

**Dynamic Land Use Change in
Sing District, Luang Namtha Province, Lao PDR**

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Revised

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LA1

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ACRONYMS

asl	Above sea level
DAFEO	District Agriculture and Forestry Extension Office
GPS	Geographic Positioning System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IDRC	International Development Research Centre of Canada
NUoL	National University of Laos
PAFO	Provincial Agriculture and Forestry Office

ABSTRACT

Sing district is the northern most districts in Luang Namtha province bordering China and Burma. The current study examines demographic change, and its impact on land use in Sing district. Furthermore, it compares the process of land use intensification in seven villages and looks into how land use intensification affects local resource tenure, and the economic relationship between villages and households. The study incorporates spatial analysis and analysis of agricultural production systems in order to understand the dynamic process of land use and agrarian changes taking place in Sing district. Our analysis illustrates the concentration of population in lowland areas of Sing district over the last decade due to a combination of causes including the pressures of government policies restricting upland shifting cultivation and opium production, and spontaneous migration caused by increased development and new economic opportunities in the lowland as increased farmers become engaged in cash crop production. At the same time, we also observe increased land use intensification in areas of lower elevation, particularly along the road. The transition is also accompanied by a transformation of rural farmers' production basis from subsistence to commercial cash crop production. This is changing the communal land and resource use practices, as privatization of resources increases competition over communal land and resources.

I. DESCRIPTION OF THE RESEARCH

Over the last decades, the landscape of northern Laos, which consists of a continuum of rugged mountainous terrain, is rapidly undergoing change. Upland shifting cultivation had been considered the root cause of forest degradation in this mountainous region of Southeast Asia (Fox et al. 2000), and many attempts have been made by the central government in Laos to restrict the expansion of swidden agricultural practices. The processes driving actual land use change that we observe today in northern Laos is highly complex.

In Laos, shifting cultivation has been on the decline in the last decade, leading to an increase in the areas of degraded forest (Thongmanivong and Fujita 2006). However, at the same time, we also find increasing conversion of degraded forest into a more permanent agricultural land, and overall land use intensification. The transformation in the last decade is accompanied by increased concentration of population in lowland areas, as well as changes in the agricultural production system: from subsistence to commercial agricultural production. The transition is particularly apparent in areas near the border areas, and along the road.

Sing district, or more popularly known as *Meuang Sing*¹ lies at the border of Burma and China along the Mekong in Luang Namtha province of Laos (See Appendix 1). The opening of the Pangthong regional border on the East of Sing district opened a new trade relationship with China for local villagers in 1992. Not only did flow of trade increased in the ancient principality of Lu people, but also influx of Han Chinese, as well as private investors of different scales from different parts of China. The effect of increased Chinese investment, particularly in agricultural production is particularly significant in transforming the district's agroecological landscape, and also changing the local farmers' basis of livelihood and agricultural production systems.

Traditionally, lowland valley areas served as the political centre of the *meuang* dominated by Tai Lu and Tai Nua people (Tai-Kadai ethnolinguistic group) surrounded by the upland inhabitants of which most of them were Akha (Sino-Tibet ethnolinguistic group), who were more mobile and often moved between highland areas. In the last decades, however, the demographic movement of different ethnic groups in Sing district has become highly complex as upland population began to relocate to lower elevations more permanently. We observe both push and pull factors that are changing the demographic dynamic in Sing district during the last decade. This includes the pressures of government policies that restrict expansion of shifting cultivation, and opium production in the upland areas, as well as economic factors that lure upland people as well as others towards new opportunities as well as access to public services.

Nevertheless, population concentration in lowland area of Sing district is inducing intensification of agricultural land use in lowland areas and increasing competition over arable land. Intensification of agricultural land use not only affects the landscape, but also bears a significant impact on agricultural production and use of agricultural labour, as more farmers become involved in cash crop production and agricultural wage labour outside of their villages.

Increased population density, and commercialization of agricultural production is also increasing competition over communal land, which is affecting customary land

¹ In this paper, we will refer to *Meuang Sing* as a historical territory before 1975, and Sing district as a post-1975 political administrative unit.

use and management practices. Farmers are particularly keen to convert any remaining areas of swidden and fallow land near the roads to rubber plantation. Amidst the widespread interest to convert secondary forest growth into rubber plantation, local administration such as the District Agriculture and Forestry Extension Office (DAFEO) is currently ill equipped in mediating and resolving the emerging land use conflicts.

The main objective of the current study funded by CICRED is to examine demographic and land use pattern in Sing district over the last decade. The research particularly aims to understand the causes of population concentration in the lowland areas, and how this happened. Furthermore, our study examines the process of land use intensification in lowland areas of Sing district and makes an observation on changes that occurred in both upland and lowland villages. The study also shows how population concentration in the lowland areas and land use intensification is affecting access to communal land as more and more farmers seek private rights to land and resources. We have selected Sing District in Luang Namtha as our research considering its location right next to the Lao-Chinese regional border and the rapid changes in agricultural landscape.

1.1 Duration and research activities

We began the research in November 2003 and conducted two field surveys at the district level and at the village level in Sing District, Luang Namtha Province in northern Laos. The first field survey is conducted during 18-31 December 2003 focusing on collecting information on land and forest use, and population at the district level, as well as conducting a brief field survey to understand the village history in Sing District. The second field survey was conducted in March 2005 with focus on household data in selected villages of Sing District (See also Appendix 2 and 3). Our fieldwork covered Oudomxin Village in Nakham Sub-district, Houaylong Kao Village in Vieng Sub-district, Chaup Village and Phiyer Village in Tongmai Sub-district. In Mom Sub-district, Boukkhou, Phaphouk Kao, Bouangaxay Kao, and Chavang mai Villages were visited. In Banxay Sub-district, villages that were visited include Chaphoukeun and Xay Village. Finally, in Xiengkheng Sub-district, villages that were visited include Xiengkheng, Eula, Phaxang, Muto Kao, and Chaphouthone.

In all of the villages visited during the fieldwork, we interviewed village elders to ask about the origin of the village and its people, as well as migration history, history of land and resource use practices. Furthermore, we checked the current location of the villages with GPS, as well as different types of forest and land used by the local villagers in the 6 sub-districts. During the second fieldwork, we also selected seven villages from three Sub-districts (Mom, Xiengkheng, Nakham) for further household interviews. Total of 61 households were interviewed (Appendix 3). In addition to the fieldwork, core research team also participated in numbers of national and regional workshops to discuss about the land use changes in northern Laos. In July 2006, the core research team also organized a half day workshop in Sing district at the District Agriculture and Forestry Extension Office to share the research findings. Appendix 4 shows the schedule of fieldwork between 2003 and 2006.

1.2 Research methods

Our research incorporates several interdisciplinary methods to understand the processes of land use transition and demographic change in Sing district. In particular,

this study aims to incorporate spatial analysis and socio-economic analysis (See also Rindfuss and Stern 1998). We use aggregated data on demography and agricultural production collected from local government offices, as well as primary field data collected in seven villages of Sing district during December 2003 and August 2005.

