, those involved in de-agrarianization acquired the assets after engaging in the process compare to those involved in intensification. Animal production has reduced considerably since this two phenomena started.

De-agrarianization and agricultural intensification as new trends have some social and cultural impacts on fundamental norms of people's life. Actually, they affect social network, time devoted to temple activities, women education improves and the use of medicinal plants is decreasing.

Apart from socio-economic and cultural impacts in the watershed, agricultural intensification has also impacts on soil, water and forest cover as environment components. Thus, it has been associated to increase soil concentrations in SOM (%), NO₃ (ppm), K (ppm) and contamination with P as well as pesticide residues; namely, organophosphate and carbamates. And increase frequency of erosion, flooding and siltation in the watershed. Regarding water quality the analysis of water and sediment samples didn't reveal any particular water contamination due to agricultural intensification. However intensified agriculture practices (irrigation) influence water availability for agriculture in the middle and lower zones. As for forest cover change, the two phenomena are shown to have contributed to maintain forest area even though agricultural encroachment and intentional forest fire are occurring in the ground. The last two factors: water and forest are in other respects considered as major sources of conflicts that have been identified in Mae Ram.

Actually water availability and pollution is a main issue between upper zone farmers and lower zones villagers. Even though there is no formal resolution mechanism about the question, there are very often some informal meetings either among villagers or arrange by TAO at district level if there is any strong complain. At village level, the initiative is always taken by lower zone dwellers who go to the Hmong (upper zone) and ask to reduce or control their use of pesticides, fertilizers and also amount of water used for irrigation. Regarding forest issue, the conflict is

between the middle zone villagers at Ban Pang Eka and the national park office. As the national park area involves the Karen's village, there is a land use conflict between the two stakeholders. To resolve the problem, there is a concept of community forest that is developed for the villagers to have land use and NTFP collection right. But they have no right to sell land, to build any house in the farm lands, neither to cut trees without National park office allowance. Currently, the risk of agricultural encroachment in the protected National park area, the wish of villagers to claim their land property right and expand their farm land is seen as an underline challenge for both parties.

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7 APPENDICES

Appendix 1 Questionnaire

Questionnaire

Village:

Date:

Number of questionnaire:

House number:

Student's name:

Translator's name:

We are a group of student from the Faculty of Life Science, University of Copenhagen in cooperation with a group of Thai student from Chiang Mai University and Maejo University. We kindly ask you to participate in our questionnaire survey. Your answers will be kept anonymous and the results will be used to analyze the *causes and consequences of de-agrarianization and agricultural intensification in the Mae Ram Watershed* to fill the requirement of our academic study. Thank you for your participation.

I. Background information

1. Name of head of household (optional):

2. Gender of head of household

☐ Male ☐ Female

3. Age of head of household _____ years old

4. Number of the members in the familypersons

Male _____persons

Female _____persons

5. Age of the member in the family

Under 15 years old _____persons

15-20 years old _____persons

21-35 years old _____persons

35-60 years old _____persons

More than 60 years old _____persons

6. Education of the member in the family

Primary school _____ persons

Junior high school _____ persons

High school _____ persons

Tertiary _____ persons

No education _____ persons

7. Ethnicity/language?

8. How many people in the family who have an occupation?

9. What is your main source of income?

☐ Farm ☐ Non-farm Both ☐

II Intensification

10. How many household members work on the farm?

11. What are your sources of labour?

Source of labour	Do you use any of these labour 1 Yes 2 No	Do you use more/less/same of this labour today compared to period before intensification?
Household		
Hired		
Help		

12. How many labourers do you hire on your farm?

13. Do you use more/less/same labour now compare to the period without intensification (fertilizer, pesticide.....)?

☐ More ☐ less ☐ Same ☐

14. Have you been practicing fallow?

☐ Yes ☐ No

15. If yes, how long is the fallow period for your farm land?

16. Have it increased/decreased or is the same compare to previous fallow period?

☐ Increased ☐ Decreased ☐ Same ☐ No fallow

17. Do you practice intercropping (growing of different crops on the farm)?

☐ Yes ☐ No

If yes, list the crops you intercrop.

.....

18. Do you practice multiple cropping?

☐ Yes ☐ No

If yes, list the crops e.g. Rice + Cabbage + Soya bean

.....

19. Do you practice subsistence (own consumption) or commercial farming (for sale)?

☐ Subsistence ☐ Commercial ☐ Both

20. Do you practice monocropping?

☐ Yes ☐ No

21. Do you practice crop rotation?

☐ Yes ☐ No

22. Complete this table on the crops you cultivate

Crops grown	Area cultivated now (rai)	Have the area cultivated been more/less/same today compared to period before intensification?	Current yield (1kg / rai)
		1 More 2 Less 3 Same	
Rice			
Soybean			
Cassava			
Cabbage			
Lettuce			
Orange			
Other			

23. Complete this table on the inputs used

Inputs	Do you use the following inputs 1 Yes 2 No	Do you use more/less/same of this inputs today compared to period before intensification?
		1 More 2 Less 3 Same
Herbicide		
Fertilizer		
Pesticide		
Manure		
Improved seed		
Irrigation		
Draft power		
Tractor		
Other		

24. Please complete this table concerning what drove you to intensify your farming activities

Driver	1 Yes 2 No	If yes, what is the level of importance*				
		1	2	3	4	5
1. Land right						
2. Increase in family size						

3. Land degradation		
4. HH Labour shortage		
5. Restriction on land expansion		
6. Better access to market		
7. Easy access to inputs		
8. Land scarcity		
9. Promotion from Government/NGO		

*1 = least important 5= most important

III De-agrarianization

25. If non-farm is one of your sources of income, what is its share in your total income?

1 2 3 4 5 6 7 8 9 10

26. Could you please list your non-farm activities?

Non-farm activities	Where is it undertaken	No. of HH members engaged in it
1.		
2.		
3.		
4.		
5.		
6.		
7.		

27. Can you recall when you start to diversify your source of income to non-farm activities?

☐ 0-5 years

☐ 10 years

☐ More than 10 years

28. Please complete this table concerning what drove you to engage in non-farm activities

Driver	1 Yes 2 No	If yes, what is the level of importance* 1 2 3 4 5				
1. Lack of security on land						
2. HH population growth						
3. Land degradation						
4. HH Labour shortage						
5. Restriction on land expansion						
6. Poor access to market						
8. Other						
9. Other						

*1 = least important 5= most important

IV Intensification and De-agrarianization

29. Complete this table on the assets you are having.

Assets	Do you own any of these assets	Quantity	Do you own more/less/same of this asset today compared to period without intensification and/or de-agrarianization?
	1 Yes 2 No		1 More 2 Less 3 Same
Television			
Radio			
Motor bicycle			
Bicycle			
Mobile phone			
House			
Car			
Savings at financial/local institution			
Washing machine			
Refrigerator			

30. Complete this table on the livestock you own.

Livestock	Do you have any of these livestock?	Quantity	Do you own more/less/same of these livestock today compared to period before de-agrarianization/and or intensification?
	1 Yes 2 No		1 More 2 Less 3 Same
Cattle			
Goat			
Sheep			
Pigs			

Poultry			
---------	--	--	--

31. Please complete this table concerning the improvement of your standard of living

Living standard indicators	1 Better off 2 Worse 3 No change	Explanation
Education		
Health		
Housing		
Access to food		
Clothing		
Access to potable water		
Other		

Appendix 2: List of the SSIs conducted and presentations attended

A – SSIs conducted in the Upper Zone

- A1 – Religious leader (Ban Mae Khi)
- A3 – Agriculture cooperative president (Ban Mae Khi)
- A4 – Royal Project representative (Nong Hoi)
- A5 – Royal Project extensionist (Nong Hoi)

B – SSIs conducted in the Middle Zone

- B1 – Deputy village chief (Ban Pang E Ka)
- B2 – Religious leader (Ban Pang E Ka)
- B3 – NTFP collector and his wife (Ban Pang E Ka)
- B4 – Farmer (Ban Pang E Ka)
- B5 – Women leader
- B6 – Youth leader
- B7 – National Park guards on patrol (Ban Pang Hai to Ban Pang E Ka)

C – SSIs conducted in the Lower Zone

- C1 – Youth leader (Ban Pang Haew)
- C2 – Village heads (Ban Pang Haew)
- C3 – Religious leader (Ban Pang Haew)
- C4 – Farmers association leader (Ban Pang Haew)
- C5 – Women association leader (Ban Pang Haew)
- C6 – Elder (Ban Pang Haew)
- C7 – Cooperative communittee (Ban Pang Haew)

D – SSIs and presentations concerning the whole watershed

- D1 – TAO officer (MaeRam sub-district administration office)
- D2 – TAO agricultural extensionist (MaeRam sub-district administ. office)
- D3 – TAO Health care officer (MaeRam sub-district health centre)
- D4 – National Park guards coordinator
- D5 – Researcher & water expert
- D6 – TAO representative

- D7 – Forest district officer (Mae Rim RFD office)
- D8 – Presentation by the National Park representative
- D9 – Presentation of the Thai administration

Focus Group Discussion reports

- FGD1 - FGD with representatives of the Hmong community (Ban Mae Khi)
- FGD3 – FGD with elders (Ban Pang Eka)
- FGD3 – FGD with elders (Ban Pang Haew)

A1 - SSI RELIGIOUS LEADER, UPPER ZONE

(is from Bangkok, in the area only since 3 years)

Impacts on cultural norms

The agricultural intensification didn't have so much effect on the religion. Most of the Hmong are now Christian. They are supporting their children for school and they send them to the city for it.

Even young people who are working in Chiang Mai are coming back to the upper zone according to religious festivals and other activities linked. Religion stays a strong point in their behaviour.

Some changes in the dress habits have appeared but it's only new trends which are coming from the city. It is not specific to the watershed but it's like everywhere.

Conflicts

Farmers are dealing with conflicts within their group and do not need to consult the religious leader for it.

A2 - SSI WITH WOMAN LEADER, UPPER ZONE

Internal factors of deagrarianisation

The young generation is moving away because they do not have their own land and they don't know how to farm. It seems easier for them to get a permanent job in the city. They still help their family for some working period in the fields (2-3 days). They are not interested anymore in farm activities because it's a hard job which requires a lot of investment for the inputs and the tools.

Consequences of de-agrarianisation

There is no real change on religious practices or dressing codes. Teenagers are bringing new fashionable clothes from the city but it's not specific to the watershed, it's happening like everywhere. People are faithful to their religion. Even if they do not work anymore in their area they come back for the religious festivals. Transport assets have increased (motorbike and car) to go to their new work place.

Characteristics of deagrarianisation

Farming is still the main sector of the upper zone and thus the main source of income. But most of the young people of the upper zone are involved in non-farm activities in permanent jobs and they are going everyday to Chiang Mai. They are mainly working for the iron manufacture and on construction sites.

5-6 women are working for hand-craft. They can sell their products to the city through a middle man. The housewife has a main role for the management in the rural society in Thailand. Through their association, they are encouraged to be involved and to work for the community. They have their own supporting budget from the TAO: one tambon, one product. Any person who is interested in can easily join their group.

State of the local knowledge about NTFP

The women leader doesn't collect by herself those products but she uses from the others villagers. They sell mushrooms, bamboo shoots and some of the collectors cultivate NTFP in their house. NTFP products are still well appreciated because you do not need to buy them and they are easy to find in the forest. However some of them are more and more difficult to collect. It could be a result of the successive changing of the forest with the slash and burn cycles used by the Hmong. It also depends on the climatic conditions: the forest is more dry and its density has changed.

Change of the local knowledge about NTFP

The NTFP consumption is decreasing because nowadays you can easily go to the health center or to the city to get medicine. The young generation doesn't know about the use of edible and medicinal plant, most of people are not interested anymore in this practice. The local knowledge is going away.

A3 - SEMI-STRUCTURED INTERVIEW WITH AGRICULTURE COOPERATIVE PRESIDENT

Date: 09th March 2009

Name of interviewee: Desha Leun, president of the BMK RP Agricultural Cooperation

Name of interviewer: Sebastien

Place of interview: Ban Mang Khi village

Cooperative launched by Hydroelectricity Agency of Thailand, originally a cooperative to produce hydroelectricity (1980), before the electrification of the area (1992), ie the connection to the regional scheme. When this happened, 20,000 BHT were left (ie gotten from the sale of the material), so it was decided to launch a cooperative for agriculture (it was at the start of intensification) and sub-district tried to help them doing so. The cooperative was named "BMK Agricultural Cooperation" and in 2008, the name Royal Project was added.

Initial budget :

20,000 = liquidation of hydroelectrical material

100,000 = membership fees

440,000 = Ministry of Agriculture

TOTAL 550,000 BHT

4 objectives :

- to give an easy access to loan
- to buy intrants for members
- to buy young female cows for breeders to get calf (3% of the sale come back to the cooperative)
- Ministry of Agriculture and Cooperation gave 440,000 BHT to help build 10 green houses via a loan system on 4 years. The cooperative dispatch this money amongst selected farmers who wish to switch to others cash crops.

Membership :

- Exclusive membership : farmers can not be members of the Cooperative and of the RP in the same time !!

- Registration fee = 100 BHT + Entry fee = 20 BHT (cheap) + a share (variable according to people possibility) for farmers wanting to be shareholders (the share depends on the fees payed)
- 70 members (households), considered as shareholders (proportion = 50% of the households in BMK – total around 150 - are members of the cooperative)
- At the origin = 60 members, now 70, but not a lot of newcomers

Loan functionment :

- Short term : repay in the 12 months, interest rate = 9%, functionment loan (intrants)
- Medium term : repay in 3 years, interest rate = 3% per year (calf breeding scheme)
- Long term : repay in 4 years, interest rate = 1%, greenhouses projects

Intrants management :

The Agri Coop buys intrants for members (pesticides, herbicides) as well as materials like sprayers, tools, seeds, etc. They are cheaper in town but here they are directly available. Everybody, even non members, can come and buy BUT members have a 3% discount.

Quantities sold per year :

700-800 bags of fertilizers (50 kg each) – cooperative charge = 50 BHT

300 bags of pesticides (0.5-1 l each) – cooperative charge = 20 BHT

300 bags of herbicides (0.5-1 l each) – cooperative charge = 20 BHT

Trend : no change in consumption

A4 - SEMI-STRUCTURED INTERVIEW WITH ROYAL PROJECT REPRESENTATIVE

Date: 11th March 2009

Name of interviewee: Mr Pawat Fong Kam, vice-director of the Royal Project of Nong Hoi

Name of interviewer: Sebastien

Place of interview: Royal Project office, Nong Hoi village

Royal Project, founded in 1966 after the first visit of the King. In 1984, foundation of the RP of Nong Hoi, the local branch of the RP, aim = to fight against opium by introducing vegetable cultivation, mainly from the cabbage family (Chinese cabbage, cabbage, lettuce, head lettuce, michli)

Functionment : the RP in Nong Hoi :

- apply the plan coming from the Head Office, defining the type of crops, the period of cultivation, the number of crops (ie defining production quota for farmers).
- Follow the soil preparation, the cultivation, the harvest
- Apply Good Agricultural Practices (GAP) : fertilizers are chosen by farmers but chemicals are regulated by RP (to comply with environmental exigencies)

Tests of the chemical contents of the crops :

- before harvest, test on chemicals contents
- before sale of the harvested products, idem chemical test.

Commercialization : Qualification test for the products :

- Grade 1 : satisfactory (products meet the requirements)

- Grade 2 : mix up (= second category)
- Grade U : uncertified

Products are accepted with a gradient of loss (e.g. Grade 1 products are accepted with a 10% loss deduction because the processor knows that approximately 10% of the bought products will be sorted out.

Accepted products are certified by a commercial label.

Commercialization : 2 types :

- DiCam : products sold to DiCam, which retails on the markets or to shops
- GoldenCrest : farmers sell their certified products themselves, on behalf of the RP

A5 - SEMI-STRUCTURED INTERVIEW WITH ROYAL PROJECT EXTENSIONIST

Date: 11th March 2009

Name of interviewee: agricultural extensionist of the Royal Project of Nong Hoi

Name of interviewer: Sebastien

Place of interview: Royal Project office, Nong Hoi village

The RP in Thailand as a whole affects 155,000 people living in rural areas (affects notably their income). It introduced changes from opium fields and shifting cultivation to perennial crops / orchards and diversified vegetable crops. Encompassed also the rehabilitation of the forested areas (now protected) and of the watersheds.

The RP has launch research & development on new crops, all introduced in Thailand (result : 350 different crops available on markets, 400 million BHT of income for farmers).