In order to understand the transitional state of land use and cover in Sing district over the previous decades we used Landsat satellite image between 1973 and 2004 to examine the overall land cover change. By using the maximum likelihood classification of the supervised classification, each Landsat image was classified into five categories including water, forest, shrub, open land (swidden), and paddy field. Area of interest (AOI) of each land use and land cover type for image classification was defined based on GPS data collected in the field. All land use and land cover types were re-classed at the end of the processing and were reduced to two main categories: non-forest and forest. This was done so to capture the trend of forest cover in transition². Furthermore, we selected three images from different time periods to assess land use change over the last decades. In order to understand the dynamic changes of forest cover, we investigated the patterns of forest fragmentation. This was done so by converting all land use and land cover map into vector form and calculating the mean size and number of forest patches.

With regards to the demographic change, we used population statistic obtained from the National Statistical Centre, District Planning Office and GTZ Meuang Sing Office. Statistic from 1995, 2001, 2003, and 2005 were spatially registered to create population density maps to understand distribution of population and ethnic groups across the district, as well as trend of population movement in Sing district. In selected villages, we also interviewed elder members of the village to understand the settlement and migration history of the villages. Furthermore, when we interviewed the individual households in seven villages, we also questioned their origin and reasons of migration.

We also conducted interviews at the District Agriculture and Forestry Extension Office (or former District Agriculture and Forestry Office) to understand the agricultural production of the district, as well as key events that affected local farming system and resource use practices during the last decade. In the seven selected villages, we also interviewed farmers' own land use history, as well as their current land use and agricultural production (Appendix 5).

1.3 Meetings and workshops

Prior to the fieldwork, core researchers (See the following section) in Laos met regularly to discuss about the research and fieldwork design. Peter Vandergeest from York University joined the preliminary fieldwork in Sing district in the late 2003, followed by Jefferson Fox in early 2004.

Throughout the research period, core researchers organized internal meetings regularly to prepare for field work, and to check progress of data collection and analysis. Core researchers also attended other relevant meetings and workshops organized in Laos and in the region to learn from other researchers' experiences on land use change and to share our understanding (i.e. Rubber study workshops organized by GTZ in Vientiane and in Luang Namtha, Mountainous Mainland Southeast Asia Mobile Workshop, Regional Workshop on Small-holder Rubber). In

² We focused on two main categories as it is difficult to detect and separate categories such as built-up area from areas under swidden and open field.

July 2006, core researchers also organized a small-workshop in Sing district inviting local stakeholders (i.e. District Planning Office, District Agriculture and Forestry Extension Office, Provincial Agriculture and Forestry Office, GTZ Meuang Sing Office) to present the research results. Presentation was followed by discussion on key issues with regards to existing gap between government policy and the expansion of commercial agricultural production.

II. RESEARCH TEAM

The core research team consists of researchers from the Faculty of Forestry of the National University of Laos. This includes Sithong Thongmanivong (Head of the Research Division, Faculty of Forestry), Thouthone Vongvisouk (Lecturer, the Faculty of Forestry), and Khamla Phanvilay (Vice Dean of the Faculty of Forestry). Yayoi Fujita (Project coordinator of IDRC/NUoL Research Capacity Building Project) also joined as a researcher and coordinator between Lao and international researchers.

Table 1 Research team

Name	Responsibilities	Email Contact
<u>Core research team</u> Sithong Thongmanivong	Spatial analysis	sithongth@hotmail.com
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Thouthone Vongvisouk	Coordination and research assistance	thovongvisouk@hotmail.com
Khamla Phanvilay	Supervising	phanvila@hawaii.edu
<u>Advisors</u> Peter Vandergeest (York University, Toronto)	Supervising research design	pvander@yorku.ca
Jefferson Fox (East West Center, Honolulu)	Supervising research activities and analysis	FoxJ@EastWestCenter.org

Table 1 indicates members of the research team including both core researchers in Laos and advisors in Tronto and in Honolulu. Sithong was mainly responsible for the spatial analysis while Yayoi led the social and economic analysis for the research. Thouthone was responsible for coordination with local authorities as well as assisting data collection and analysis. These three researchers led series of fieldworks in Sing district. Meanwhile, Khamla who is currently working on his doctoral degree at the University of Hawaii under the supervision of Jefferson Fox, joined our fieldwork on numbers of occasion and provided advises. He also facilitated the final workshop organized at DAFEO. During the fieldwork students from the Faculty were also hired as research assistants.

International researchers include Peter Vandergeest (York University) and Jefferson Fox (East-West Center). Both of them have extensive research experience in the Southeast Asia on natural resource management. They advised the core research

team on research and fieldwork design at the beginning of the research. They also visited the field sites with the research team.

During the fieldwork, the core research team also collaborated with GTZ Meuang Sing Office. We were accompanied by Akha translators including Ms. Phou Ye and Mr. Au from GTZ Meuang. We also worked with District Agriculture and Forestry Extension Office during the fieldwork as their staff helped to coordinate researcher with local villagers.

III. RESEARCH RESULTS

3.1. Background

Sing district is located in northern part of Luang Namtha province, which borders Burma and China (Appendix 1). The town of *Meuang Sing* is located in the valley land. The elevation of Sing district ranges between 600 and 1,865 m asl and annual rainfall in is approximately 1,200 mm, with annual temperature ranging from the highs in 30 degrees Celsius during April and May, and the lows in 18 degrees Celsius during January and February.

Prior to the French colonial intervention in the 19th century, the area was historically known as *Meuang Xiengkheng* an ethnic Tai Lu (Tai-Kadai ethnolinguistic group) principality (Grabowski 1999). It was originally located along the banks of Mekong, its territory spreading between present day Burma and Laos. It was only in 1890 through the British and French agreement that the area was recognized as a neutral state, and colonial boundary was delineated: area on the east bank of the Mekong became the French protectorate. Throughout history, Sing district has experienced dynamic movement of people. Referring to the old Xiengkheng Chronicle, Grabowsky (1999) claims that areas of *Meuang Sing* was depopulated and then repopulation throughout the 16th and 19th century due to wars between regional overlords. It was only in 1889, after the French intervention, that the first population census was conducted in *Meuang Sing*. According to the French record, there were 15 villages located in the valley with total of 346 households, which roughly estimates over 3,000 people. However, this record does not include population living in the upland areas.

According to Lyttleton et al. (2004) influx of Lu and other minority groups from China arrived to Meuang Sing during the early 20th century. In particular, the influx of migrants from China increased during the Cultural Revolution in China in 1958. According to one villager in Donechai village, which is a Lu village in Nakhom sub-district bordering Meuang Mang county in China, former landlords were captured and severely treated during the Cultural Revolution. This induced out-migration of many Chinese Lu people to Laos. This was followed by another wave of population movement, during 1965 and 1968 as the area became entrenched in the civil war of Laos. Populations moved to the western part of northern Laos including present day Houayxay near the Thai border establishing a new village. It was not only until after the rise of the Communist regime in 1975 that Sing district was repopulated as people began to return to their original villages³. Currently there are 94 villages in Sing district (2005), with total of 30,303 people. The majority of the population (47 percent)

³ According to villagers in Mom village, they had fled to areas near Houayxay in present day Bokeo during the mid 1960s and established a village named Mom Mai village (the new Mom village). Villagers from Xiengkheng and Xay also took refugee in areas near Houayxay during the mid 1960s.

are Sino-Tibet ethno-linguistic group (Akha), followed by 41 percent of Tai-Kadai ethno-linguistic group (Tai Lu, Tai Nua, Tai Dam, Phunoi), 12 percent of Hmong-Mien ethno-linguistic group, and 1 percent of Mon-Khmer ethno-linguistic group (Table 2). In Sing district, the majority of the population is Tai-Kadai ethnolinguistic origin (55 percent).

Table 2 Percentage of ethnic groups in Sing district

Ethno-linguistic group	Ethnic group	Percent of population
Sino-Tibet	Akha	47%
Tai-Kadai	Lu, Nua, Dam, Phunoi	41%
Hmong-Mien	Hmong, Yao	12%
Mon-Khmer	Khmu	1%

According to Grabowsky (1999), Tai Nua and Lu people were dominant inhabitant of lowland areas of *Meuang Sing*, while the mountainous areas were occupied by Akha people. Yao people who are Hmong-Mien ethno-linguistic group arrived in Sing district during the 19th century, migrating from areas of southern Yunnan province in China. However, today there are Yao people who were relocated to Sing district during the early 1990s from refugee camps in Thailand. These were people that fled Laos during the war and after 1975 but were unable to resettle in the third countries. The majority of them lived in northwest Laos including Viengphoukha district in Luang Namtha province and Bokeo province, however, the Lao government, in coordination with the UN High Commission on Refugees (UNHCR), provided residential areas for repatriating refugees. The Hmong people in Sing district are the most recent migrants. They arrived from different parts of northern Laos (i.e. Xiengkhouang province, Namtha district) during the period between 1991 and 1996. The main reason for their migration was restriction of upland shifting cultivation and opium production in their villages, while at the same time the deputy provincial governor of Luang Namtha particularly convinced Hmong people to engage in lowland farming in Sing district where land was still abundant.

3.2. Demographic changes

3.2.1 Demographic changes in Sing district: 1995-2005

One of the early census that was conducted in *Meuang Sing* is dated 1889 (Grabowsky 1999). This census covers 15 rural settlements in the plains of Meuang Sing, with 481 houses and approximately 3,000 people, although the figure does not include Akha villages that surrounded the lowland villages (Grabowsky 1999, Lyttleton et al. 2004). Meanwhile, the population of Sing district today is 30,548 people. There are 94 villages or *baan*, which is the lowest administrative unit in Laos. Table 3 indicates population changes in Sing district between 1995 and 2005. According to Table 3, population increased during the course of a decade, while numbers of villages in the district have declined from 110 villages in 1995 to 94 villages in 2005. Table 4 particularly indicates 20 percent decline of Akha villages

between 1995 and 2005. This is due to both government induced relocation and spontaneous resettlement of upland villagers to lowland villages.

Table 3 Population change in Sing district 1995-2005

Sub-districts	1995		2001		2003		2005	
	No. Villages	Population						
Mom	15	2,191	13	2,332	13	2,849	13	3,433
Nakham	18	3,708	18	4,212	17	4,700	18	5,183
Namkeoluang	12	3,247	12	4,452	10	4,405	12	5,065
Thongmai	18	3,789	17	5,042	16	6,553	17	6,792
Vieng (Xiengchai)*	22	5,179	21	6,007	21	6,841	22	7,791
Xay**	13	1,387	8	1,115	4	616		
Xiengkheng	12	2,939	11	2,876	11	2,080	12	2,284
Total	110	22,440	100	26,036	92	28,044	94	30,548

* Vieng sub-district was changed to Xiengchai sub-district in 2005

** Villages in Xay sub-district significantly decreased as villagers relocated to other sub-district. As a result, remaining Lu village was incorporated into Xiengkheng sub-district.

Source: National Statistic Office (1995, 2003), GTZ Meuang Sing (2001), District Planning Office (2005)

Table 4 Numbers of villages in Sing district by ethnolinguistic origin

1995		2005	
Akha	69	Akha	55
Lu, Dam, Nua, Phunoi	31	Lu, Dam, Nua, Phunoi	29
Hmong-Mien	9	Hmong-Mien	9
Mon-Khmer	1	Mon-Khmer	1
Total	110	Total	94

Source: National Census (1995), District Planning Office (2005)

Table 5 indicates population growth rate in Sing district in comparison with the national rate of population growth. While the national rate has been declining, population growth rate in Sing district is steadily on the rise. However, as has been indicated in Table 3, population growth rate at sub-district level is highly variable. For example, in Table 3 we discern declining population growth rates in Xay and Xiengkheng sub-districts that border Burma in the northern part of the district. These two sub-districts are mountainous, and are predominantly occupied by Akha people. Population decrease in Xay sub-district was particularly striking as it declined by more than 50 percent from 1,387 in 1995 to 616 in 2003. In Xay sub-district, the last remaining Lu village (Xay village) was incorporated into neighbouring Xiengkheng sub-district in 2005 as other upland Akha villagers migrated out from Xay sub-district to villages in lower elevation. Total population in Xiengkheng sub-district is also 30 percent lower than in 1995. Here too, the upland villagers are migrating to villages in lower elevation in other sub-districts.

Table 5 Average annual population growth rate in Sing district

Years	1995-2000	2000-2003	2003-2005
National average	2.5%	2.5%	1.2%
Sing district average	2.7%	3.9%	4.5%

Source: National Census (1995), District Planning Office (2005)

As a result of the exodus of mountainous population, population in other sub-districts in lower elevation have increased. For instance, population of Thongmai sub-district increased 1.8 times during the last decade, while population in Mom, Namkeoluang and Vieng (or former Xiengchai) sub-districts increased by approximately 1.5 times. These migrations are not temporary but more permanent, accompanied by ‘deterritorialisation’ and ‘reterritorialisation’ as noted by Goudineau (1997). Unlike in the past, resettlement often meant shifting of residential area, but retaining access to vast agricultural land in the upland areas, the recent migration is more permanent as the villagers abandon their upland villages including residential and agricultural lands. What this indicates is a trend of dramatic population decline in the upland areas and rapid concentration of population in lowland areas in three sub-districts including Thongmai, Namkeoluang and Vieng, as well as lowland valleys in Mom sub-district.

Figures 1 illustrate changes in population density in Sing district between 1995 and 2005. Population data was imported to ARC GIS programme to generate the point coverage and density map. Population density map was created using kernel density function, which allows calculating the density of features in a neighbourhood of point features. Search radius of 2,000 metre and density unit sets of square kilometre was used to calculate the population density for each time period. We used a series of population data. For 1995 and 2003, we used population census data from the National Statistic Centre, while the population in 2001 is based on the results of a baseline survey conducted by GTZ. Population data for 2005 is based on the national census; however, this was obtained from the district planning office. Figure 1 indicates the depopulation of upland areas, and concentration of population in the district centre, and areas along the major roads.

Furthermore, we used information on ethnicity from 1995 and 2005 census data to understand the changes in ethnic distribution of villages in Sing district (Figure 2). This figure confirms the ethnic bias of population movement as noted earlier in Table 4. While there is little changes for Lu village, Figure 2 indicates that the upland Akha villages in 2005 are mostly concentrated in areas along the district roads, except for Xiengkheng sub-district.