Comprehensive commercialization program :

- Plantation
- Production
- Quality certification process (safety, freshness, etc)
- Post-harvest management
- + help to establish cooperative farming (e.g. good relations with the Ban Mang Khi cooperative)
- + extension : development centre used as a “vitrine” to introduce farmers to new crops and form the volunteers to new techniques.

The RP of Nong Hoi membership and statistics :

- Extent = all the Upper zone + part of the other watershed (3,000 rai)
- 80% of land = non-irrigated, cultivation : June to January, 2-3 harvests, fallow = 4 months
- 20% of land = irrigated, 4 harvest a year (1 during the fallow period of the 80% quoted above). Surface currently in extension
- Main crops = head lettuce, Chinese cabbage, cabbage, carrot
- Duty of the RP : to avoid the middlemen to take control of the market (through guaranteed price mechanism)
- Membership = 195 households on 6 villages (Ban Mang Khi = 5, Ban Pang Hai = 5, Ban San Lang = 10, Nang Mai Mai = 60, Nong Hoi = 70). Only 10 in our watershed because of : villages far away from the office, people used to sell to middlemen

- Membership : duties are : respect of the GAP, submit a report of intrants used (compared to chemicals content tests) and help to participate in environmental events (tree plantations). Rights are : access to guaranteed prices, access to improved seeds.
- The farmers report : farmer notes every important input and submit the report to the RP which control the utilized amounts (without fixing thresholds). The report is crosschecked with chemical residue analysis (=chemical analysis of tissues)
- Not everybody can join : the RP can not buy all the production (only 10% of what produce every farmer), not everybody is willing to respect the quality criteria.
- Subsidies system has changed recently and farmers do not care about meeting the RP quality criteria : people quit more (membership decreasing) + lot of them do not want to obey the pesticide/herbicide control by the RP. (119 substances forbidden in Thailand, 2 herbicides + 2 pesticides only authorized by the RP = coppersulfate + salt as herbicide)
- RP try to meet the requirements of 4 production systems : GAP, EU-GAP, Global GAP, Organic Production System.

Miscellaneous :

- Fallow period remains unchanged
- Area of cultivation hasn't changed because boundaries have been fixed by RP and the Ministry in charge of land development. Area of intensified cultivation has increased whatever the proximity of these plots to the water sources.
- Cropping pattern = monocropping
- Use of chemical inputs = decreasing (more and more use of organic inputs, chicken manure mainly) / general use of inputs = increasing
- Labour = family + migrants (Shan people)
- Main factor leading to intensification = King commitment & word (people massively followed the word of the King)
- Subsidies = RP used to provide seeds and intrants, and deduce their costs from the harvest purchase. Not any more : main reason for people to quit the RP.
- Infrastructure : integrated development scheme with specialized ministries (health centres, school, electricity, road, etc : all appeared in the watershed subsequently to the RP).
- Budget = 50% the King, 50% the government (annual loss = 2 million BHT)
- Farmers do not integrate the quality issue BUT don't care because they have other ways to sell their products (directly to the market). They always sell somewhere but sometimes have problem with middlemen who don't pay (sometimes at all). Policy of the RP = to pay within a week.
- Organic project : increasing demand in Thailand for organic products (for the moment, every organic product is imported and expensive).
- Erosion = 10% of the land (= problem). Answer = terracing, furrow, soil ridge, elephant garss plantation, all techniques inherited from opium production.
- Cooperative : each village has got one, most of the villagers participate.
- Water management = water shortage, project to use ground water (drill till 97m) to get 4,000 l.hour-1
- Supply of agriculture products : fertilizers, pesticides, seeds, sale to the members only.
- Most common fertilizer : 13 13 21, 15 15 15, 46 0 0 (urea)

B1 - INTERVIEW WITH DEPUTY VILLAGE CHIEF (BAN PANG EKA)

Interviewee: Mr. Nappom (Village Deputy Chief) Date: March 08, 2009

Interviewer: Destaalem

Time: 11:40 AM – 12:25 AM

Translator: Buhm

Place: Village Church

Reporter: Lensa and Ann

1. Can you please give us brief introduction about the village, ethnic diversity, HH number.....???

There are 67 HH and most are Karen, 1 Hmong, 4 Lawa and about 2 Local Northern Thai. The main source of income for the area is wages

2. Do the people practice agriculture or what is the main source of income?

They work for wage mostly on urban areas outside the village but they also work sometimes as labourers for wage on agricultural farms.

3. What about those working on their own farm, do they apply fertilizer and chemicals?

Yes, they apply fertilizers and herbicides but not pesticides. They have been practicing that since about ten years ago for ease of farm management.

4. What products do people collect from the forest?

People collect bamboo shoots, mushroom and banana from the forest for own consumption but they also sell what is left from consumption.

As to medicinal plants, it is only 4-5 elders who collect but otherwise people just go to the clinic and use the 30 Baht health care service.

5. Since agri. Intensification (use of fertilizer, pesticide....) and de-agrarianization (off-farm activities....) are occurring, has there been a change in the infrastructures of the villages / the watershed?

If yes, to which precise factors can it be linked?

The infrastructure in the village is not actually as a result of de-agrarianization or agricultural intensification, but because of developmental activities of the administration of the area.

6. What are the conflicts related to de-agrarianization and /or agricultural intensification

In the past they had conflict with the forest officer and some villagers were arrested and protested and asked permission for cultivation so recently, they are allowed to work on the land but they cannot expand it. And now they are allowed use the community forest for NTFP but cannot cut trees. As to the utilization forest, cutting is allowed but should be done with permission.

The main water source used in Bang Pang Eka is not the one flowing from Bang Pang Khi but rather from another stream called Hoing Eka that later joins Mae Ram. However, when villagers use the water in the rainy season, they say that the chemicals coming from the upper zone is irritating. As to the volume of water, it is enough since they only use it in the rainy season and work for wage in the dry season.

7. In the dry season, why didn't they use irrigation for farming like those in the upper zone?

Villagers have also asked for irrigation facility from the administration but since they have limited land it could not be realized. Here there is no royal project to support the people and because of the climate, they could not grow flower like upper zone

villagers. The royal project used to come to the area but they just stopped and did not even buy the harvested products

B2 - INTERVIEW WITH RELIGIOUS LEADER (BAN PANG EKA)

Interviewee: Mr. Bae La (Religious Leader) Date: March 08, 2009

Interviewer: Destaalem Time: 5:15-6:05PM

Translator: Buhm Place: His house

Reporter: Lensa

1. How long have you been living here?
Although born in Chiang Dao, has moved to Bang Pang Eka since 40 years ago.
2. How many religions are here?
Christianity – Karen
Buddhism – Local Thai
Animism - Lawa
3. Have you seen cultural changes in your village/ communities/area due to agricultural intensification (use of fertilizers, pesticides, cash crops) and/or de-agrarianization (off-farm activities)?
There is no change because of this as many of the people going out for urban employment and the children going to school in the urban area come back on Friday and involve in the local activity before they go again to the urban area.
4. How about the effect of urban employment on the dressing habit?
They may dress or speak differently but in the belief they are still same. They change their dress because teenagers like to follow fashion but for the elders it is because of the heat, as it will be too hot to wear the traditional cloth of Karen. The traditional cloth is handmade and very expensive so they wear shirts and other cloths but not because of urban employment.
5. What is your role as a religious leader in the area?
Taking care and giving support to the villagers in terms of spiritual and moral issues. At a certain age people may face family problem so they need spiritual support and advice.
6. Have you ever been involved in resolving conflicts?
Since there might be misunderstandings among family members, he, as a religious leader, settles such disputes.
7. Have people complained to you regarding the delineation of the National park which partly includes their cultivation land, so that you could negotiate on their behalf?
In history, the villagers were using the land first and it was then after that the national park was delineated, so there were conflicts between the villagers and the national park people. As a result he has been selected as a leader and together with a head man and sub district officer to negotiate with the national park officers for permission of forest utilization and hence they came up with the utilization and community forest.
8. So do you think the villagers are satisfied by that solution now?
The Karen people way of living is different and they don't intend to increase much agriculture and believe to protect the forest as much as possible.
9. The royal project is operating in the upper zone, why do you think it is not operating here?

People in this village are not interested in the royal project because they think the royal project is not responsible enough as they never came to even buy their produce after introducing crops (coffee, avocado). And the interviewee even thinks that the people would not be interested even if the royal project comes back.

10. So what is the livelihood plan of the people?

Most of them work for wage labour and most young don't have interest in agriculture anymore and go for jobs in the city like electricity power, resort area and construction site. In the past people were satisfied with a rice farm, buffalo and elephant but now they see the assets of others and hence start to aspire as well.

B3 - INTERVIEW WITH NTFP COLLECTOR AND HOUSEWIFE (BAN PANG EKA)

Interviewee: Mrs. Nongnuch (NTFP Collector and housewife)

Date: March 15, 2009

Interviewer: Destaalem

Time: 11:10 - 11:45AM

Translator: Buhm

Place: village shade

Reporter: Lensa

1. Do you collect any NTFP products?

Yes

2. What and for what purpose?

I collect Banana, mushroom, bamboo shoot, eggplant and some edible insects from the forest both for home consumption and for sale.

3. How do you see the level of NTFP collection in the past and now from your experience?

The level of collection has increased and many people collect NTFP these days hence the NTFP has decreased.

4. Do you also collect medicinal plants before and now?

I collect edible plants but not medicinal plants. However, my parents used to collect it and still do.

5. If your parents collect medicinal plants, why didn't you follow them?

My father used to make calf syrup but i never learnt to do it.

6. So if your parents are still collecting medicinal plants, do you have an interest to collect and utilize?

No, actually I don't have, because am afraid to use it and I prefer to use medicine from the city.

7. What is your main source of income?

My main income is from farm but I also work in the city.

8. How did you hear about the urban medicine? Is it because you work there?

No I have been using urban medicine since childhood. But I also buy herbal medicine.

9. Is there any conservation plan for edible plants collection within the community or by you?

No, no project so far and I also have no knowledge about that. I have even seen sometimes people cutting even small trees on the tip for resin collection to make syrup but causing the tree to dry. But big trees in the national park cannot be cut.

10. Can you collect NTFP everywhere?

Yes, it can be collected from everywhere even the conservation forest.

11. Have you ever participated in any training given by national park officers as to conservation?
No. But once I have participated in an activity that was organized by some organization to cover trees by monk cloth (the yellow fabric) to discourage people from cutting down trees.
12. Do you think the fact that people don't usually collect medicinal plants these days can be related to the fact that they are going for urban employment or doing agriculture and hence having limited time?
Not really. It is rather because of the seasonal nature of the crops to be collected. Some will not be found in one season.
13. What is the season for NTFP collection?
Banana flower is collected the whole year were as others are collected in the rainy season.
14. What is the season that people go for urban employment?
Those working permanently on urban job do it the whole year round. But agriculture depends on season. For eg. When people harvest rice, they hire external labour.
15. Now that people are busy with urban job, do you think the pressure of NTFP collection is low?
No, because in some households even if two are working outside for urban job, the rest of the household will still collect NTFP.

B4 - INTERVIEW WITH FARMER (BAN PANG EKA)

Interviewee: Mrs. Wen (Farmer)

Date: March 15, 2009

Interviewer: Destaalem

Time: 4:25 – 4:55PM

Translator: Buhm

Place: her house

Reporter: Lensa

1. Do you use medicinal plants from the forest or do you use urban medicine?
I use both.
2. What are the edible plants and medicinal plants you collect now and in the past?
I collect jack fruit, Taro and Pak Kul (vegetable) and as to medicinal plants I collect Pao leuy (Black), Kamm (white) and kra Chai Dam.
3. How do you see the knowledge of villagers as to the use of medicinal and edible plants?
The number of medicinal plants and edible plants has decreased in the forest because of increase of population utilizing it. But teenagers don't know about the medicinal and edible plants as they are afraid to use it. And mostly it is the elders that collect medicinal plants. Because of education, many teenagers know about urban medicine and if they get money they just go to hospital. And since some people are using it for sale, they over utilize it to the extent of even uprooting.
4. How has de-agrarianization and agricultural intensification influenced the use of edible plants and medicinal plants?
Because of urban employment, less people tend to use the food from the forest and medicinal plants.
5. Is it because they don't have time?

Most people working outside don't have time to collect both medicinal plants and edible plants or even young people go to education hence they spend their time there.

6. How about conservation aspect?

In terms of conservation, I conserve medicinal and edible plants but the others come and use it as well and many people don't care nowadays because they don't use it and because they use urban medicine.

7. Do you teach your children about medicinal plants?

Yes, I also sometimes use medicine from medicinal plants for my kids but when they don't get better, I send them to the hospital.

8. Do you fear that this indigenous knowledge will be lost in future?

Yes maybe. Because of development, people go to hospital and it is not like in the past anymore.

Change in religion from Animism to Christianity has also an impact on medicinal plant. Because people used to call spirit using some medicinal plants from forest but now they have stopped using that for spirit as they are no more animist but Christian.

B5 - SSI WITH YOUTH LEADERS (MS,RATTAN) -MIDDLE ZONE

1 what do you think that the reason why youngsters migrate to cities?

Since there was no education in the village and most of the villagers are not well educated in the past parents prefer to send their Childs to school in the city.

What are the main sources of income for youngsters in this village?

The students are more dependent on their family and some of them help their family through working in their free time. These youngsters who are not students source of income is work for wage in the village and out of the village in the cities.

Why do you think that young farmers or youngster migrate to urban or cities for a job than engaging in agriculture?

Youngsters borrow money for different purposes and they should also pay back. Since their agriculture product is not enough for sale to pay back their dept, they are forced to search for a job in cities. In addition to this now a day's youngster are not interested on agricultural production activities.

Why do you think youngsters are coming to be less interested on agriculture?

Since agriculture is labor intensive and full of uncertainties youngsters are getting less interested. In addition to that the limitation of land to expand by royal forest makes youngster not to have a land as large as they want and makes them less interested to invest on agriculture.

Why do they practice intensive practice to produce more on limited land?

Actually most of them are practicing intensive agricultural practice that using of fertilizer, pesticides, herbicides and others. But this is even not enough for the increasing demand of youngster and the population and also not easy to practice it because it demands finance.

So, how do you evaluate the socioeconomic and culture of the youngsters since they start to intensify their agriculture and searching work for a wage?

The youngsters in the village work hard to change their family and parents livings and searching for a job in cities and within the village and neighbor villages. Youngsters are coming to be more educated and problem solvers. Generally this village youngster is better than any others and respect their culture and Christianity except few outliers.

B6 - SSI WITH WOMEN LEADER (MS BONNAK)-MIDDLE ZONE

For how long are you living in this village?

I born in this village and I live in this village.

What are the main sources of income for this village villager?

Mainly work for wage and secondly agriculture and forest products.

What are the reasons that the villagers makes depend on nonfarm activities?

There are many reasons that the villagers forces to search for nonfarm alternative sources of income. Some of the basic reasons are shortage of land, population growth, land degradation, expensive livings and others. Especially the youngsters were not educated and that forces them to engage on temporary, hard, non skill jobs and with lower wage.

How do you evaluate the villagers' socioeconomic and cultural situation from the time that they start to engage for nonfarm alternatives?

Most of the villager and the youngsters' livings is relatively coming to be improved. Some of the villagers are building and renewing their houses and having savings. But the challenge of the youngsters is coming a lot that include expensive livings. For example to build house youngsters should buy construction wood that have been even accessible in the forest before. So, this situation makes them to work hard.

There are really few that follow fashion that out of their culture and religion that imitates from the cities and the mass media but most of them respect their culture and religion. Especially these mobiles and movies have some negative impacts on the culture of the youngsters.

How do you see the impact of nonfarm activities on food and feeding habit of the villagers?

In the past people were depend on farm and forest product but now a day's peoples are more depending on market staffs that a products of intensified production system. And this makes people to be more fat and unhealthy. Then health problem coming serious and people are shifting from use medicinal plants to modern clinics.

How can you evaluate the villagers and youngsters including female's level of awareness and social development to create opportunities and solve challenges now a day?

People are now coming to be more educated more than ever and close to information and then people are coming to be more wise and sociable to create opportunities. They are coming also good in taking care of their family and relatives. But also there are some cultural impacts like informal friendship and decreasing of helping each other. E.g. using of mobile phone to seduce girl or boy friend without family permission

How do you compare the social relationship (family, friend, loyalty, responsibility, age)and working habit of villagers and specifically youngsters from the time that nonfarm and intensified practices are manifested?

Few of the youngsters are coming to be not good as before. They consider themselves more knowledgeable than their parents for every thing and they make independent decisions. But also there is also an effort to be self sufficient economically and to help family.

As women leader, how do you see the females' equity and males awareness on equality in this village now a day?

In the past womens were not decision makers and they were not educated. But now days they become more educated and share decision making and taking care of the family. Women as well working to generate income and male respect their equality when it compare to the past.

B7 - FOREST WALK & SSI WITH NATIONAL PARK GUARDS

Date: 16th March 2009

Name of interviewee : Five NP guards

Name of interviewer : Sebastien + Desta Alem

Place of interview: Forest between Ban Pang Hai and Ban Pang E Ka

NTFPs collection :

- Wood for fuelwood (especially Hmong people who stick to old cooking practices), building, sale (under the shape of fuelwood notably). Officially, collection of wood is forbidden, even dead wood.
- Snakes, mushrooms, bamboo shoots, insects

Problem of fires :

- Kill animals
- Can help regeneration of plants (seed opening), some species grow faster after a fire (??), no indication of negative effect on some species.

Management :

- RFD used to plant teak in gaps left by shifting cultivation, to get continuous cover. These plantations are under threats as well as the “natural” forest : people cut wood in the plantations.
- No plantation since the forest is managed by NP
- People of the two surrounding villages still use the resource but this is not considered as a major threat. Main problem of the NP is to fight against agricultural extension.

C - SSIs conducted in the Lower Zone

C1 - SEMI-STRUCTURED INTERVIEW WITH YOUTH LEADER IN BAN PANG HAEW

Date: 07th March 2009

Name of interviewee: Youth leader

Name of interviewer: Deo-Gracias and Justice

Place of interview: Ban Pang Haew village

Why are farmers engaged in non-farm activities (urban employment and tourism)?

Most of people living in the lower zone, namely Ban Pang Haew area, were poor farmers who cannot make the ends join. Some twenty years old, a period came when rich people from cities came, in search of peaceful area. As such, they propose to farmers to sell part of their farm land at very high amount of money. Since many farmers were not used of earning such money at once, many went for selling their land. After selling their farm lands, farmers are able to build new houses with bricks, electricity, pay school fees for their children, etc. However there is a problem because those farmers left without farm lands has no more activity to make life

affordable. Thus they are more or less constraint to search for new job and because of that reason they go to MaeRam city center, Chiang Mai or work in what used to be their farm land but for the profit of the new landowner's who becomes their master.

Another aspect of the phenomenon is that most of the people from that generation have been educated. So, at a point they move to city to pursue their study. When they complete, they don't come back because there is no opportunity so if parents get old, nobody is available to continue working on their farm land so they sell the land to rich people from outside.

An important aspect to mention is that they have been a phenomenon of contamination. Actually in most of the households (family) where people engage in non-farm activities, they life improve and are able in some months to buy motorbike, pay for hospital, not relying anymore on medicinal plants. By observing those changes, more and more families engage in non-farm activities that pay better after all in the area. However there are some failures even though it is few cases.

C2 - COMMUNITY MEETING WITH YOUTH LEADER IN BAN PANG HAEW VILLAGE HEADERS

Date: 08th March 2009

Name of interviewee: Village leaders

Name of interviewer: group 1 and 4

Place of interview: Bang Pang Kaew village

- **From farming to de-agrarianisation (History)**

In the past, income was earned by families from rice, cattle rearing, and other farm activities. However, nowadays such a household livelihood strategy disappears and many farmers start selling their farm land. For instance a farm land previously sold at 3 000 Bath would have been sold at 3 000 000 Bath to someone from city. After selling their lands, farmers engage in non-farm activities such as urban employment, daily job, farm labor, etc. The change grows very fast because with their new non-farm occupation, many families save enough money and can buy cars, motorbikes, pay school fees for their children, etc. Farmer families that resist the change finally move to non-farm activities or send their children to city as well. Simply because when the other children go for non-farm activities, they earn more money and can buy some assets (TV, motorbike, mobile phone, refrigerator, etc.) to their parents. Another reason is that after farmers die, their children are not willing to continue farming and it results in the sale of the farm land. A main reason why city dwellers prefer buying land in Ban Pang Haew village (lower zone) instead of other part of Mae Ram watershed is that its lands are secure and the area is not part of the national park. Also, the change brings along road facilities, tape-water, electricity, better life. Though, on the other side when some farmers sell their farm land, they don't find any other job so that even-though they have very nice house, it is difficult for them to bear life.

- **Major conflicts in relation with the middle and the upper zone of the watershed (water issue)**

In the past, after growing rice farmers sow soybean without any fertilizers or pesticides. But since about ten years, farmers use more and more pesticides because of some insect attacks. Since some years, people in the upper zone have been using much water for flower and cabbage production that causes shortage and pollution of water in lower zones. An indicator of water pollution is for instance fish whose skin change color and they even die sometimes due to water pollution problem. In Ban Pang Haew, it is thought that water pollution issue is not due to the Kmong (living in upper zone) but instead, it is the Burma employed in Ban Mae Khi farms that use too much pesticides and are then seen as the source of water pollution.

As a major source of conflict in the watershed, the problem of water quality and shortage has been addressed by the Royal Project who installed tape water network but still irrigation is creating some conflict..... To handle the problem at a local level, even though there is no open crisis, some representatives from the lower zone meet from time to time the Kmong of the upper zone. Unfortunately water management is very difficult and sensitive so that it persists till now despite different efforts.

C3 - SEMI-STRUCTURED INTERVIEW WITH RELIGIOUS LEADER IN BAN PANG HAEW (LOWER ZONE)

Date: 15th March 2009

Name of interviewee: Buddhist Religious leader

Name of interviewer: Deo-Gracias, Justice and Ton

Place of interview: Buddhist temple

What are the cultural changes due to de-agrarianisation from your perspective?

De-agrarianisation constrains many farmers to sell their farm lands and send their children to school. Unfortunately when they finish school, there is no job we have now more thieves. People don't believe anymore and less go to temple and even pray in the new generation.

Food

With the new trend of development, people prefer fast and expensive food. They deny local dishes. Before this phenomenon of de-agrarianisation, food were mainly vegetable and once you eat, you take medicine. With the new habit, people like fat, meat that shorten their life and make them fall sick easily.

Dressing

With the trend of de-agrarianisation, women dress sexy and don't cover their body anymore. That new way is not a Thai way of dressing. And moreover, Thai dressing style is no more common.

What are the major conflicts in the area and how are they solved?

Water is known as a major source of conflict in the watershed but there is no real resolution way. It is a very complex and difficult question.

Today, there are less river, less fish compare to the past in this watershed.

Another problem is that the investors are interested in their own benefit and some farmers suffer after they sell their farm lands.

C4 - SEMI-STRUCTURED INTERVIEW WITH FARMERS ASSOCIATION LEADER IN BAN PANG HAEW (LOWER ZONE)

Date: 15th March 2009

Name of interviewee: Kune PrasongKham Bai

Name of interviewer: Deo-Gracias, Justice and Ton

Place of interview: Interviewee's house

Historic of the association and its activities?

There is only one farmers association called Sahakom Kan Kaset in the lower zone and it was created in 1971. It comprises 59 members of which 20 farmers today and anyone interested can join. The initiative and implementation is from the local government that supports the association.

Its activities are to help farmers to buy genuine fertilizers, seeds, fertilizers and even agricultural machine at low cost.

However, many people shift from agriculture, sell their farm land and work now in non-farm activities. To adapt itself to society changes, the association has now three new objectives: loan with low interest rate, access and sale of fertilizers and other agriculture input, help members to access credit and prepare funerals.

C5 - SEMI-STRUCTURED INTERVIEW WITH WOMEN ASSOCIATION LEADER IN BAN PANG HAEW (LOWER ZONE)

Date: 15th March 2009

Name of interviewee: women leader

Name of interviewer: Deo-Gracias, Justice and Ton

Place of interview: Interviewee's house

What are the cultural changes due to de-agrarianisation from your perspective?

Before the phenomenon of de-agrarianisation, leisure time was spent by helping one another to process juice for instance. But that cultural habit disappear entirely nowadays.

Also, in April (as the hottest month of the year), there was a festival where people used to go to elders to ask for forgiveness. Nowadays, less and less celebrate that festival. It is now more done as a gathering in temple and pray instead of going to elders.

Food

Before the new trends, people were used of raw meat all that is said very bad nowadays.

Dressing

Dressing style changes drastically about 8 years ago among youth especially.

What are the reasons why people use medicinal plants?

People used medicinal plants because they are in harmony with nature, hospitals were very far (can only be reach by walk) and few. And at the same time, they were some villagers who know a lot about plant virtues.

What are the major impacts of de-agrarianisation on medicinal and edible plants?

Medicinal plants are rare now in the forest. For instance Mai Gen Dan was available in the forest to heal allergy but nowadays it has disappeared.

The availability of hospitals contribute also to the lost of knowledge about medicinal plants and the number of traditional healers is decreasing.

Nowadays, some medicinal plants are still brought from forest and grown in house even though it is an old habit. That helps not to go to forest when you are in need of that specific plant.

As for edible plants, there is still availability for consumption but it is less compare to the past.

C6 - INTERVIEW WITH ELDER (BAN PANG HAEW)

Interviewee: Mr. Saen Ngam (Elder)

Date: March 09, 2009

Interviewer: Deo

Time: 5:25-6:20PM

Translator: Dao

Place: His house

Reporter: Lensa

1. From your experience in this area, what do you think are the reasons why farmers choose to intensify (use of fertilizer, pesticides, mechanization, etc) and change their land use pattern (intercropping, rotation, larger farm, etc.)?

Since the atmosphere here is very good, capitalists send middle men or an observer to negotiate the price and then they buy. Then when one farmer sells land and changes his/her life, the others are also motivated to sell hence this is how it changed. Moreover, after the foreigners bought land and fenced it, some farmers could not access their land so they were sort of obliged to sell theirs as well and even with cheap prices.

In earlier days farmers were not using fertilizer and pesticides as at that time there were no insects and yield was also as much like today. But now they cannot stop using fertilizers and pesticides because of poor yield and insects. So these days they are forced to use it.

Previously they used to harvest cabbage in one month but now they can even harvest in 2 weeks.

2. From your experience in this area, what do you think are the reasons why farmers choose to engage in non-farm activities?

Nowadays there are many farmers that go out for construction and field work but they used to be land owners. But when they run out of the money they become laborers.

And the young generation doesn't want to be a farmer because it is a very difficult and hard work.....as he said "face always on the ground and back always facing the sun"

3. When did people start selling their land and going for urban job?

About 20 years ago

4. What are the conflicts related to de-agrarianization and /or agricultural intensification?

There are conflicts between the upper zone and lower zone regarding water availability and pollution.

The sub district TAO went to approach the villagers of the upper zone but they said that they were not using fertilizer and pesticide when they were growing opium but now that the royal project has come they are no more growing opium rather other crops with application of fertilizer and chemicals. So they said they don't have a choice except to use it. As a result the villagers in Ban Pang Haew are now buying bottled water and some also have tap water.

5. What is the change in use of medicinal plant?

Medicine is very popular nowadays so people don't go to the forest now to collect medicinal plants. And the wisdom is also disappearing because now there is no transfer of knowledge to the young generation so it is being lost. Moreover the government has also introduced hospital.

C7 - SSI WITH COOPERATIVE COMMUNITTEE

(4 years of existence)

8 Why does this association exist?

As a group, the members can buy goods from outside the village and give more refund to the members. They have those goods at the cheaper price which is beneficial for the villagers.

Some members do not really understand about the cooperative. Because of its success no new members are allowed, they keep the same group with the same number.

Is there any relation between the creation of the cooperative and the agricultural intensification?

Villagers were going out to buy goods in the city, which was very expensive. A group spent 20 000 baths to the city to buy some goods and then come back to the village where they can sell it and divide the benefits which can be refunded (eg.10 percent share, 2 percent for cooperative 2 percent for the seller the rest is divided between the members). Customers are involved and appreciate to pay for something into the village. The sample Karen village is good for communittee.

This idea come from another province which have been created 20 years ago. They achieved a benefit of one million bath per year.

There is no really clear linkage between the communittee and the city. The demand is increasing and the chief of the communittee cooperative place a lots of hope in this project. Their structure is still at the beginning of its life and has a small budget, but it will develop step to step. For the moment, there is no benefit to young people in the communittee. If a huge benefit is achieved, the money can be redistributed as loan for students or fundation for students.

It's only the beginning of the cooperative and the members are not individuals but households. Since they have started they can now accord credits around 1000 to 2000

per households. We should keep in mind that agricultural practices in the village have a direct consumption as a goal. The diversity of the members make is strong, most of the villagers are working outside the village.

D – SSIs and presentation concerning the whole watershed
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D1 - SEMI-STRUCTURED INTERVIEW WITH TAO AT MAERAM SUB-DISTRICT ADMINISTRATION OFFICE

Date: 13th March 2009

Name of interviewee: TAO

Name of interviewer: Deo-Gracias and Destaalem

Place of interview: Maeram sub-district administration office

What are the TAO implications in forest and natural resources management in Maeram?

Based on the law, TAO is required to be responsible of forest, soil and water resources management. But in reality TAO has no section to deal with natural resources and environment protection. The only unit they have is a team for soil. To work with the complexity of who is responsible of forest and natural resources in the area, TAO cooperate with Royal project, Royal forest department (for data related to forestry) and with local people to create fire belt or reforestation activity, seedling activity if some village asks. Regarding the budget for such activities, TAO assists villages that ask for financial help.

What are the problems that TAO face in relation with forest management?

There is a problem of boundary, border of specific land use attribute in the ground. Actually agricultural land, protected forest land, community forest and national park overlap at many places. In fact the law devoted national park management to a ministry that is different from the one in charge of community forest and conservation forest. This problem of boundary doesn't help TAO to take total responsibility regarding forest management and there is a need to find trade off. For example, the national park office and the Royal project office cooperate to find the area (located in the national park) where Royal project can implement some of its actions. From this complexity TAO actions are now more or less limited to development program, fire belt construction and sensitization.

How many types of forests exist in the Tanbon?

Three types of forests exist:

National park; Conservation forest and community forest

What does TAO do to avoid soil erosion challenge in Maeram watershed?

There is a collaboration between the Queen Botanic garden, the Royal project and TAO. Quite often some sensitization are organized to local people about impacts of deforestation and how to plant some grass or forest species in order to increase forest cover in their area and thus reduce risk of erosion.

What does TAO do to water pollution challenge in Maeram watershed?

To control the problem of water pollution, the Royal project cooperate with some office (Royal forest department, TAO) to prevent farmers from using dangerous pesticides and pollute water. But this action is mainly the responsibility of Royal project.

Also, there is every year water quality test to report any problem of contamination. Fortunately, the water is clean from the last reports. In the tanbon, 2 types of water are used: ground water and mountain water. "Regarding fish that are wounded, I think it may be a problem of climate change or their stay in rice field that or often intensified (utilization of fertilizers and pesticides)."

What does TAO do about agricultural intensification?

TAO has its own extensionists who advice farmers in their farm activities.

Tax issues and land right claim in Maeram

Mainly, TAO collect tax from shops, publicity sign board, farming activities including green houses (6 villages pay out of 12). The other villages don't have land right and as such they don't pay tax.

The same tax is paid for every kind of land use system. 80 Bath is paid every year for 10 Rais owned. It is not because someone owes a green house or use pesticides and fertilizers that he will pay more tax. The tax is land property tax.

About land right claims, nowadays more and more villagers claim their land right over forest conservation and even they welcome. In the past, people simply leave peacefully their lands when it falls under government authority (national park or conservation forest).

D2 - SEMI-STRUCTURED INTERVIEW WITH TAO AGRICULTURE EXTENSIONIST

Date: 16th March 2009

Name of interviewee: TAO agriculture extensionist

Name of interviewer: Deo-Gracias, Lensa, Justice and Ton

Place of interview: Maeram sub-district administration office (TAO office)

Introduction

The TAO agriculture extensionist works in the middle and lower zone of Maeram watershed. The upper zone is left to the Royal project.

The objective of TAO extensionist is to advice farmers so that they reduce pesticides utilization. This by promoting thai biological control herbs.

Crops grown and livestock rear

In Ban Pang Eka, Karen people grow rice, maize; and they rear cattle, chicken. All this as subsistence agriculture. Rotation and agro-forestry are very common in that area.

In the lower zone, rice, soybean, lychee and longan orchard are very common. Rotation of rice and soybean is much practiced. Most of villagers in that area go for urban employment and only few (about 10) still practice agriculture in the area.