Figure 1 Population density map in Sing district: 1995-2005

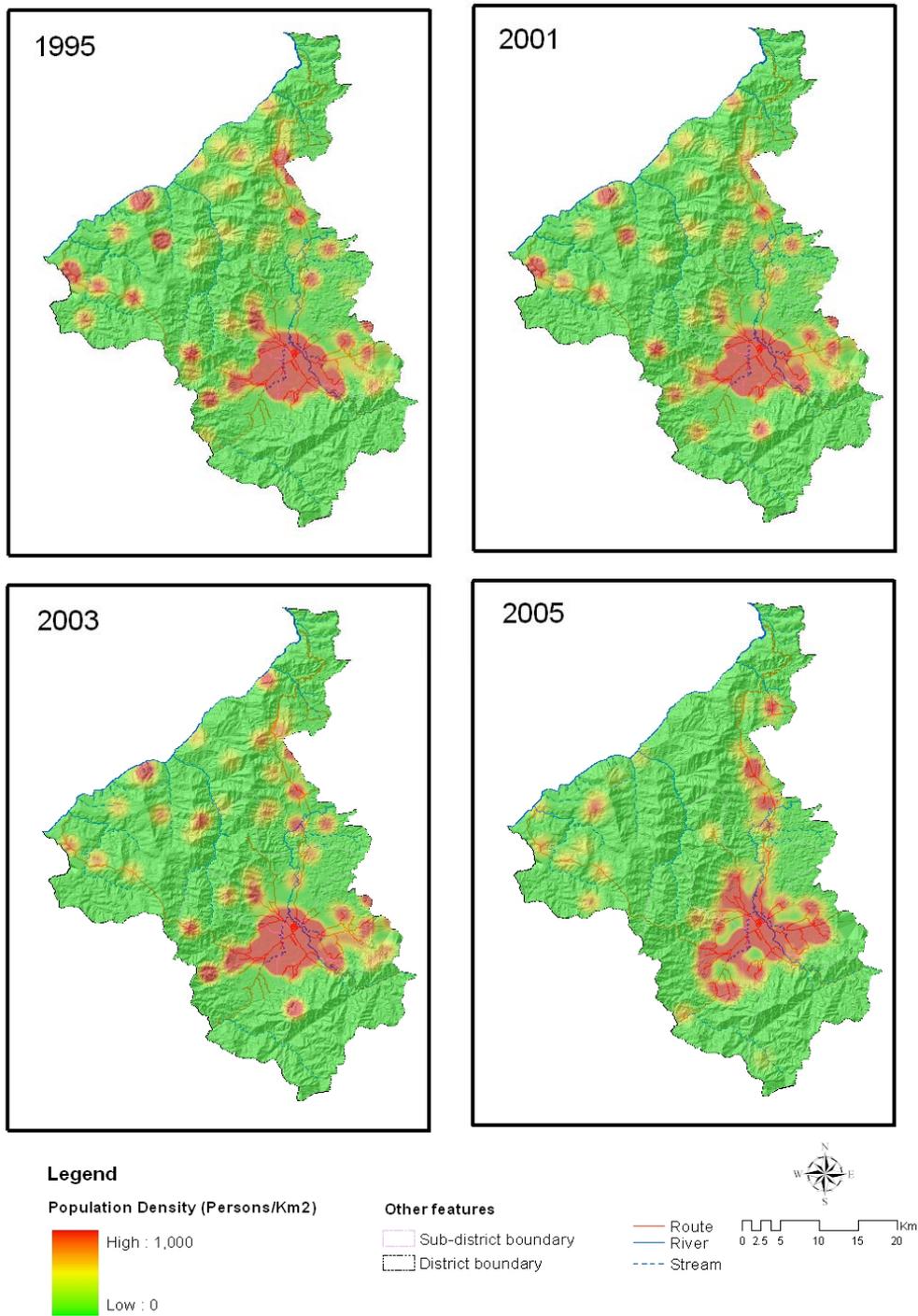
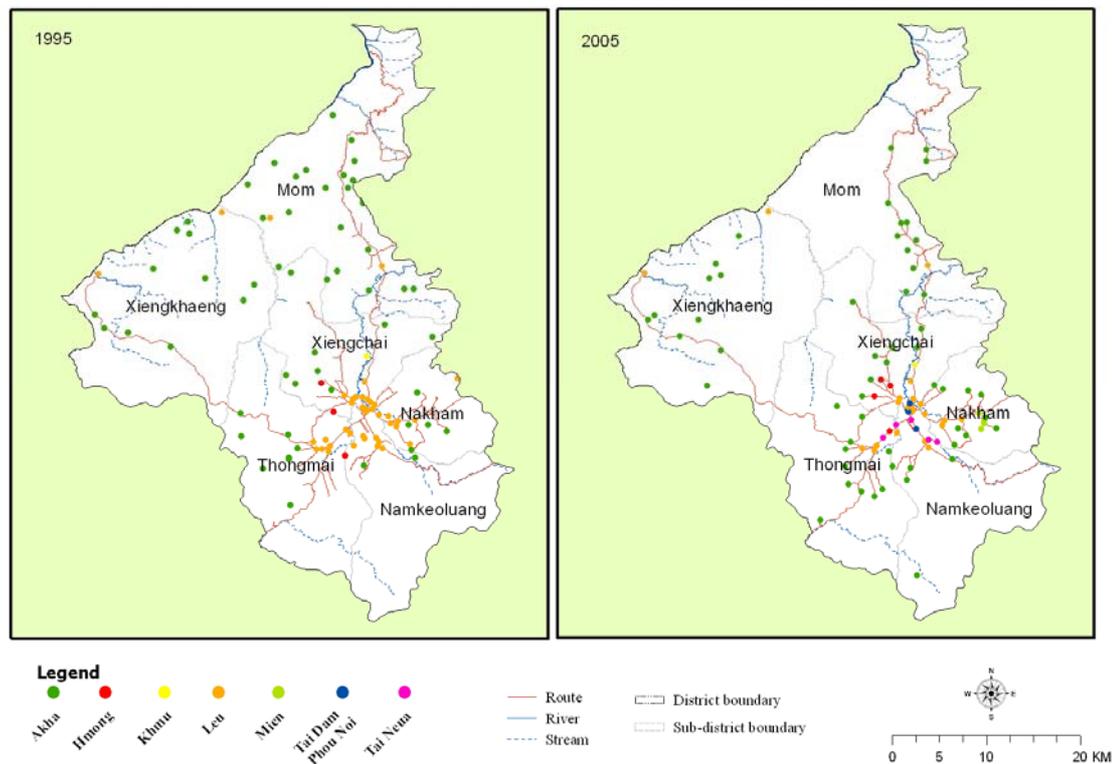


Figure 2 Ethnic distributions of villages in 1995 and 2005



3.2.2 Causes of demographic change

While population movement in areas of Sing district has been historically dynamic, the demographic patterns during the last decade have been particularly volatile within the district as has been explained in the previous section. Changes are particularly significant for upland population who abandoned their old villages and moved to areas of lower elevation, establishing more permanent residence in those areas. Cohen (2000) points out how the combination of government policies restricting shifting cultivation and opium production discouraged upland people from continuing their way of living and led to relocation into areas of lower elevation, thereby leading to concentration of population in the lowland areas. Baird and Shoemaker (2005) refer to such movement of population as internal resettlement, which is a systematic relocation of people within a country (p6). Their study on internal resettlement and the involvement of international aid agencies in Laos suggests strong policy implications on internal resettlement. In particular, they refer to government policies that was implemented during the last decade, which focus on restricting expansion of shifting cultivation, opium eradication, security control, delivery of development services and cultural integration as major catalyst of resettlement. They also link the problem of internal resettlement with more specific government policies such as focal site development, village consolidation and the land and forest allocation. Based on literature review, as well as 75 interviews and people affiliated with 46 organisations in Laos, Baird and Shoemaker (2005) support the notion suggested by Goudineau (1997) that there is no such thing as voluntary

resettlement in Laos, that all resettlement is directly or indirectly affected by the government policy.