In the upper zone, people grow mainly vegetable but some farmers stop when there is shortage of water.

Inputs for agriculture

Some farmers buy improved rice seeds but others get rice seed from their own field. Also, they used some pesticides and fertilizers (urea and NPK). Also, farmers use green and chicken manure to grow different crops.

There is no global water management system for the whole watershed. Farmers manage themselves and it is the same for irrigation pipe and network.

Farmers associations

In the upper zone, there is no specific farmers association. It is the Royal project that takes most of responsibilities. But in the middle and lower zone, there are some farmers' associations. However they don't last long; people gather just for specific interests.

Impacts of fertilizers and pesticides on water quality

Sometimes pesticides can be smelt in the upper zone (atmosphere pollution) but villagers in the middle and lower zones don't complain of that. And also, the upper zone is quite far away.

Flooding and siltation

Flooding is very common villages like Hong Nok and Hong Nai

Other issues (conflicts for instance)

There is nothing to mention about the lower zone

In the middle zone, the main issue is related to national park area and villagers settlement and agricultural lands

In the upper zone, the problem is about open area in the forest for agriculture and housing. Also, sometimes some farmers block the water stream for their own use. That often bring internal conflicts in the upper zone.

D3 - SSI WITH HEALTH CARE OFFICER (MAE RAM SUB-DISTRICT HEALTH CENTER)

HC basically provides preliminary aiding (first aid) and takes care of non-severe sickness, including provides/promotes education concerning health care to people in their responsible area.

Concerning to the impact of polluted water, there are the cases of skin irritation or some other sicknesses that probably caused by polluted water. However, it cannot be certainly said that the polluted water is the only cause. Since, HC is mainly responsible for the preliminary aiding, therefore, HC cannot examine or test for the causes of sickness concerning water quality. The examination or test is normally taken place in the hospital where equipments and officers are well-prepared. We had some cases of skin irritation of those farmer who walked through the intensive chemical-used filed. This case is more obvious to examine than the use of polluted water. Thus, it is possible that polluted water can be one of the causes but it cannot be said for sure in HC field of responsibilities.

D4 - SSI WITH NATIONAL PARK GUARD COORDINATOR

Could you please introduce us your responsibility in the NP and for how long you have been working?

He has been working for 14 years and his main responsibility is to take care of forest and aware of people to take care of forest to restore forest and to maintain forest health like to protect fire and use of it sustainably.

How are you doing this all activities to achieve the intended objectives of forest protection?

We work with head of the village and villagers for the forest management.

How do you know the boundary of the national park?

The boundary is on a map and we use the map for boundary delineation.

How villagers are participating on forest management?

We are working in collaboration with the villagers that enables villagers to utilize the forest in a sustainable manner. Villagers are using NTFPs and with the permission some products like timber for construction.

Is there any agricultural expansion practice by the villagers?

Both the villagers and outsiders try to expand their agricultural land. But we try to solve it with the cooperation of villagers and village chiefs. But also, if it is a significant illegal action is taken place we arrest for both villagers and outsiders.

How do you evaluate the villagers' perception toward the national park?

In the past villagers and national park have been different perception toward the mission of the forest management activities but now a days we have the common understanding of forest management and sustainable utilization. We are working now together with the villagers for restoration and reforestations with the help of forester's extension service.

You told us that you are working on awareness development of the villagers how to manage the forest, but the villagers know more about the forest and what are you going to teach them?

Actually the villager knows more about the forest but just to work together for common interest.

Villagers are still collecting NTFP (food fruits, flowers, vegetables) with the help of national park without damaging the forest.

So, is there any illegal collection of forest products? If so, how do you manage it?

Both outsider and villagers collect forest timber illegally but we advise to cut trees with permission died trees or matured enough trees otherwise they are going to be arrested.

Do the villagers know about community forest?

Yes, they know about community forestry well, community forest is forest that managed by the community rules and regulation. CF committee is elected by the villagers and work together with the national park office. Less people are now a day's collecting forest product s and people are respecting the rules and regulation. Illegal collection is keeping on

decreasing. If illegal cutting is from the national park and reservation forest the illegal collectors are going to be arrested but if it is from the CF we report to village head.

We are aware of forest fire with some indicators, what are the causes of forest fire?

Human induced and natural accidents are the main causes of forest fire.

People put fire to the forest to get animals for food and sometimes by accident like when they smoking.

Is there any change on the forest cover?

Yes, it is decreasing due to agricultural expansion and some other utilization. But it is very slow when it compare with before the establishment of the National park and conservation forest.

What are the causes for decreasing forest cover due to agricultural expansion and forest utilization?

Population growth, Shortage of land, land sale and lack of land could be some of the main reasons.

Why do the villagers didn't have the land right?

Yes, villagers have the use right on their land and even with some restriction in some agricultural lands like not allowed to build residence houses and not to sale the land. This is because; if they have the right to sale their land they are going to sale the land and they may start to expand their land to the forest.

What is the benefit of the villagers from the National park and RFD?

Villagers can collect NTFPs and construction wood with permission from the village chief, NP and RFD from the forest. In addition to that villagers could also be benefitted from the labor opportunities related to the national parks and RFD like eco-tourism. But there is no direct benefit share from the income that generated by the NP or RFD through different means because it is submitted to the government directly.

Why do you think that villagers are shifting from the conventional agricultural production to intensified agriculture and other non farm activities? Does it have any relation with NP?

Yes, the prohibitions to expand agricultural land by the NP and RFD could have its own role in addition to the other reasons that villager forces to increase their production on the limited land and searching for other alternatives sources of income.

How do you see that the impact of intensification and nonfarm activities on the forest?

Yes, the intensification and nonfarm activities reduce the pressure on forest from agricultural expansion and over utilization of the forest.

D5 - SSI WITH RESEARCHER AND WATER EXPERT

What internal and external factors motivates/forces farmers to intensify (use agricultural techniques and inputs like fertilizer and pesticides) their farm land?

The Royal project, the land development department and the forest department are the main stakeholders for the promotion of the agricultural intensification within the watershed. Farmers had to stop land expansion. Some external organizations were also involved.

Livelihood has been changed by the transportation network and the improvement of the communication. Thus the living standards are higher. In the past, it was only sufficiency farming. Since the Royal Project is established village of the upper zone have become as semi-urban communities.

Why are the internal and external factors that motivate/force farmers to engage in non-farm activities (urban employment and tourism)?

Natural resources are the main limitation for farm activities. Thus land-use and water has been changed and their restricted uses had pushed people to find non-farm activities. The wish of having a better livelihood and a higher income remain the first reasons.

Can you describe the impact of agricultural intensification (use of fertilizers and pesticides) on soil in Mae Ram watershed?

The main impact is the lowest quality of the soil due to important erosion. Siltation has increased and is filling up streams. This causes flooding problems during the rainy season for the middle and the lower zone. Because of the erosion, the soil nutrients stock (here focusing on organic matter and carbon content in the soil) has decreased in the all watershed. That's why the use of fertilizer is now present in most of the crop practices in order to fill the gap.

For example the lower soil fertility in the middle zone resulting from 40 years of cultivation without shifting because of the presence of the National park. Production of rice in this area has so decreased that now people need to buy rice for their own consumption.

What is the degree of erosion, flooding and siltation across the watershed?

Problems of erosion are mainly occurring during the rainy season because of the intensive cropping in the upper zone (several harvesting on the same plot without any fallow period). These events are mentioned by villagers in the middle and lower zones. In the middle, some farmers are still doing cropping during this season (paddy rice) and their fields are often overflowed by flooding from the upper zone. Their frequency is higher than before but their extent remains the same.

Different types of erosion are present:

- shift and gully erosion which are resulting of overflows,
- stream bank erosion from floodings.

During the dry season there is no problem related to the erosion but they remain the main issue in the middle zone during the rainy season (Ban Pang Hai is closed to Ban Pang Kae).

What are the impacts of application of fertilizer and pesticide on water quality?

The water resource is degraded because the sediments flow down into the rivers (impact of the erosion). The aquatic ecosystem have been destroyed which is a major problem. In the past, the river was the main source of proteins for Karen people (fishes, insects, aquatic plants) but now they have to rely on the market products. Farmers of the upper zone apply more fertilizers during the rainy season because they believe that if they apply more, they would get more. According to previous

survey from Thai students, some fish species which indicated a good water quality cannot be found anymore.

During the rainy season, the water quality is very low because of all the pesticides residues are going down the stream with the slope. But none of them have been found in the sediment analysis, neither in the previous one which was conducted during the rainy season by Thai students last year. This could be explain by the physical characteristics of the soil (sandy soil) which cannot stock heavy metals.

Before the intensification, villagers from middle and lower zones were using the water of the river for drinking purpose. It was clear water. They mentioned changes in physical quality of water as odor, color and particles. Nowadays they do not believe in water quality anymore and buy bottle of water for drinking consumption.

What are the impacts of agricultural intensification on availability of water for agriculture, livestock and human consumption?

Villagers do not mention about water quality, with pesticides residues but emphasis on its availability problems: flooding in the rainy season, shortage in the dry one. For the livestock and human consumption it's rather a problem of quality than availability.

At the watershed level, problems can be ranked as below:

- 1 flooding, siltation (mainly in August and Septembre)**
- 2 erosion (stream bank erosion)**
- 3 water quality**

Conflict resolution

The main problem is not the different sub zone but the various ethnics. Hmongs have their own attitudes and beliefs which are totally different from Karen people and villagers from the lower zone. They cannot solve the problem because it's firstly a cultural one. Theu do not have any common point to share, nothing really link them together to a shared goal.

Moreover, extensionist from the Royal Project do not have the knowledge and the basis to manage the conflict and to come up with a solution. The local empowerment is weak because village chiefs of each sub-zone are not really involved in their own village. Two of them work as middle man or estate trader and the one from the middle do not live in his zone. These leaders do not have any activities in common to work on it together.

D6 - SUMMARY OF SSI WITH TAO SUBDISTRICT REPRESENTATIVE LOWER ZONE

History of the lower zone?

Hundred years ago: only cattle farms BAN. Cattle and field productions were only dedicated for subsistence purpose. The poor people of the area were using NTFP from forest for their own consumption.

2524: The outsiders, mainly from Bangkok, have taken the land from the villagers

2525 to 2552: Electricity and transportation network were implemented

The price of the land increased a lot because of the outsiders demand and a many villagers decided to sell their land to have cash money.

50 000 baths/rai in 2525 □ 3 000 000 baths nowadays

Only 3 farmers have their own land and less than 10 farmers rent land for farming. All the rest of the villagers have sold up. Most of them need to go out for urban employment, mainly in construction. There is nowadays a big owner "Sukantra property" from Bangkok who owns an important part of the land.

Problem of water

Because of the use of fertilizers, herbicides and pesticides in the upper zone, many kind of diseases and pesticides contamination are coming to the zone during the rainy season with the floods. Insects migrate also from the upper zone to the lower since the use of insecticide is lower. Because of that, farmers in the lower zone have to apply chemicals inputs to protect their crops. Changements in water eco-system have been seen by Tao. In the past, fish were easy to find with a simple equipment. Now, because of the pesticides and washing residues in the water, there is no more fish here. Before the intensification water was drinkable and people could use it for any purpose. Nowadays, water is only for agricultural purpose. Villagers are afraid of the contamination from the upper, family have to buy bottles of water.

Before there was no problem with quality and quantity of water or flood time. Now there are facing those problems during the dry season. But Hmong are still using the land in an intensive way, they do not care about the downstream consequences. Middle and lower zones are complaining about this but when they go up and ask to key informants to Hmong they ask help from RP officers. The answer is always the same: this is just promotion by the RP and they are under his protection. Hierarchy is an important concept in Thailand. Middle and lower have never had any answer from the Hmong, neither from the RP. It's only a one-way communication. Even if Hmongs keep quiet, relationships between upper and lower are still friendly.

The answer of the RP: the problem of water is outside they do not need to bring any solution. The RP promote intensification only in the upper zone so they support only this zone.

NTFP

NTFP collection during the rainy season: bamboo shots, mushrooms, vegetables along the river.

During the dry season: ant eggs, banana shots and leaves. The olders can collect local medicinal plants. Products collected are firstly addressed for their consumption but can also be sold.

Changes

Most of the villagers who are working in non-farm activities have construction jobs and women are working as housemaid for tourist resort and millionaire.

1. transportation network, electricity

Villagers can send their products to the market but the land is already sold

RP needs good roads for selling his products

2. living standards are too high for them

They send their children for education in the city, because they think there is a real difference between the local school and the one of the city.

Generally the living standards have been improved because of the outsiders, army general and rich family who have taken the land just need to tell the local organizations of their problems. They are very influential.

The main problem is that the land doesn't belong to the villagers but to few big owners.

Land rights

Chanode: you can sell your land

NSK can be automatically changed in chanode, most of people have this one

NSK 1: you have to ask the permission to the entire village

Benefits from outside

Less benefits because villagers became labor force and housemaid. Ex farmers are now gardeners in luxurious villa for example.

The main benefits is the transportation network.

D7 - SEMI-STRUCTURED INTERVIEW WITH FOREST DISTRICT OFFICER

Date: 12th March 2009

Name of interviewee : Mr Apinan Panjan, forest officer of the RFD for the watershed (Mae Rim district)

Name of interviewer : Sebastien

Place of interview: Mae Rim RFD offices

Utilization of the community forest : Officially, villagers can not :

- Trespass (go inside)
- Take things out (especially to sell them)
- Graze animals within the boundaries

Which means conservation status (since 1994), exactly like in the NP (which is under preservation status).

In practice : officers have to be flexible : villagers can go and collect little things (snakes, medicinal plants, mushroom) + eventually a dead tree BUT can not collect big things (wood, wildpig, game). 10 people arrested each year (not much but denotes a problem/conflict)

To cut a tree in the community forest : administrative control :

- Ask permission to village headman
- This one ask permission to NP chief (in Tard Mok)
- This one warn the RFD chief in Mae Rim.

Miscellaneous : forest cover decreases every year (like wildlife) because population increases (encroachment to get and secure land) + capitalist encroachment (investment for making resorts/tourist infrastructure/big private house). NO problem of logging (e.g. for export).

Actual problems :

- people cutting tree but don't knowing it is conservation area. Answer : information delivered to village head who deliver it to people in the villages
- people clearing the land to sale it : answer = more patrolling.

D8 - PRESENTATION BY THE NATIONAL PARK REPRESENTATIVE

Date: 10th March 2009

Name of speaker : representative of the National Park

Name of note taker : Sebastien

Place of intervention : Base camp

National Park under the Ministry of Environment & Natural Resources (formerly under the RFD), Service of the National Parks.

4 main missions :

- Take in charge the actions against the policy of the RFD (encroachment, poaching, etc)
- Provide support to activities welcoming tourists
- Ensure tourists security
- Take care of services (= maintenance of the facilities)

Borders of the National Park :

Reference used = the map of the Royal Act defined the boundaries of the forest managed by the RFD. Each village council (villages inside or bordering) will be invited to define the border definitely (by concrete marks). In the first phase survey : villages are given the chance to clear their border with the Park.

Official version for the Karen zone : the RFD gave all the information, people have no problem to keep their land BUT try to gain new one through encroachment, the use of NTFPs is not strictly restricted BUT controlled – it is tolerated locally even if it is not stated in the Royal Act. NTFPs can be harvested for own consumption but also for sale (e.g. bamboo shoots). In clear : villagers can keep all the former benefits from the Park as far as they do not expand their cultivated land.

Park statistics :

Staff = 170 officers both local and outsiders

Area = 200,000 rai

Main problems : expansion of cultivated land. To fight against : survey to map the land and compare it to the Government Agreement of 1998. At first, tolerance : people were not threatened ("amnesty") but encouraged to declare their current land as a final baseline.

Community forest : not in the area of the NP, not included in the law BUT it is a claim of the community.