Based on our field interviews in four sub-districts, villagers that we interviewed raised several reasons for their migration. War had been the initial reason of migration of villagers in Xiengkheng and Xay sub-districts during the period between 1960s and 1980s. Epidemic and security reasons were other causes of migration and relocation in border areas of northern Sing district. However, more recent resettlement was caused by access to development services. International organisations began to assist development of rural infrastructures such as road, water supply system, irrigation canals, and health clinics in the early 1990s. This began to attract upland villagers to areas near the road, which was often located in lower elevation. In addition, the government also encouraged small and scattered villages to merge into one administrative unit, village consolidation (Baird and Shoemaker 2005, p12-13) to integrate upland minority ethnic groups into mainstream Lao culture, and rural development. There have also been efforts to develop 'focal sites' and area perceived to have potential for development, which also induced migration and relocation of upland villagers incorporating approximately 16 villages with a population above 5,200 people (Baird and Shoemaker 2005).

In Sing district, relocation of upland villagers began in the 1990s as rural development projects reached the upland areas. GTZ in particular played a significant role in providing development services and rural infrastructures in remote villages of Mom, Xay, and Xiengkheng sub-districts. Rural infrastructure development gradually induced relocation of upland villagers into areas of lower elevation. It was during the mid 1990s that more pressures were exerted by the local authorities to relocate upland villages by merging small villages and delineating resource boundaries through the land and forest allocation policy. The central government policy to stop shifting cultivation was also prioritized in Sing district. On top of that, government campaigns to stop opium production largely affected the upland land use control in Sing district. Stringent enforcement to eradicate opium production began in 2003 and continued up to 2005. During this period, armed local officers frequented upland villages and burned opium poppies. Farmers that continued to produce opium were severely punished and were 're-educated' at the district centre.

However, it was not only the government policies that pressured resettlement of upland villagers to areas in lower elevation. Exodus of upland population to the lowland areas in the last five years was also facilitated by increased cash crop production in the lowland areas and emergence of economic opportunities. Opening of the regional border in 1992 facilitated commercial agricultural production in Sing district as transborder trade flourished⁴. New crop varieties were introduced from China through investors. Farmers began to cultivate high yielding non-glutinous rice varieties, maize, sugarcane and other vegetables. Contract farming flourished as Chinese merchants and investors provided capital and technical support to farmers. While wealthy Akha villagers purchased land in the lowland and mobilized labour to cultivate paddy rice and cash crops, economically less well off Akha villagers became agricultural wage labourers in lowland villages, abandoning their lands.

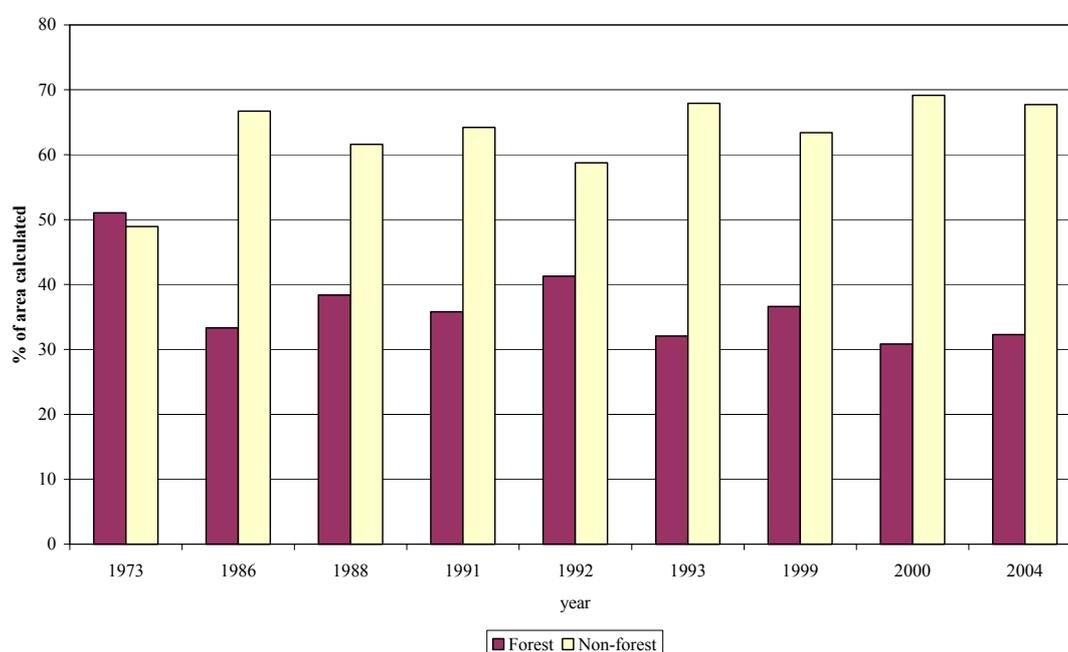
⁴ Transborder trade includes both formal and informal trade across the national boundaries. Private investors (both Han and non-Han Chinese) are often key agent in the formal trade, while ethnic (Akha-Akha, Lu-Lu) and cross-ethnic networks (Akha-Lu, Yao-Lu) facilitates informal trade.

3.3 Patterns of land use intensification and agricultural labour

3.3.1 Land and forest land use change

Spatial analysis for the current study used a series of satellite images (Landsat) between 1973 and 2004. Out of the total district area of 142,957 ha⁵, changes in forest and non-forest land use was assessed for 79,494 ha (56 percent). The main objective of the analysis was to understand the historical patterns of forest cover in Sing district. We define forest including both secondary as well as dense forest. While the district statistic on forest area includes shrubs, bamboos and degraded forest areas, we considered these land categories as non-forest area in the spatial analysis.

Figure 3 Forest and non-forest land in Sing district



According to Figure 3, forest area in the district declined from 50 to 30 percent of total area calculated between 1973 and 2004. A period between 1974 and 1986 indicates the most significant decline of forest from 50 to 30 percent, while recovering to 40 percent in 1992. We can hypothesize several factors that caused significant forest loss between 1974 and 1986. One cause is forest fire. Satellite image in 1986 particularly indicates a large tract of areas affected by fire in Xiengkheng and Xay sub-districts. While we were unable to confirm the frequency of forest fires in the past with the villagers, the district agriculture and forestry officer in Sing district noted high incidence of forest fire in Xiengkheng and Xay sub-districts every year due to local hunting practices that use fire to chase wildlife. In the meantime, between 1986 and 2000 we generally observe a cycle of forest cover ranging between 30 to 40 percent. However, after 2000 the rate of forest remains approximate at 30 percent.