D9 - PRESENTATION OF THE THAI ADMINISTRATION

Date: 13th March 2009

Name of speaker : teacher of CMU + Morgens

Name of note taker : Sebastien

Place of interview: Base camp

History :

- Constitution of 1997 : passed only because of the financial crisis in Asia)
- Constitution of 2006 : passed because of the military coup)
- Constitution of 2007 : transition regime

3 administrative levels in Thailand = central, regional, local

- Central : 20 ministries (1 secretary of ministry each) with departments
- Regional : province (governor, nominated), district (sheriff), sub-district (kanman), village (village headman).
- Local : 3 normal levels : Provincial Administrative Organization (PAO) (elected, supporting the governor), Municipality, Tambol Administrative Organization (TAO)
- Local : 2 special units : Bangkok Metropolitan, Pattaya municipality

Functionment :

- Province + district : under Ministry of Interior, control + approve activities of local administration
- Department of Local Government Promotion (within the Ministry of Interior) encourages and check local administration organization.
- Conclusion : two opposite trends (centralization + decentralization)

The TAO :

- Total number = 6746 (10,000 people per Tambol, 6 to 10 villages)
- Council : 12-20 representatives (2 per village)
- 3 classes : big (income > 20 M BHT), middle (6-20 M BHT), small (< 6 M BHT)

FGD – Focus Group Discussion reports

FGD1 - FGD WITH REPRESENTATIVES OF HMONG COMMUNITY IN UPPER ZONE

Date: 15th March 2009

Name of speaker : Representatives of the Hmong community, including the village head assistant for the Hmong community.

Name of note taker : Sebastien

Place of interview: Ban Mang Khi village

Land use :

- Stability in agricultural and forest surface. Intensification on already cultivated land.
- In some places, increase of forest surface because the remnant of slash-and-burn cultivation (now a forbidden practice) are recovering.

Water & chemicals management :

- Water has same taste and color, it changes only in time of heavy rain, when the pollutants (chemicals) are brought downstream. Some indirect impact on aquatic fauna : too much sediment, less fish.
- Chemicals : affect some people only (because of safety measures not respected). –
- Erosion problem : stable (no loss of soil).
- 1/3 of the farmers do not use irrigation.

De-agrarianization : People go to the city because investment for farming is too important for them, they don't want to be in debt (refusal of debt situation), they just want to cultivate for their own consumption (willingness to stay in a subsistence mode). Impact on land : some sell their land (in the upper zone).

Intensification driving forces :

- NOT the infrastructures (roads were constructed BEFORE the RP BUT improved after by Ministry of Transport)
- NOT land scarcity (farmers know how to cope with fertility depletion, they do not need to expand their land)
- Main reasons : RP + willingness to increase their income
- Secondary factors : loan availability

Trend analysis :

Before 1980 : upland rice + maize + opium

1980 : fight against opium + introduction of lychee and vegetables

1987 : peak of lychee planting, start of the decline before real production (lychee trees too young) : wrong development operation. Lychee stops because market prices are very low (too much supply – 5 BHT.kg⁻¹ at this time), and only one harvest a year.

1999 : introduction of greenhouse culture

2002 : real start of intensification with massive use of intrants

2002-2009 : increase in the general use of intrants (especially chicken manure), decrease in the use of chemical intrants

FGD2 - FOCUS GROUP DISCUSSION WITH ELDERS IN BAN PANG EKA (LOWER ZONE)

What is the main source of income of the villagers?

Agriculture and mainly from nonfarm activities

Is there any change in the farming practice when it compare with the previous time farming practice?

Yes, farmers are using fertilizers, tractors, irrigation, and new crops which were not common before

What are the basic reasons for the change from the traditional farming to this intensified farming?

Before there was enough land for fallow but now a days due to the population growth, restriction of land expansion for shifting cultivation, shortage of land forces farmers to use their land continuously without fallow. This makes the land to be degraded and produce low. And this product is not enough to feed the household members. So the farmer should use the alternatives to increase their production that includes use of fertilizers and irrigation. But this is not practiced by most of the farmers in the village due to shortage of finance to buy the inputs, shortage of water and land.

What are the nonfarm activities that most of the villagers engaged?

Work for wage that could be in construction, farm and service sectors with in the village or Neighbour villages and cities. There are also some villagers that have permanent jobs in governmental and nongovernmental organization.

Why do the villagers engage in these nonfarm activities?

As we explained before the product from agriculture is not enough to the villager to fulfil the increased demand of the household. Living expense is getting high now a days. There are villagers that didn't have land. Even some of the villager land they have is very small that they inherited from their parents fragmented among family members. There is no enough water in the dry season to produce two times using irrigation. Land expansion is not possible by the national park and RFD. There is low interest from the youngster on farming activities. There is access of job with good payment. So, the villagers are engaged in these nonfarm activities to improve their livelihood.

FGD3 - FOCUS GROUP DISCUSSION WITH ELDERS IN BAN PANG HAEW (LOWER ZONE)

Date: 15th March 2009

Name of interviewee: Elders

Name of interviewer: Deo-Gracias, Justice and Ton

Place of interview: Lower zone

Let recall that this FGD is aimed at: Time line change analysis.

What are the major change in Ban Pang Haew village?

Soil fertility: In the past, buffalo and cattle were left free in farm land where they live their manure (sheet) to keep soil fertility. About 20 years ago, chemical fertilizers and pesticides were introduced in agriculture.

Farm land sale: Many reasons justify why people sell farm lands. Actually, in education level in the old generation is very low (primary school maximum) but with the new generation, people even attend university. Thus children are not ready

to go for farming and parents chose to sell their farm land because they are old. Also, land division among children after their parents die explain the phenomenon. In fact when children divide a farm land, there are free to do what they want with the land they inherited from their late parents. And mostly, they sell the land to rich people from city. Thus they can buy car and build nice house. But car has no sheet, no manure as buffalo had had. That's why people use today chemical fertilizers and pesticides.

Non farm activities: Nowadays, after selling farm lands, people go to town to find job. They mainly work in construction

What are the consequences of de-agrarianisation from elders' perspective?

De-agrarianisation leads to the need of more materials and debt. Sometimes people spend 70% of their wage to pay debt. With farming, there is no need of car, no need of TV, no need of fuel, no road accident. You can save money and not have huge debt.

Also, nowadays land is very expensive and very few people can go back to agriculture even if they wish.

What change have you notice in water availability?

In the lower zone, people nowadays don't dare drink water from the stream because they know that upper zone farmers use pesticides. Ban Pang Haew villagers know that if they drink the stream water, they will not die on spot but the poison will accumulate in their body.

About water quantity availability, it reduces a lot compare to the past (40 years ago). Actually, it was possible late in the nights to hear waterfall located at 10 km noise. That is no more possible currently. The same for rivers' size, that reduced very much.

Water conflict management.

Regarding water conflict, no action is formally taken; but there are some informal discussions between native Thai but not with Kmong people in the upper zone neither the Karen in the middle zone. This is to avoid fight.

Appendix 3: pH Category

pH category	Value
Extremely acid	3.5 – 4.4
Very strongly acid	4.5 – 5.0
Strongly acid	5.1 – 5.5
Moderately acid	5.6 – 6.0
Slightly acid	6.1 – 6.5
Neutral	6.6 – 7.3
Slightly alkaline	7.4 – 7.8
Moderately alkaline	7.9 – 8.4
Strongly alkaline	8.5 – 9.0

(Adopted from: USDA 1998)

Appendix 4: Classification based on OM, NO₃, P, K and Ec levels

Level	SOM (%)	Available P (ppm)	Exchangeable K (ppm)	NO ₃ (ppm)	EC (dS/m)
Very High	>3.5	>50	>300		>16
High	2.5-3.5	40-50	200-300	>30	8 - 16
Moderate	1.5-2.5	20-40	100-200	10 - 30	4 - 8
Low	0.5-1.5	10-20	40-100	<10	2 - 4
Very Low	<0.5	<10	<40		<2

(Adopted and modified from: Mingthipol; and NMSU 2000)

Appendix 5: Bulk density classification for soils of different textures

Soil texture	Ideal bulk densities for plant growth (g/cm ³)	Bulk densities that restrict root growth (g/cm ³)
Sandy	<1.60	>1.80
Silty	<1.40	>1.65
Clayey	<1.10	>1.47

(Source: USDA-NRCS soil quality test kit guide)

Appendix 6: Pesticide contamination level

Pesticide contamination level	
0	No contamination
+1	Slight contamination
+2	Moderate contamination
+3	Moderately high contamination
+4	High contamination
+5	High risk contamination to human and food chain

(Source: Personal communication with Associate Prof. Dr. Orathai Mingthipol, Faculty of Architecture and Environmental Design, Maejo University, Thailand)

Appendix 7 : Internal and external factors leading to intensification

The questionnaire survey gave the following results (ranked by decreasing order of importance and grouped by relative weight) :

Driving factors	Type of factor	Rank	Percentage of all the cumulated answers	Number of answers	Number of answers per sub-zone		
					Upper zone	Middle zone	Lower zone
Access to market	Pull	1	15.2	21	14	5	2

Access to inputs	Pull	2	15.2	21	13	5	3
Household size	Push	3	15.2	21	13	5	3
Land degradation	Push	4	10.1	14	7	4	3
Labour shortage	Push	5	9.4	13	8	4	1
Restriction on land expansion	Push	6	9.4	13	7	5	1
Promotion from Gvt/RP/NGO	Pull	7	8.7	12	10	1	1
Land scarcity	Push	8	6.5	9	3	5	1
Good infrastructure	Pull	9	5.8	8	7	1	0
Irrigation availability	Pull	10	2.2	3	3	0	0
Land rights	Pull	11	1.4	2	0	1	1
Labour availability	Push	12	0.7	1	1	0	0
TOTALS			100	138	86	36	16

NB 1 : the three last columns show the representativeness per sub-zone (the most important factors per zone being highlighted by using red characters) in order to outline the geographical origin of the different answers.

NB 2 : the questionnaire gave the possibility to respondents to select any possible number of factors (from 0 up to 12) and this table has been build on 138 (positive) answers from less than 50 respondents.

NB 3 : Labour availability (ranked 12th) is a useless double since at the opposite of labour shortage (ranked 5th) : as it can be only one possible case for the labour situation (scarcity or plenty), it has been decided to ignore the less represented of the two factors and to consider it as neglectable in the further analysis

A basic analysis of this statistical ranking per sub-zone shows that :

- There is no striking pattern of distribution between push and pull factors.
- For each of the three sub-zones, the three most-quoted driving factors are the same (access to market, access to inputs and household size). The distinctions between zones occur with the next (secondary) factors : labour shortage and promotion from Royal Project characterize the Upper Zone, restriction on land expansion and subsequent land scarcity characterize the Middle Zone, and land degradation seems in the Lower Zone as important as the three most-quoted ones (same weight). These statistics roughly correlates the information gained through interviews and general observation.

Appendix 8: Forest cover changes

The following table showing the different land use changes in the Mae Rem watershed between 1997 and 2008 has been compiled from different sources :

Sub-zones (and their relative surface within the watershed)			Upper zone (26%)			Middle zone (42%)			Lower zone (32%)			Watershed (100%)		
Representativeness through time (1997 – 2002 – 2008)			% 97	% 02	% 08	% 97	% 02	% 08	% 97	% 02	% 08	% 97	% 02	% 08
Type of land use	FOREST	Moist evergreen forest	18.6	17.9	20.3	28.04	26.94	21.22	15.87	15.5	14.76	62.51	60.34	56.28
		Mix deciduous forest	0	0	0	2.58	9.96	9.78	4.61	7.38	3.87	7.19	17.34	13.65
	TOTAL		18.6	17.9	20.3	30.6	36.9	31	20.5	22.9	18.6	69.7	77.7	69.9
	AGRICULTURAL LAND	Paddy rice field	3.32	2.21	2.03	3.87	1.48	5.35	3.14	7.01	3.69	10.35	10.7	11.07
		Up land rice /maize/ vegetable	2.21	3.51	2.4	3.51	2.4	3.51	5.9	2.77	6.83	11.62	8.68	12.74
	TOTAL		5.5	5.7	4.4	7.4	3.9	8.9	9	9.8	10.5	22	19.4	23.8
	OTHERS	Villages	1.11	1.11	0.92	1.11	1.11	1.48	1.66	1.48	2.21	3.88	3.7	4.61
		Other lands (including roads)	0.55	0.74	0.18	2.95	0.37	0.74	0.92	0.37	0.74	4.42	1.48	1.6
	TOTAL		1.7	1.9	1.1	4.1	1.5	2.2	2.6	1.9	3	8.3	5.2	6.3
	GRAND TOTAL		26	26	26	42	42	42	32	32	32	100	100	100

Source:

NB : Admitting that the sub-zones surfaces haven't change through time, the changes in percentages are exactly assimilated to changes in surfaces (which do not appear per se in this table).

Appendix 9: Acquisition of assets after intensification and/or de-agrarianization

	Agricultural intensification			De-agrarianization			Both		
Assets	More	Same	Less	More	Same	Less	More	Same	Less
Television	93.33	6.67	0	100	0	0	92.31	7.69	0
Radio	73.33	26.67	0	85.71	14.29	0	84.62	15.38	0
Motor bicycle	75	25	0	100	0	0	92.86	7.14	0
Bicycle	66.67	33.33	0	100	0	0	60	40	0
Mobile phone	93.33	6.67	0	100	0	0	92.86	7.14	0
House	40	60	0	75	25	0	80	20	0
Car	92.86	7.14	0	100	0	0	83.33	16.67	0
Savings	100	0	0	100	0	0	100	0	0
Washing Machine	100	0	0	100	0	0	100	0	0
Refrigerator	100	0	0	100	0	0	87.5	12.5	0
Sewing machine	50	50	0	0	0	0	0	100	0
Cattle	100	0	0	0	0	0	100	0	0
Pigs	0	44.44	55.56	100	0	0	20	60	20
Poultry	9.09	45.45	45.45	33.33	33.33	33.33	27.27	54.55	18.18

Appendix 10: Standard of living after intensification and or de-agrarianization

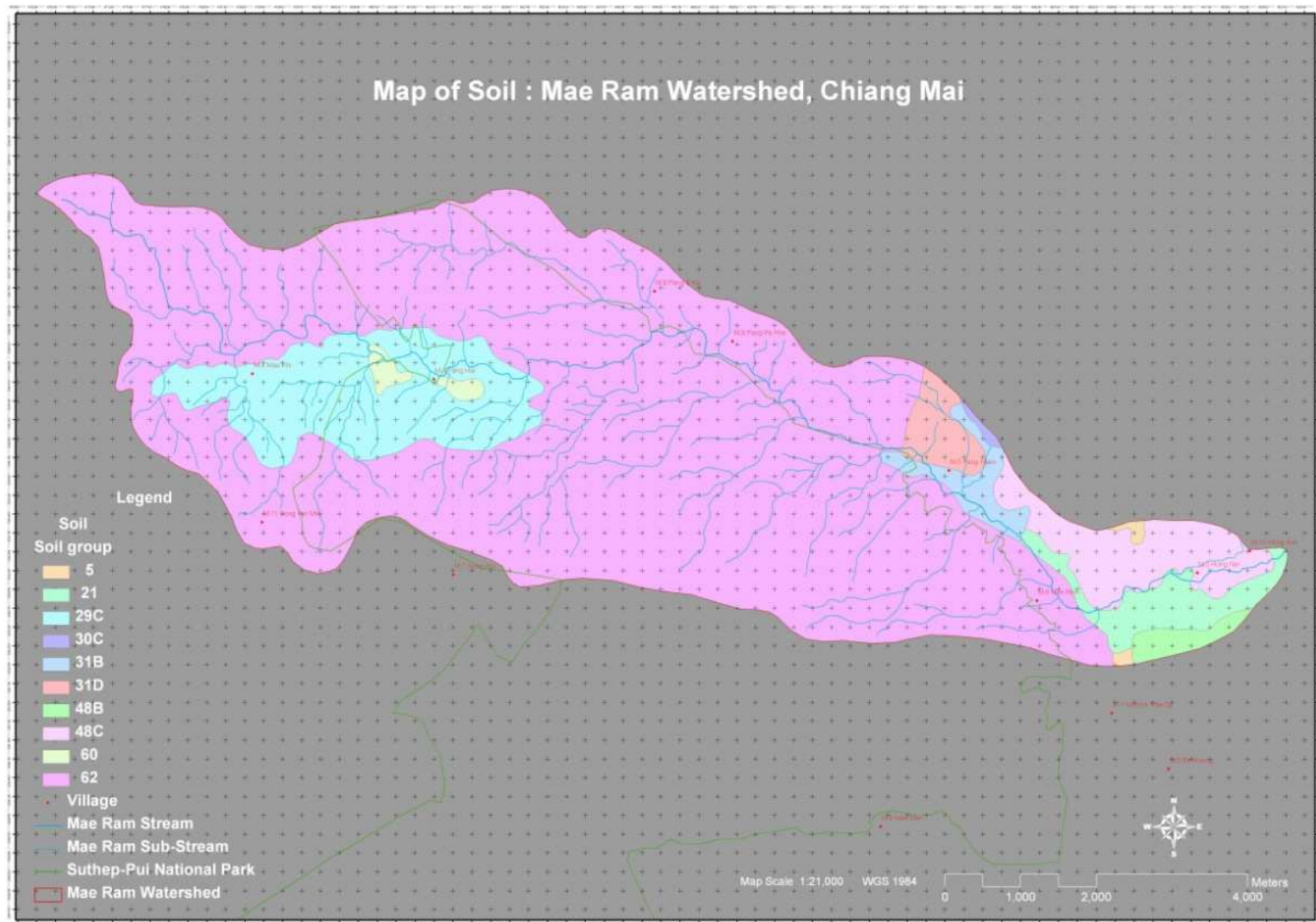
	Agricultural intensification			De-agrarianization			Both		
Living indicator standard	Better off	Worse	No change	Better off	Worse	No change	Better off	Worse	No change
Education	100	0	0	70	0	30	93.33	0	6.67
Health	93.33	0	6.67	91.67	0	8.33	93.33	6.67	0
Housing	46.67	0	53.33	83.33	0	16.67	86.67	0	13.33
Access to food	80	13.33	6.67	75	16.67	8.33	80	13.33	6.67
Clothing	86.67	0	13.33	75	8.33	16.67	100	0	0
Access to potable water	73.33	6.67	20	83.33	8.33	8.33	73.33	13.33	13.33

Appendix 11: Practicing of monocropping

Do you practice monocropping?