⁵ While the district agricultural and forestry office records 187,900 ha as the official area of Sing district. This includes areas of Meuang Yuan which is now part of China. In our research, we used the actual district area based on field observation and interviews at the district government offices.

Table 6 Forest fragmentation

Years	1973	1988	2000
Numbers of patches	164	4,790	6,306
Average size of patch (ha)	446	12	7

Table 6 indicates the degree of forest fragmentation during 1973 and 2000. Numbers of forest patches have increased by over 38 times during a quarter of century from 164 patches in 1973 to 6,306 patches in 2000. On the other hand, average size of forest patch declined by more than 98 percent during the same time period. This indicates a fragmentation and degradation of forests between 1973 and 2000. According to foresters working at DAFEO, there was hardly any commercial logging for commercially valuable species in Sing district. Although our forest fragmentation analysis does not cover the recent years, local farmers also claimed that collection of non-timber forest products declined as more upland fields were converted into permanent agricultural land and rubber plantation.

3.3.2 Agricultural production in Sing district

Sing district has the largest tract of agricultural land in Luang Namtha. In particular, area of paddy field is the largest among five districts in the province (Table 7). According to Table 8, lowland rice production in Sing district increased by 57 percent between 1999 and 2004, from 13,747 ton to 21,626 ton respectively. The increase in production was accompanied by expansion of paddy rice field from 3,652 ha to 5,444 ha (49 percent). In addition, use of high yielding rice varieties (non-glutinous) from China and higher input of fertilizer have significantly contributed in increasing the rice production, and sales of surplus production to China.

Table 7 Agricultural land areas in Luang Namtha province, 2003

District	No. HH	Agriculture (ha)	Paddy (ha)	Upland Rice (ha)
Namtha	5,976	4,998	2,684	1,078
Sing	4,775	5,666	3,296	1,416
Long	4,125	3,929	932	2,569
Viengphoukha	2,815	2,774	677	1,844
Nalae	3,749	4,480	141	3,953
Total	21,440	21,847	7,730	10,860

Source: District Agriculture and Forestry Office (2003)

Table 8 Rice production in Sing district

Year	Paddy		Swidden	
	ha	Ton	ha	ton
1999	3,652	13,747	1,515	2,575
2000	3,829	14,219	1,379	2,506
2001	4,302	15,082	1,326	2,254
2002	4,511	16,290	1,326	2,259
2003	3,007	7,530	651	520
2004	5,444	21,626	530	901

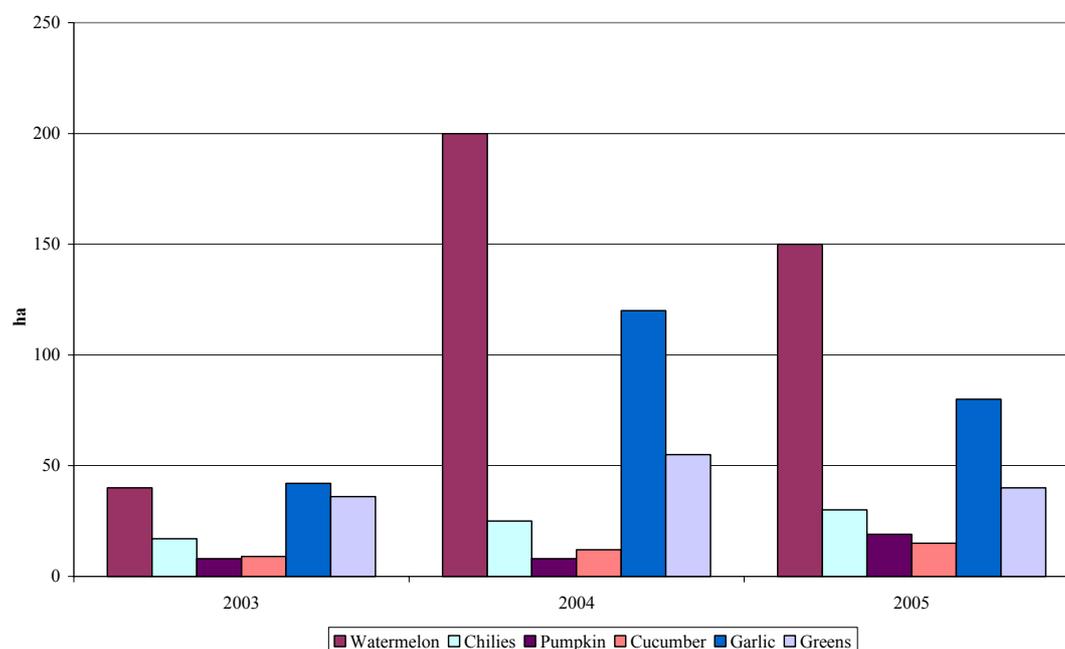
Source: 1999 to 2002 are based on Lyttleton et al. (2004) while 2003 and 2004 are based on the statistic from the District Agriculture and Forestry Extension Office of Sing district (2005)

While irrigated field remains low at 3 percent of the total area for rain-fed paddy field, the dry-season paddy field is often used after the rice harvest to cultivate vegetables including chillies, watermelon, pumpkin, garlic, cucumber and so forth. Figure 4 shows the dry season paddy field which is used for watermelon production. In the meantime, according to Figure 5, areas where vegetables are produced in Sing district are increasing rapidly. In particular, Figure 5 indicates significant increase of areas under watermelon production; from 40 ha to 200 ha in 2003, and 150 ha in 2004. The importance of watermelon as a key cash crop is also confirmed by Table 9 which indicates that production of watermelon quadrupled from 1,200 ton in 2002 to 4,500 ton in 2004.

Figure 4 Use of dry season paddy for watermelon production (Nakham sub-district)



Figure 5 Areas of lowland vegetable production (Unit: ha)



Source: District Agriculture and Forestry Extension Office of Sing district (2005)