		Frequency	Valid Percent
Valid	Yes	23	82.1
	No	5	17.9
	Total	28	100.0
Missing	System	14	
Total		42	

Appendix 12. Soil classification map of Mae Ram Watershed



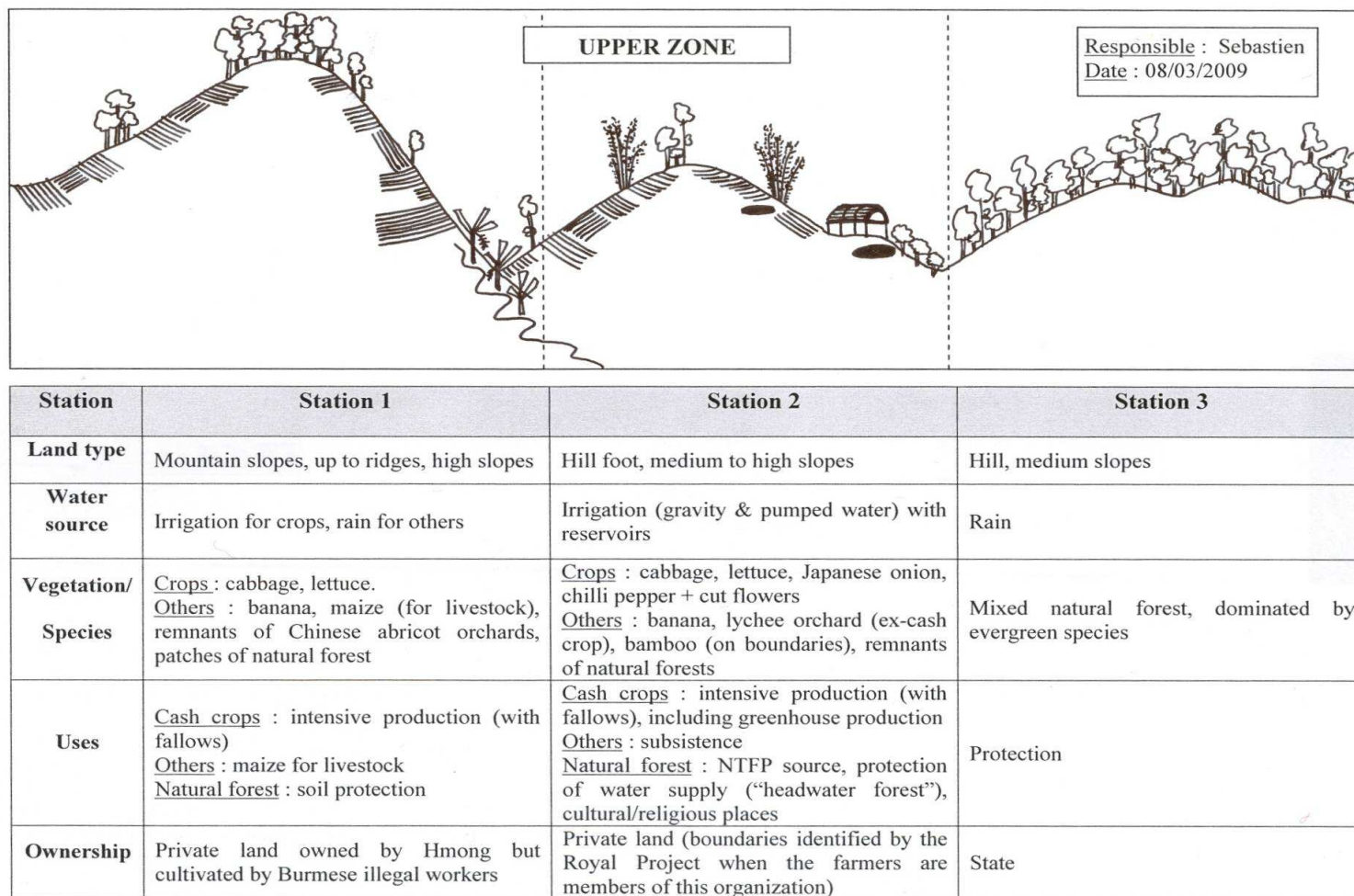
Appendix 13. Seasonal activity calendar

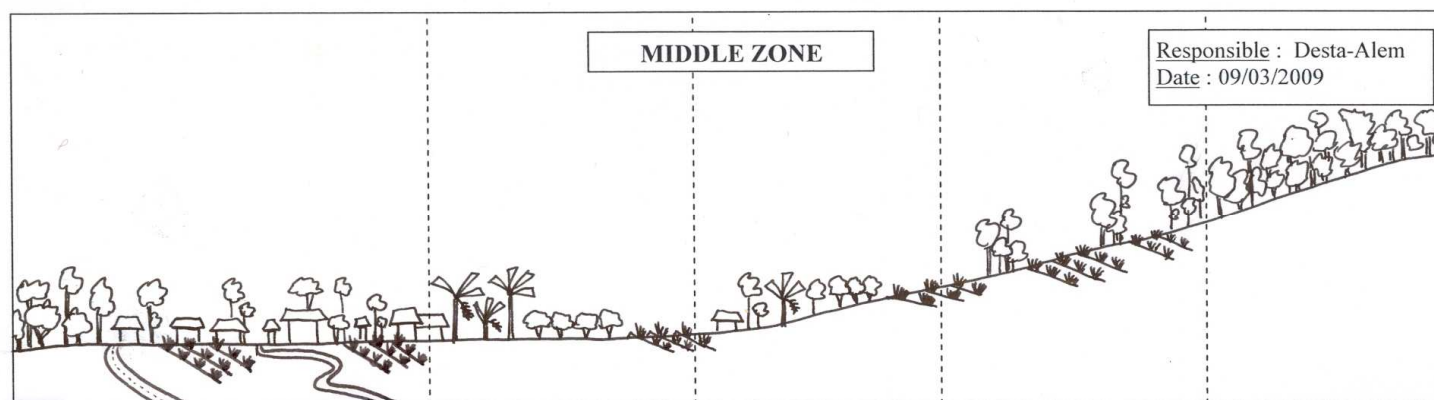
Ban Mae Khi, upper zone		January	February	March	April	May	June	July	August	September	October	November	December
Flower	irrigation	←											→
Maize	rainfall					←	→						
						←							
Rice	rainfall					←							
Soybean	rainfall					←							
Vegetables	rainfall					←							
	irrigation	←											→
NTPF collection									←	→			
Non-farm activities		none											

Ban Pang Eka, middle zone		January	February	March	April	May	June	July	August	September	October	November	December
Maize	rainfall					←				→			
Rice	rainfall					←					→		
	irrigation						←					→	
Soybean	irrigation	←			→								←
Vegetables	irrigation	←	→									←	→
NTPF collection		←			→	←				→			→
Non-farm activities		←			→	←			→	←	→		→

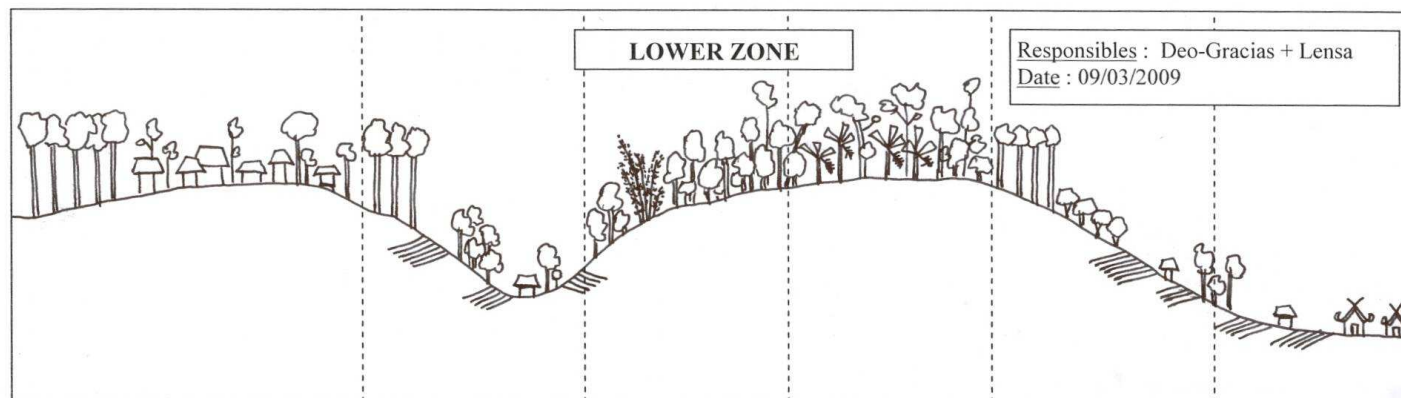
Appendix 14. Transect walk maps

Annex 2 : Transects through the watershed





Station	Station 1	Station 2	Station 3	Station 4	Station 5
Land type	-	-	-	-	-
Water source	Water stream	-	-	-	Water stream
Vegetation/ Species	Reservation forest, homestead plants, crops . paddy rice + beans	Fruits trees (lychee), homestead plants, crops : paddy rice, upland rice, banana, beans,	Fruit trees, homestead plants, cash crops, intercropping with banana, upland rice	Forest, cash crops, banana, upland rice	Natural forest
Uses	Farm land, residence, village street, road, water stream, forest + land	Farm land, orchard, residence, village street	Farm land, orchard farm, residence	Farm land, forest	Community forest, grazing land
Ownership & miscellaneous	Reservation forest	-	-	Community forest, encroachment, forest fire	Community forest, encroachment, forest fire



Station	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Land type	-	-	-	-	-	-
Water source	-	-	-	-	-	-
Species	Teak plantation, <i>Chromolaena odorata</i> , crops : rice + soybean	Teak plantation, other forest species, crops : rice + soybean	Forest species, bamboos	Forest species, very large banana plantations	Teak plantation, other forest species, rice plots, herbaceae (grazing), banana plantations	Banana plantation, rice
Uses	Village settlements	Agricultural land, forest	Conservation forest	Community forest	Farmland, Lychee orchard, forest	Farm land, village settlement, tourism resort, forest office
Ownership & miscellaneous	-	Cattle grazing, logging and burnt trees	Erosion	Agricultural encroachment, erosion, medicinal plant collection	Agricultural encroachment, logging and burnt trees	Logging and burnt trees

Sustainable Land Use Field Course Interdisciplinary Land Use and Natural Resource Management



De-agrarianization and Agricultural Intensification in Mae Ram Watershed (North-Western Thailand)

Final synopsis

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Acronyms

FGD Focused Group Discussion

GPS Global Positioning System

HH Household

PRA Participatory Rural Appraisal

SSI Semi Structured Interview

1. Introduction

8.1 Background

Rapid economic growth and even more rapid economic decline have characterized a number of developing countries, over the course of the last decade of which Thailand; attaining a so-called 'middle income' status. In addition to these recent events, population growth and movement, land-use change often linked to deforestation and land degradation and the globalization of poverty have continued apace (Kearney, 1995; Lambin et al., 2001; Geist and Lambin, 2001; Bingham, 2002 In Wadley et al., 2006). Furthermore, other changes (including increased commercialization, transborder trade, forest conservation policy, penetration of capitalism, modernization, etc.) may have lasting effects on land-use strategies (Wadley et al., 2006) and improvement of social welfare developed by households (Parnwell, 1988). In that respect, Rigg and Nattapoolwat (2001) mention that rural households are dividing their time between farm and non farm activities, constructing livelihoods that are increasingly hybrid, both spatially and sectorally. Northern Thailand is concerned by such trends and as consequence among many other, rural-urban movement is more and more seen as widespread and large-scale phenomenon regarding rural population strategy to improve their livelihood. In fact, a number of recent studies in Thailand have shown that the scale of total mobility to urban area (Chiang Mai and Bangkok) is far greater than that suggested by censuses, which generally do not record temporary or circular movement (Goldstein, 1978). As households change demographically, and some members migrate to and establish new residences and income sources in nearby urban and peri-urban areas, crop specialization changes as well (Eder, 1999 In Wadley et al., 2006). In a context of shrinking landholdings, the result of this movement is labour shortages within the communities of origin hence labour is known as playing a decisive role in agricultural decision making for production (Wongruechai, 1998; Lightfoot et al. 1983).

In Northern Thailand mountainous region, local livelihood strategy response to different changes is found consisted of both subsistence and commercial agriculture with strong connections to local and international labour markets (Wadley et al., 2006). Indeed, Rigg and Nattapoolwat, (2001) noticed that Northern-Thailand has been influenced by two successive but, partially overlapping processes: commercialisation followed by deagrarianisation. In such context of opposite processes, the challenge remains the tensions and conflicts between farming and non-farming activities (Ganjanapan, 1986) which often works out to the detriment of farming, especially intensive cropping (Rigg and Nattapoolwat, 2001). Actually, while intensification of agriculture provides the only realistic means of raising rural income in the long term for the large majority in North-Thailand (Thailand: National Economic and Social Development Board, 1977;1982; Parnwell, 1988), as mentioned by Parnwell (1988) there are real dangers of intensifying agricultural land use and following very important economic rather than ecological principles.

For instance, discussions concerning communities' rights or interests and land use policy (forest conservation, agricultural intensification) have existed for centuries. Some environmental conservationist groups, for example sought an end to deforestation in all forms, and also forms of reforestation. Social developmental groups and rural communities in contrary required greater protection for existing forest areas so as to allow continued access by rural groups. (Craig and Timothy, 2002). In addition to the complexity, the role of so-called hill tribes in deforestation is also highly controversial (Grandstaff, 1980 In Craig and Timothy, 2002).

From all mentioned above, it may be drawn that Northern Thailand of which Chiang Mai, is very complex area to analyze. And there is a very deep diversity regarding ethnicity, land use change and adaptation, interests of power-holders and stakeholders, etc (Dearden, 1995; Parnwell, 1988). In our process of analysing the societal change in Mae Ram watershed, we will consider the conceptual framework developed by Dearden (1995) with the embedded relationship between the economic, cultural and environmental aspects of development.

8.2 Problem Statement

In the Mae Ram watershed, agriculture is an important economic activity and about 21.37% of the land area is used for agricultural activities. The agricultural activities are mainly the production of paddy rice, peanut, soybean, maize, fruits, vegetables and cut flowers for export. As household livelihood strategies change and development occurs, some inhabitants are rather engaged in non-farm activities such as tourism, collection of NTFP products, seasonal urban employment to earn income. In the Mae Ram watershed, there are indications of an increase in the labour force shifting to non-farm activities mainly by migration. According to Aumtong et al. (2008), the young generations around the watershed seems to be less interested in learning and inheriting their parents' occupation which is mainly farming. Such attitude may explain the increasing importance of de-agrarianization in the watershed. As consequence, Nambiro (2007) asserted that decline in labour force for agricultural activities results in agricultural intensification because farmers resort to substitution of human labour with the usage of herbicides, fertilizers, machineries etc. Hence, this issue in addition to other factors is likely to result in intensification of agricultural activities in some parts of the watershed. These two phenomena (de-agrarianization and agricultural intensification) would definitely have socio-economic impacts on the livelihood of the watershed population as well as environmental effects.

To in-depth knowledge related to these issues and in the light of literature background, the current study is designed to focus on the socio-economic and environmental drivers as well as consequences of de-agrarianization and agricultural intensification in Mae-Ram watershed.

8.3 Research questions

Main research question

In the context of rural dynamics, what are the causes and consequences of de-agrarianization and agricultural intensification in Mae Ram Watershed?

This will be achieved by answering the following sub questions.

Sub questions

- What are the characteristics and extent of agricultural intensification and de-agrarianization in the Mae Ram watershed?
- What are the internal and external factors driving the de-agrarianization and agricultural intensification?
- What are the socio-economic consequences of de-agrarianization and agricultural intensification?
- What are the environmental consequences of de-agrarianization and agricultural intensification?
- Does de-agrarianization and/or agricultural intensification produce or reduce conflicts of interest over natural resources conservation or utilization? If so, how are these conflicts locally addressed?

8.4 Concept Definition

Agricultural intensification can be defined as increases in labour or capital inputs per area unit; the creation of landesque capital (e.g. in the form of soil/water conservation structures or irrigation systems); and changes in land management for the purpose increasing output per unit area. (Løvenbalk et al, 2003).

It can further be classified into labour, capital and land intensification. Labour intensification depends on excessive use of labour per unit area while capital intensification refers to the higher use of capital input (e.g. fertilizer, pesticide, herbicide, machineries, draft power, irrigation) per unit area. Land intensification depends on increased cropping intensity by intercropping, multiple cropping etc.

For the purpose of this study, agricultural intensification refers mainly to land and capital intensification.

De-agrarianization should be understood in our study in accordance with the definition given by Bryceson (1997) which is four parallel long-term process of occupational adjustment (livelihood), income-earning reorientation, social

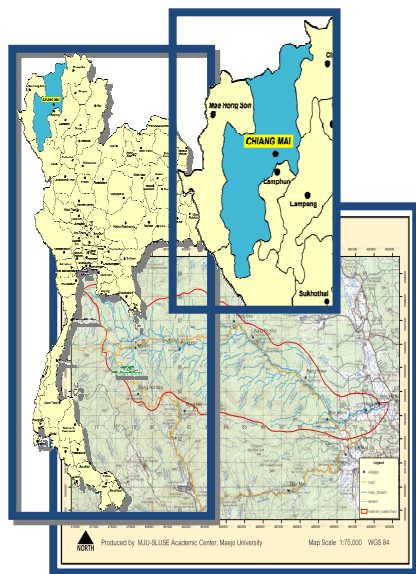
identification and spatial relocation of rural dwellers (resettlement) away from agricultural-based modes of livelihood.

Environmental impact in our study is mainly used to refer to the impact of agricultural intensification and de-gararianization on forest, Soil and Water.

2. Methods

2.1 Research area description

The study area, Mae Ram is a sub-watershed of Mae Rim watershed located in the province of Chiang Mai; District Mae Rim and Sub district Mae Ram. The watershed



under study has an area of 54.2km² and is 5km from Mae Rim city. It is divided into three areas where the upper stream is mountainous with elevation range of 900-1500masl; the middle - mountainous to flat land with 600-900masl and the lower predominated by flat land ranging from 300-600masl. Between 2003 and 2007, the seasonal temperature ranged from 10 to 30°C and the monthly average rainfall extended to 500mm. There are various evergreen and mixed deciduous forests in the watershed apart from areas under National park and the Royal Project. The different ethnic groups in the watershed include the Hmong people in the upper, the Karen in the middle and the Muang in the lower stream, (Aumtong, 2009).

2.2 Research design

Sub Research Question 1: What are the characteristics and extent of de-agrarianization and/or agricultural intensification?

Working Questions	Proposed Method	Source of Information	Sampling
1. Who are the stakeholders involved in agricultural intensification and de-agrarianization?	SSI with key informant	Agric extensionist, Village Chief	Sampling Type 3 (Purposive sampling for SSI)
<u>Intensification</u>			
2. What are the agricultural patterns and techniques used in the area for intensification (intercropping, multiple cropping, terracing, tillage,...)?	Resources Map, Transect	Farmers	Sampling Type 2 (Purposive sampling as for FGD)
	Observation		
	FGD, Trend analysis	Farmers	Sampling Type 2 (Purposive sampling for FGD)
	SSI with key informants	Agric Extensionist	Sampling Type 3 (Purposive sampling for SSI)
	Secondary data	Agricultural dept documents, Satellite images	
3. What are the inputs used?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	SSI with key informant	Agric Extensionist	Sampling Type 3 (Purposive sampling for SSI)

	Observation		
4. How large is the farm land under intensification?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
5. What type of crops are grown and livestock reared by HH?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	Cropping calendar	Farmers	Sampling Type 2 (Purposive sampling as for FGD)
	SSI with key informant	Agric Extensionist	Sampling Type 3 (Purposive sampling for SSI)
<u>De-agrarianization</u>			
1. What are the non-farm income sources and where are they undertaken?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	FGD	Farmers	Sampling Type 2 (Purposive sampling for FGD)
2. What is the contribution of the non-farm income in the HH livelihood strategy?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
3. How many of the HH members are engaged in non-farm activities?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)

Sub Research Question 2: What are the internal and external factors that promote de-agrarianization and/ or agricultural intensification?

Working Questions	Proposed Method	Source of Information	Sampling
<u>Intensification:</u>			
1. What internal factors motivate/force farmers to intensify and change their land use pattern?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	FGD	Farmers	Sampling Type 2 (Purposive sampling for FGD)
	SSI with key informant	Youth leaders, Elders, Researchers	Sampling Type 3 (Purposive sampling for SSI)
	Literature review		
2. What external factors motivate/force farmers to intensify and change their land use pattern?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	FGD	Farmers	Sampling Type 2 (Purposive sampling for FGD)
	SSI with key informant	Youth leaders, Elders, Researchers	Sampling Type 3 (Purposive sampling for SSI)
	Literature review		
<u>De-agrarianization:</u>			
1. What internal factors motivate/force farmers to engage in non-farm activities?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	FGD	Farmers	Sampling Type 2 (Purposive sampling for FGD)
	SSI with key informant	Youth leaders, Elders, Researchers	Sampling Type 3 (Purposive sampling for SSI)

	Literature review		
2. What external factors motivate/force HH members to in non-farm activities?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	FGD	Farmers	Sampling Type 2 (Purposive sampling for FGD)
	SSI with key informant	Youth leaders, Elders, Researchers	Sampling Type 3 (Purposive sampling for SSI)
	Literature review		

Sub Research Question 3: What are the socioeconomic consequences of de-agrarianization and/or agricultural intensification?

Working Questions	Proposed Method	Source of Information	Sampling
1. What are the HH assets before and after agri. intensification and de-agrarianization?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	Observation		
2. How has the living standards (schooling, access to food, health, shelter, clothing) of the HH been influenced by agri. intensification and de-agrarianization?	Questionnaire	HH	Sampling type 1 (Stratified sampling method for Questionnaire)
	Observation		
3. How many Farmers' associations/cooperatives before and after agric intensification and de-agrarianization and what are their role and activities?	SSI with key informants	extensionist, farmers' association leaders	Sampling Type 3 (Purposive sampling for SSI)
4. How has agric intensification and de-agrarianization influence infrastructure (roads, tel..)?	SSI with key informants	village chiefs,	Sampling Type 3 (Purposive sampling for SSI)
5. What are the impacts of de-agrarianization and agric. intensification on cultural norms of the area (food habits, clothings, religion, housing, etc)?	SSI with key informants	religious leaders, women leaders	Sampling Type 3 (Purposive sampling for SSI)

6. What is the local (indigenous) knowledge on the utilization of edible and medicinal plants from the forest?	SSI with key informants	extensionist, Farmers, Housewife, NTFP collector, health care officer, local healer	Sampling Type 3 (Purposive sampling for SSI)
7. How have the local knowledge changed due to agricultural intensification and/or de-agrarianization?	SSI with key informants	extensionist, farmers, Housewife, NTFP collector, health care officer, local healer	Sampling Type 3 (Purposive sampling for SSI)
8. How do these changes influence the local way of conservation or utilization of natural resources (edible and medicinal plants)?	SSI with key informants	extensionist, farmers, Housewife, NTFP collector, health care officer, local healer	Sampling Type 3 (Purposive sampling for SSI)

Sub Research Question 4: What are the consequences of de-agrarianization and/or agricultural intensification on environment?

Working Questions	Proposed Method	Source of Information	Sampling
1. What are the impacts of application of fertilizer and pesticide on water soil quality?	SSI with key informant	Health Official, Extensionist, Water expert	Sampling Type 3 (Purposive sampling for SSI)
	FGD	Villagers	Sampling Type 2 (Purposive sampling for FGD)
	Water and soil analysis	Students	Soil and water sampling
2. How does agric. intensification and de-agrarianization influence the availability of water for agriculture, livestock and human consumption?	Transect	Key informant	Sampling Type 2 (Purposive sampling as for FGD)
	SSI with key informant	Water expert	Sampling Type 3 (Purposive sampling for SSI)
	Water availability calendar through FGD	Villagers	Sampling Type 2 (Purposive sampling for FGD)
3. What is the degree of erosion, flooding and siltation across the watershed?	Transect walk	Key informant	Sampling Type 2 (Purposive sampling as for FGD)
	SSI with key informant	Agri Extensionist, Soil expert	Sampling Type 3 (Purposive sampling for SSI)
	Observation	Field indicators for erosion	
4. What are the impacts of intensification and de-agrarianization on forest cover?	Observation	Field walk	
	GPS mapping of specific areas	Field walk	
	SSI during field walk	Foresters	Sampling Type 3 (Purposive sampling for SSI)
	Secondary data (Areal photograph and satellite image)	Foresters/(Khun Khate)	

Sub Research Question 5: How do de-agrarianization and /or agricultural intensification influence conflicts of interests on natural resource conservation or utilization?

Working Questions	Proposed Method	Source of Information	Sampling
1. What are the conflicts related to de-agrarianization and /or agricultural intensification?	SSI with key informants	Village chiefs, elders	Sampling Type 3 (Purposive sampling for SSI)
	Secondary data	Documentations	
2. How are the conflicts prioritised?	Ranking by individual informant	Village chiefs, elders	
	Secondary data	Documentations	
3. Who are the stakeholders involved in the conflict and what are their needs interest and positions?	SSI with key informants	Village chiefs, elders	Sampling Type 3 (Purposive sampling for SSI)
	Secondary data	Documentations	
4. What are the local conflict resolution strategies/mechanisms for the major conflicts?	SSI with key informants	Village chiefs, forest officers, extensionists, religious leaders, elders	Sampling Type 3 (Purposive sampling for SSI)
	Secondary data	Local rules	

2.3 Data to be collected and Collection Methods

To increase the reliability and validity of data's that will be collected, diverse methods of data collection will be implemented. The selected methods that are the most appropriate to collect data's that are required to address the research question includes secondary sources, questionnaire, semi structured interview, natural scientific methods and some PRA tools that includes FGD, Historical transect, social and resource map, scoring and trend analysis. The synergy of diverse methods will help to cross check or triangulate and to increase the data reliability and validity.

2.3.1 Secondary data collection

Literature review that includes records, reports, news paper, journals, thesis, articles, books and unpublished data, as well as internal notes, statistics, etc will be used as source of secondary data that helps to make comparison with the primary data as well as to get an over view of the reality on the ground.

2.3.2 Primary data collection and sampling techniques

2.3.2.1 Natural Science Methods

As part of primary data collection especially to see the environmental impact of agricultural intensification and de-agrarianization, we plan to have soil and water samples analysed from the upper, middle and lower stream of the watershed for cross cut comparison and further triangulation with data collected by other methods, particularly, key informant interview. Global Positioning System (GPS) will also be used to map the various households, transect walks, soil and water sample spots and boundaries of zones/villages in the watershed. Moreover, daily observation will help us to further understand the socio-cultural and natural setting of the community and the watershed as a whole.

2.3.2.2 Questionnaire

Considering the intention of quantifying some issues, questionnaire survey will be used to collect primary data from households of the study area. Questionnaires will be distributed among households from all the three parts of the watershed area while taken into consideration different ethnic groups and wealth status. The questionnaire will be designed to provide us with data on the drivers, characteristics and extent, socio-economic and environmental consequences of agricultural intensification and de-agrarianization.

A pilot survey of a draft questionnaire will be carried out once in Thailand in collaboration with our Thai counterpart and interpreters. This aims to test whether or not the questions are easily understandable and coherent for the target group and that enables to address research objectives.

The results from this method will furthermore be used to identify issues for further investigation and potential key informants.

2.3.2.3 Semi Structured Interview - SSI

Semi-Structured interview has been chosen as one of the information gathering methods as it, unlike questionnaire, will allow us to have an in-depth understanding of the different aspects of agricultural intensification and de-agrarianization in the watershed from the perspectives of our key informants/interviewees. In addition, the SSI, unlike the Focused group Discussion (FGD), can help us address some sensitive issues, especially the different conflicting interests that could result from de-agrarianization and agricultural intensification as people tend to freely express their opinions individually than in group. Moreover, SSI will also help to triangulate information gathered by other methods.

The key informants will be selected based on their knowledge about the village and activities within the village. The proposed key informants are village chiefs, elders, youth leaders, foresters, Agricultural extensionists, researchers from Chiang Mai University, soil & water experts, woman leader, religious leader, farmers association's leader and health official. This will allow us to gather relevant data on characteristics, extent, causes and socio-economic and environmental consequences of de-agrarianization and agricultural intensification processes. Individual interview guidelines have been developed for each of the selected key informants based on the data required from them. Moreover, the guidelines will be pre-tested to estimate the time required for the interview and to check clarity of the questions beforehand.

2.3.2.4 Participatory Rural Appraisal

✓ Resources map

Resource map is to be considered as a tool to have a spatial structure of natural resources (forest, water, other), land use and land pattern as well as detailed information about households and the watershed as a whole (habitation patterns, houses, schools, hospitals, temples, etc). In practice we intend to do such a map in every one of the three agro-ecological zones during a focus group discussion. Beyond a bird's eye view given of the whole watershed and detailed information (based on dwellers' opinion) provided by resources map, it may involve actively many people at once and will be very useful to build the confidence of villagers and break the ice at a very beginning. The process of social mapping will be a starting point on of understanding the socio-economic stratification of the communities in terms of its resources its distribution and management. Later and onward, the resources map will be used as background for implementation of research questions different aspects.

✓ Transect

Transect is another PRA method that will be used to explore the spatial dimensions of natural resources (forest, agriculture, others) and infrastructures in people's management of their environment. It will be drawn as a cross-section of the different agro-ecological zones (upper, middle, lower) and their characteristics. The transects path will be chosen based on the analysis of the research maps previously drawn in the different zones. Hence, one may compare certain socio-economic and environmental parameters and even conflicts indicators; including infrastructures, ethnicity dependence, gender related dimension, topography, land type, land use systems, land tenure, soil-type, soil-fertility, vegetation, crops, seasonal usage, problems, opportunities and solutions. Recall that historical facts regarding land and resources use will be included in the transect so that we have an idea of spatio-temporal change and trends across the watershed. Gender and cultural as well as socio-economic dimensions will be taken into consideration to build the transect walk group. Transect will be used as a triangulation tool along the way, during data collection and data analysis.

✓ Trend analysis

We will use trend analysis to explore and understand temporal dimensions of the changes in agricultural intensification and de-agrarianization practices that have taken place in the watershed area over the past years. The trend analysis will be organised with knowledge recall of farmers during focus group discussion.

✓ Cropping calendar

Cropping calendar is a time-related PRA method that will be drawn during a focus group discussion, in order to have an overview of the different crops (cash and subsistence crops) produce in the agro-ecological zones and the period of time they are grown. During the focus group to draw cropping calendar, questions related to agricultural techniques as well as land-use system (inter-cropping, monoculture, relay culture, etc.) will be touched upon. Later, if details are needed, they will be covered by questionnaires at household level.

✓ Water availability calendar

Water availability calendar is a PRA method that will be also drawn during a focus group discussion at agro-ecological zone level. The specificity is that the calendar will give an idea of three specific type of water along the year: human consumption, crop production and livestock. In practice, water available during the period when there is enough volume may be used as baseline volume. Then it will be compare to the other period to draw the trend for each period of the year and for every type of water as mentioned above.

✓ Focus Group Discussion (FGD)

Focus group discussion would be used in supplementing the information that would be gathered through questionnaire because it allows participants to build on one another's responses and come up with ideas they might not have thought of in the semi structured interview or filling a questionnaire.