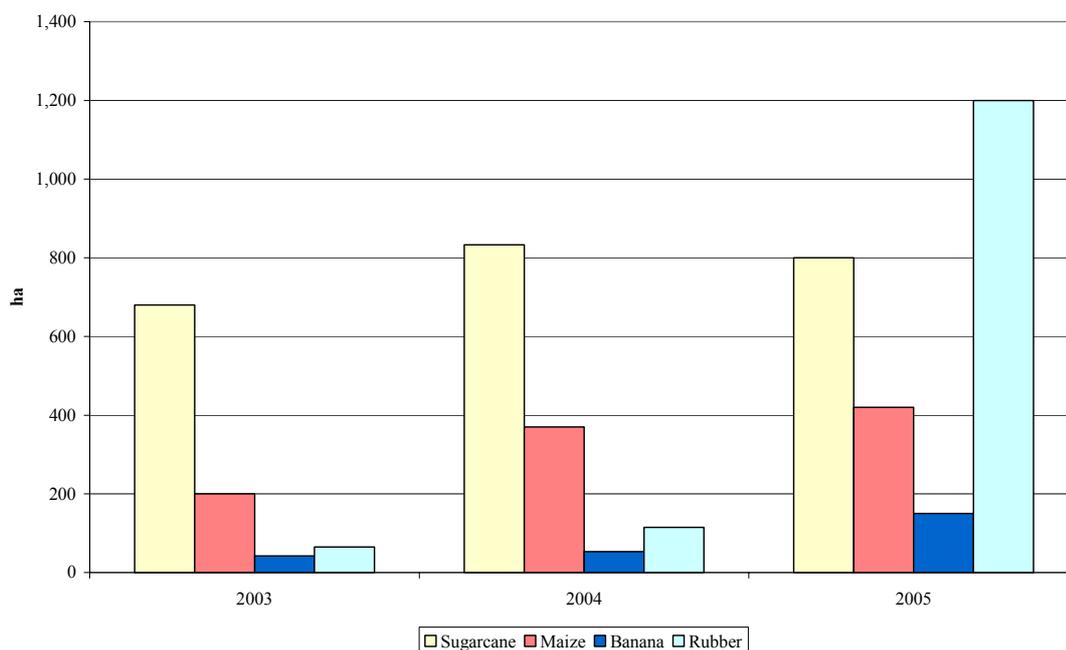
Table 9 Lowland vegetable production (Unit: ton)

Year	Watermelon	Chillies	Pumpkin	Cucumber	Garlic	Greens
2003	1,200	85	240	127	126	180
2004	3,600	125	240	168	360	275
2005	4,500	150	380	75	560	200

Source: District Agriculture and Forestry Extension Office, Sing district (2005)

In the meantime, production patterns in the upland are also changing. As indicated in Table 8, the area under shifting cultivation has declined by 67 percent between 1999 and 2004. However, decline in the areas of shifting cultivation does not mean that upland swidden and fallow lands are abandoned by the farmers. Instead, we observe increased conversion of swidden and fallow lands to permanent agriculture, particularly in the areas along the road. Figure 6 indicates the increasing areas of sugarcane, maize, banana and rubber in Sing district during the last three years. As in the lowland agricultural production, the majority of the farmers cultivate sugarcane, maize and banana on contract basis, and export the products to China.

Figure 6 Areas of upland cash crop production (Unit: ha)



Source: District Agriculture and Forestry Extension Office of Sing district (2005)

Rubber is among the newest boom crop in Sing district, which is rapidly spreading throughout the district. During our interview with the district agriculture and forestry extension office in Sing district, we were told that 53 villages planted rubber in 2004, while the number increased up to 73 villages in 2005, expanding the total area of rubber dramatically in the last two years as shown in Figure 7. While several private companies are starting to contract with local farmers to cultivate rubber, the expansion in the last few years owes significantly to the self-investment, and farmer to farmer investment.

3.3.3 Household agricultural production

Now we turn towards the household agricultural production and labour use in three sub-districts. Xienkheng is the mountainous area where elevation ranges between 450 and 1,850 metres a.s.l. In the meantime, Mom ranges between 600 and 1,650 metres asl making this a moderately hilly area of Sing district. Nakham is the lowland area with an elevation ranging 650 and 1,550 metres asl Road access has been particularly difficult in mountainous areas of Xienkheng and Xay sub-districts until recently.

We conducted in-depth household surveys in seven upland and lowland villages of different ethnic origin including Tai Lu (Tai-Kadai ethnolinguistic group), Akha (Sino-Tibetan ethnolinguistic group), and Yao (Hmong-Mien ethnolinguistic group) in the three sub-districts (Table 10) to understand the differences in household agricultural production, and their use of land, capital and other inputs. In each village we asked the village leaders to cluster households into three groups according to their economic status in the village, access to land and livelihood characteristic (Table 11). All together, we interviewed 61 households in seven villages.

Table 10 Characteristics of villages

Sub-district	Village	Ethnicity	Year of establishment	Origin
Xiengkheng	Eula	Akha (Pouly)	about 200 years ago	Sipsongpanna (China), Meuang Khan (Burma)
	Xiengkheng	Lu	about 200 years ago	Sipsongpanna (China)
Mom	Mom	Lu	1965	Meuang Yuan (China), Longkhone (Burma)
	Lomeu	Akha (Jicho, Pouly)	early 1990s	Bouakkou and Phaphouk Kao villages (north of Mom sub-district)
Nakham	Donechai	Lu	1877	Sipsongpanna (China)
	Namdet Mai	Akha	1985	Namdet Kao village (Nakham sub-district)
	Oudomxin	Yao	1993	Repatriated from refugee camp in Xiengkhan, Phayao province (Thailand)

Source: Fieldwork (2005)

Table 11 Classes of households

Class	Average land holdings (plots)	Farming and livelihood characteristics
Well-off	5-6	Paddy, swidden, sugarcane, rubber, and livestock
Middle	3-4	Paddy, swidden, sugarcane, rubber and livestock
Poor	≤ 3	Swidden, NTFP collection and hunting, some livestock, wage labour

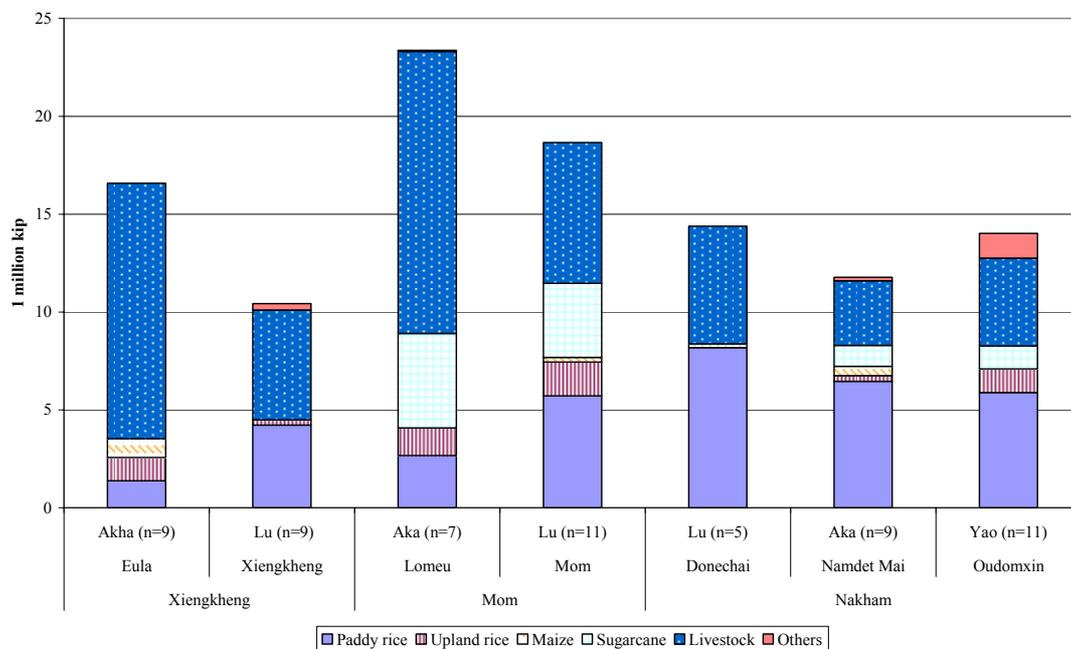
Although each village has a distinct settlement history, war and epidemics have been the main causes of migration historically in all three sub-districts. However, as we can see from Table 10, more recent relocation was instigated by villagers' demand for lowland paddy field (Namdet Mai), and the influence of government policy that restricted expansion of shifting cultivation (Lomeu). Oudomxin is the only newly established village in our research site which was established to house repatriating Yao refugees from Thailand. When the village was established, Yao repatriates purchased agricultural land (esp. paddy fields) as they were only allocated residential area.