Participants of about 10 to 12 people will be drawn considering their ethnic group, wealth and gender. One focus group discussion would be done in each zone. It will be used in seeking in depth information concerning the drivers of the agricultural intensification and de-agrarianization process as well as the consequences of these phenomena.

2.3.2.5 Sampling methods

Type 1.

➤ Questionnaire

To collect representative data through questionnaire from representative respondents of diversified community of Mae ram water shade, stratified random sampling method will be used based on basic criteria for stratification that have significant influence on the knowledge, experiences, perception and opinion of respondents toward deagrarianization and/or agricultural intensification.

Sampling method: Stratified random sampling

Unit of observation: Household

Sampling strata (3):

- Agro-ecological zones
- Ethnic groups
- Wealth categories

Sampling size (rate): Minimum of 30 respondents

Type 2.

➤ Focus group discussion

To achieve a representative focus group discussion with discussants that helps to have generalized idea of the community they represent, discussants will be selected purposively based on criteria's with the help of key informants.

Sampling method: Purposive sampling with the help of key-informants

Selection criteria of target groups: age class, wealth categories, gender, villagers, ethnic diversity

Sampling size: 10 to 12.

N.B: One FGD per agro-ecological zone.

Type 3.

➤ Semi-structured interview

In order to collect reliable and detail information (data) through semi structured interview from specialists, experts, researchers and most familiar or concerned bodies to the specific subject matter of the study; respondents will be selected purposively based on their knowledge or experience to the intended specific subject matter of the study with the help of key informants.

Sampling method: Purposive sampling with the help of key-informants

Number of semi structured interviews with key informants: 18 in total

N.B: Some interviews will be dropped out if information needed is addressed by previous interviews.

2.4 Data Analysis technique

According to Mikkelsen (2005), a useful way of analyzing qualitative data starts with thematic coding and clustering. Thus we shall organize the raw data into conceptual categories and/or themes. Once the coding is done, matrix displays and graphics can be elaborated for an in-depth results analysis. In addition, quantitative data as well as qualitative data will be analyzed using descriptive statistics methods when necessary. Hence, frequency of distribution, cross-tabulated contingency table, histograms will support data analysis.

2.5 Materials

The following materials will be needed to carry out this study.

- ✓ Printer
- ✓ A1 paper for FGD
- ✓ Markers (different colours)
- ✓ Recorder
- ✓ GPS
- ✓ Measuring tape
- ✓ Compass
- ✓ chemical kits for soil (and water) analysis
- ✓ Motorbike
- ✓ Scotch tape and Glue

2.6 Critical Assumptions

Time is considered to be the main limitation to the current study as there are only ten days in the field to actually collect most of the required data. Moreover, as a result of language barrier, there might also be data loss through translation apart from data withhold by respondents as it might be difficult to build rapport in such a short time and hence making it difficult especially to gather information regarding some sensitive issues. However, the study team would try to gather the required data and to further triangulate using various methods and respondents/key informants.

2.7 Dissemination of Results

The study team plans to share, if possible, preliminary findings to participants through community meeting before leaving the study area or later share the detailed findings through the study coordinators in Chiang Mai; and furthermore to anyone from the general public with an interest on the research subject through an electronic version on SLUSE home page.

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Annex

Annex A: Questionnaire

Village:

Date:

Number of questionnaire:

House number:

Student's name:

Translator's name:

We are a group of student from the Faculty of Life Science, University of Copenhagen in cooperation with a group of Thai student from Chiang Mai University and Maejo University. We kindly ask you to participate in our questionnaire survey. Your answers will be kept anonymous and the results will be used to analyze the *causes and consequences of de-agrarianization and agricultural intensification in the Mae Ram Watershed* to fill the requirement of our academic study. Thank you for your participation.

II. Background information

1. Name of head of household (optional):

2. Gender of head of household

☐ Male ☐ Female

3. Age of head of household

4. Education of head of household

☐ Primary school ☐ Junior High ☐ High school ☐ Tertiary
☐ No education

5. Ethnicity/language

6. How many adults in the household?

7. How many children/minors in the household?

8. Which type of land rights do you hold?

☐ Customary ☐ Inherited ☐ Leasehold ☐ Other (Please state.....)

9. What is your main source of income?

☐ Farm ☐ Non-farm ☐ Both

II Intensification

10. How many household members work on the farm?

11. How many workers (outside your HH) do you hire to work on your farm?

12. Do you hire more/less/same workers now compare to the period without intensification (fertilizer, pesticide.....)?

☐ More ☐ Less ☐ Same ☐ None

13. Have you been practicing fallow?

☐ Yes ☐ No

14. If yes, how long is the fallow period for your farm land?

15. Have it increased/decreased or is the same compare to previous fallow period?

☐ Increased ☐ Decreased ☐ Same ☐ No fallow

16. Do you practice intercropping (growing of different crops on the farm)?

☐ Yes ☐ No

17. If yes, list the crops you intercrop.

18. Do you practice multiple cropping?

☐ Yes ☐ No

19. If yes, list the crops e.g. Rice + Cabbage + Soya bean

20. Do you practice subsistence (own consumption) or commercial farming (for sale)?

☐ Yes ☐ No

21. In which village do you hold the land on which you are intensifying?

22. Complete this table on the crops you cultivate

Crops grown	Area cultivated now (rai)	Have the area cultivated been more/less/same today compared to period before intensification?	Current yield (1kg / rai)
		1 More 2 Less 3 Same	
Rice			
Soybean			
Cassava			
Grape			
Other fruits			

23. Complete this table on the inputs used

Inputs	Do you use the following inputs 1 Yes 2 No	Do you use more/less/same of this inputs today compared to period before intensification?
		1 More 2 Less 3 Same
Herbicide		
Fertilizer		
Pesticide		
Manure		
Improved seed		
Irrigation		
Draft power		

Tractor		
Other		

24. Please complete this table concerning what drove you to intensify your farming activities

Driver	1 Yes 2 No	Explanation
1. Land right		
2. Increase in family size		
3. Land degradation		
4. HH Labour shortage		
5. Restriction on land expansion		
6. Better access to market		
7. Easy access to inputs		
8. Land scarcity		
9. Promotion from Government/NGO		

III De-agrarianization

25. If non-farm is one of your sources of income, what is its share in your total income?

1 2 3 4 5 6 7 8 9 10

26. Could you please list your non-farm activities?

Non-farm activities	Where is it undertaken	No. of HH members engaged in it
1.		
2.		
3.		
4.		
5		
6.		

7.		
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27. Can you recall when you start to diversify your source of income to non-farm activities?

☐ 0-6 years ☐ 5-10 years ☐ More than 10 years

28. Please complete this table concerning what drove you to engage in non-farm activities

Driver	1 Yes 2 No	Explanation
1. Lack of security on land		
2. HH population growth		
3. Land degradation		
4. HH Labour shortage		
5. Restriction on land expansion		
6. Poor access to market		
7.		
8. Other		
9. Other		

IV Intensification and De-agrarianization

29. Complete this table on the assets you are having.

Assets	Do you own any of these assets	Quantity	Do you own more/less/same of this asset today compared to period without intensification and/or de-agrarianization?
	1 Yes 2 No		1 More 2 Less 3 Same
Television			
Radio			
Motor bicycle			
Bicycle			
Mobile phone			
House			

Furniture			
Savings at financial/local institution			
Others			

30. Complete this table on the livestock you own.

Livestock	Do you have any of these livestock?	Quantity	Do you own more/less/same of these livestock today compared to period before de-agrarianization/and or intensification?
	1 Yes 2 No		1 More 2 Less 3 Same
Cattle			
Goat			
Sheep			
Pigs			
Poultry			
Other			
Other			
Other			

31. Please complete this table concerning the improvement of your standard of living

Living standard indicators	1 Better off 2 Worse 3 No change	Explanation
Education		
Health		
Housing		
Access to food		
Clothing		
Access to potable water		
Other		

Annex B: FGD Guideline

Number of discussants: _____
Name of facilitator : _____
Date and time : _____
Place of FGD : _____

(Brief introduction about the research objective, estimated time the FGD will take ...)

1. What are the inputs and agricultural techniques used in the area for intensification (fertilizer, pesticides, terracing, tillage,..)?
2. What are the reasons that motivate/force farmers to intensify (use of fertilizers, pesticides and or mechanization or animal traction if it exists) and change their land use pattern (the crops you grow and your land area size, rotation, monoculture, association, etc.)?

By mentioning the factors, respondents will not make any difference between internal and external factors. It will be our task to filter later.

3. What are the non-farm activities that are practiced by farmers in the area?
4. What are the reasons that motivate/force farmers to engage in non-farm activities (land conflicts, lack of labour, profitability, etc.)??

By mentioning the factors, respondents will not make any difference between internal and external factors. It will be our task to filter later.

5. Is there any change in water quality (taste, color,...) from the time you started agri intensification (using fertilizers and pesticides)?
6. How does agric. intensification and de-agrarianization influence the availability of water human consumption, livestock and for agriculture (annual distribution to be illustrated by water availability calendar)

Thank you for your time.

Annex C: Draft SSI Guideline

Semi Structured Interview Guideline for Agricultural Extensionist

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

1. Who are the stakeholders involved in agricultural intensification and de-agrarianization?
2. What are the
 - a. crops grown and livestock reared by farmers practicing agricultural intensification?
 - b. agricultural techniques farmers use for intensification (terracing, tillage,..)?
 - c. inputs farmers use for intensification?
 - d. common non-farm activities
3. Do farmers organize in associations for input purchase, sale of produce or for sharing resources like water?
4. How have agricultural intensification and de-agrarianization influenced Farmers' associations/cooperatives in the area? Has the number of associations increased or decreased? What are the role and activities of the associations?
5. What are the types of fertilizers and pesticides used in the area?
6. Can you describe the impacts of fertilizer and pesticide application on water quality?
7. What is the degree of erosion, flooding and siltation across the watershed?
8. Have there been/ Are there any conflicts arising from agricultural intensification and de-agrarianization (especially as to the utilization of the natural resources in the area like water, forest)?
9. If so, what local strategies/mechanisms are used to resolve these conflicts?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Youth Leader

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

1. What motivates/ forces farmers to intensify (use agricultural techniques and inputs like fertilizer and pesticides) their farm land?
2. Why are farmers engaged in non-farm activities (urban employment and tourism)?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Researchers

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

1. What internal and external factors motivates/ forces farmers to intensify (use agricultural techniques and inputs like fertilizer and pesticides) their farm land?
2. Why are the internal and external factors that motivate/ force farmers to engage in non-farm activities (urban employment and tourism)?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Soil & water Expert

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take)

1. Can you describe the impact of agricultural intensification (use of fertilizers and pesticides) on soil in Mae Ram watershed?
2. What is the degree of erosion, flooding and siltation across the watershed?
3. What are the impacts of application of fertilizer and pesticide on water quality?
4. What are the impacts of agricultural intensification on availability of water for agriculture, livestock and human consumption?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Forester

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

Has the forest cover decrease or increase in the area?

Is there an estimation of the forest cover change?

To which phenomena do you attribute these changes?

Is the Royal Forest Service involved in conflicts in the watershed?

With whom (identify stakeholders) and about what (identify the resource)?

Has the RFS developed conflict resolution methods for dealing with forest-related problems occurring between the Service and the local people?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Farmer association's leader

Name of interviewee : _____

Name of interviewer : _____

Date and time : _____

Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

How many farmers' associations are there in the watershed?

Has this number decreased or increased after agric intensification and de-
agrarianization?

What is their role and activities?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Village chiefs

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

Since agri. Intensification (use of fertilizer, pesticide....) and de-agrarianization (off-farm activities....) are occurring, has there been a change in the infrastructures of the villages / the watershed?

If yes, to which precise factors can it be linked?

What are the conflicts related to de-agrarianization and /or agricultural intensification

Who are the stakeholders involved in the conflict and what are their needs, interests and positions?

How are the conflicts prioritized?

How are these conflicts locally managed?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Elders

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

From your experience in this area, what do you think are the reasons why farmers choose to intensify (use of fertilizer, pesticides, mechanization, etc) and change their land use pattern (intercropping, rotation, larger farm, etc.)?

From your experience in this area, what do you think are the reasons why farmers choose to engage in non-farm activities?

What are the conflicts related to de-agrarianization and /or agricultural intensification

Who are the stakeholders involved in the conflict and what are their needs, interests and positions?

How are the conflicts prioritized?

How are these conflicts locally managed?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Religious leader

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

Have you seen cultural changes in your village/ communities/ area due to agricultural intensification (use of fertilizers, pesticides, cash crops) and/or de-agrarianization (off-farm activities)?

Do you think they impact on ... and how ?

Religious linked

religious practices (faith, conversion, ...)

food and eating habits (type, frequency, religious rules)

Morale linked

dress rules and appearance

communittee feeling

Cultural linked

time conscious

language

social relationship, family, friend (extended family: loyalty, responsibility, age)

work habits and practices

What are the local conflicts related to agricultural intensification and/or de-agrarianization?

What are the local conflict resolution strategies/ mechanisms?

Have you ever been involved into one of these resolutions?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Women leaders

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

Since when are you living here?

Have you seen cultural changes in your village/ communities/ area due to agricultural intensification (use of fertilizers, pesticides, cash crops) and/or de-agrarianization (off-farm activities)?

Do you think they impact on ... and how?

Religious linked

religious practices (faith, conversion, ...)

food and eating habits (type, frequency, religious rules)

Morale linked

dress rules and appearance

communittee feeling

Cultural linked

time conscious

language

social relationship, family, friend (extended family: loyalty, responsibility, age)

work habits and practices

housing structure

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Semi Structured Interview Guideline for Health Official

Name of interviewee : _____
Name of interviewer : _____
Date and time : _____
Place of interview : _____

(Brief introduction about the research objective, estimated time the interview will take ...)

Are there problems of water quality due for example to the use or drink of water which could have been polluted by fertilizer and pesticides? Incidence or report?

(Give chance for interviewee to ask questions, if any.)

Thank you for your time. ☺

Annex D: Time schedule

Location		Chiang Mai University			Mae Rem Watershed										Chiang Mai University			
Date (in March)		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Day No		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Obligations	Orientation / encountering	X			X													
	Techniques demonstration		X															
	Presentation preparations		X	X						X					X	X	X	
	Presentations			X							X							X
	Transfers				X										X			
	Day off											X						
Time allocated to field work (see details below)						X	X	X	X			X	X	X				
Data collection	Secondary data use (including remote sensing)		(X)															
	SSI guidelines testing		(X)															
	Key informants interviews (14)				(X)	(X)						(X)	X	X				
	FGD (3)					X												
	Resources map (3)					X												
	Trend analysis					X												
	Cropping calendar					X												
	Matrix ranking					X												
	Water availability					X												

	calendar																
	Transect walks for erosion (3)					X											
	Transects with key informants					X					X						
	Household survey (questionnaires, 3*30)					(X)	X	X	X								
	Household GPS mapping					(X)	X	X	X								
	Soil + water sample collection for analysis											(X)					
	Soil + water plots GPS mapping											(X)					
Data recording					X	X	X	X	X	X	X	X	X	X			
Data analysis									X	X					X	X	X

Annex E: Planned collaboration with Thai counterparts

Our group consist of six Danish students and three Thai students from various academic backgrounds (Agronomist, Foresters, Natural Resource Manager, Agricultural Economics and Architecture designer). We intend to form three subgroups to carry out our research activities.

Agronomist Sub group (Two Danish and One Thai)

Natural Resource Management Sub group (Two Danish and One Thai)

Socio-Economist Sub group (Two Danish and One Thai)

We are in contact with them during the writing of the synopsis and we will spend our first three days in Chiang Mai University coordinating and finalising on our research plan.

Annex F: Planned collaboration with the 3 other groups

The fact that our group is the cross-cutting group undertaking the study at the watershed level involving the upper, middle and lower zone, calls for collaboration with all the other groups involved in individual studies in each of the three zones. Hence, as much as possible, we plan to synchronize our methods especially administration of household questionnaire and transect walks with each of the groups to minimize the chance of interviewing a household by more than one group or asking for a transect walk to the same informants for the second time which would otherwise be a waste of the respondents' time and might even lead to lower quality data as the respondents might feel bored with repetition of questions and activities. In addition to this, our group will also rely on the soil and water analysis result from the group undertaking a study in the upper zone of the watershed considering the time constraint we are facing and the large area (whole watershed) we have to cover. To this respect, discussions are well underway with the other groups as to how best to synchronize and fit the methods to the timeframe set.