Based on household interviews, we understand that in all three sub-districts farmers are involved in a variety of agricultural production other than paddy and swidden rice. Figure 7 indicates average household agricultural production in seven villages during the period between 2004 and 2005. Output includes gross agricultural production including livestock. Meanwhile, input includes labour, as well as fertilizer, pesticides and other costs incurred in the agricultural production. Total labour inputs for each crop are calculated in terms of monetary unit *kip* (1 USD = 10,800 kip, 2005

price). In the Figure, number in parenthesis beneath village names indicates total numbers of households interviewed during the fieldwork in each village.

Figure 7 also shows importance of livestock in rural livelihoods. In Xiengkheng and Xay sub-districts, farmers trade cattle and buffalo to Thailand, China and Burma, while in Mom sub-districts farmer trade large livestock to China as well as domestic market in Sing district. Livestock production is also part of the agricultural production system in lowland Nakham sub-district. However, many farmers in the lowland area stopped raising large livestock due to declining areas for grazing, and increased incidences of theft as population concentrated in the lowland area. Instead, farmers in the lowland villages raise pigs and domestic fowl (e.g. chicken, duck) for income. From Figure 7, we can also discern that livestock production is particularly important part of agricultural production in Akha villages such as Eula and Lomeu.

Figure 7 Average household agricultural production



Source: Fieldwork (2005)

Figure 7 indicates a high degree of commercialisation of agricultural production in Mom sub-district focusing on sugarcane and rubber. In both villages, agricultural investment is heavily concentrated on rubber and sugarcane. On average farmers in Lomeu and Mom invested over 5 million kip for rubber, and 5 million and 10 million kip for sugarcane. While sugarcane is cultivated on contract basis with sugarcane processing factory based in Meng Peng in China, rubber was mostly self-financed by the farmers.

During the interview, we learnt that several households started to plant rubber almost 14 years ago in Lomeu, and 8 years ago in Mom village by farmers' own initiative. These were farmers that visited their relatives in China, and observed how they accumulated wealth first-hand. Some of them also worked on their relative's rubber plantation and gained first-hand experience. However, the majority of the rubber trees that were planted by these farmers were damaged by the frost in 2000.

Only a few numbers of trees are currently ready for tapping in both villages. In the last two years, farmers in two villages are beginning to replant rubber due to numbers of reasons. First is the increasing price of rubber in China, followed by the proximity to collection points and processing factories in Meuang Yuan and Meng Peng in China. Lastly, accumulation of wealth through sugarcane production has also helped farmers to make decisions to plant rubber in their former swidden and fallow lands. Concurrently, farmers' access to capital has increased as more Chinese companies and private individuals are investing in rubber under a range of sharecrop arrangements.

Figure 7 also indicates commercialisation of agriculture in other sub-districts. In Nakham sub-district, rice production accounts more than 50 percent of total agricultural production in all three villages. While farmers in Donechai village withdrew from sugarcane production due to its low return to investment and heavy demand on labour, farmers in Namdet Mai and Oudomxin continue to cultivate sugarcane. However, farmers in Namdet Mai and Oudomxin are also beginning to diversify their agricultural production by cultivating maize, other vegetables, and rubber due to low productivity of sugarcane production.

Meanwhile, Donechai village farmers appear to narrow their agricultural production focusing on livestock and rice production. This is due to farmers' intensification of lowland paddy fields to cultivate high yield rice varieties, and vegetable production in the dry-season. In addition, increasing numbers of farmers are becoming involved in agricultural trade. Not only do they collect and sell rice produced in their own village, but also collect a variety of agricultural products from other local farmers in Sing district and sell them through their relatives in China, who come to pick up the products regularly in their village (Figure 8). These farmer-traders play a significant role in facilitating the transboundary agricultural trade as they do not have to pay business and export taxes. On the other hand, Figure 8 also indicates relatively low rice production in mountainous villages of Xiengkheng sub-district. Low rice production in Eula and Xiengkheng is only off-set by livestock production.

Figure 8 Local agricultural trade



Until recently commercialization of agricultural production in Xiengkeng sub-district has been limited. While development projects tried to promote varieties of activities as an alternative to shifting cultivation and opium production (i.e. livestock production, fruit tree and pine-apple production, and cultivation of non-timber forest products), only a few successes have been achieved. Road network has improved in the last few years, yet use of Mekong River continues to be the dominant trade route in these Xiengkeng sub-district. Despite its seeming remoteness, farmers in Xiengkeng are also beginning to plant rubber on their own. Farmers in Xiengkeng and Eula are purchasing rubber seedlings from a Chinese Akha trader residing in Xiengkeng village, who is frequently in contact with her family members in Jihong located in Xishuangbanna prefecture. While cash crop production in these upland villages remains limited, it does not mean that farmers are isolated and cut off from the market entirely. Expansion of rubber will inevitably change household agricultural production and livelihood basis in the next decade to come.

Integration to the market economy not only increased commercialisation of agricultural production in Sing district but also increased demand for agricultural labour. Table 12 shows farming activities for key products grown in the study area including upland and lowland rice, maize, sugarcane, vegetables and rubber. In lowland villages, farmers that focus on paddy rice production are beginning to intensify their agricultural land use by growing varieties of vegetables after the rice harvest including cucumber, garlic and chillies. Some lowland farmers such as in Namdet Mai and Oudomxin are also allocating their dry season labour to sugarcane production.

Table 12 Agricultural calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Paddy</i>				Land preparation	Plowing	Transplanting					Harvest	
<i>Swidden</i>		Burning, clearing			Planting	Weeding					Harvest	
<i>Sugarcane</i>			Harvesting			Weeding			Weeding		Pest management	
<i>Maize</i>		Burning, clearing		Sowing		Weeding		Harvest				
<i>Rubber</i>				Burning, clearing			Planting					
<i>Cucumber</i>	Land preparation, sowing			Harvest								
<i>Garlic</i>	Mulching		Harvest									Planting
<i>Chillies</i>			Preparation					Harvest				

Source: Fieldwork (2005)

As mentioned in an earlier section, sugarcane is cultivated on contract basis with a processing factory in China. Harvest takes place during the dry season, but the timing of the harvest depends on the arrival of trucks from China and cannot be determined

by an individual farmer. In all three sub-districts where sugarcane is grown, villagers collectively harvest sugarcane to cope with the time and labour constraints. Agricultural labour outside of the villages is also hired to cope with labour shortage during the harvest season. We observed tractor loads of Akha villagers surrounding Mom village arriving daily to work in the field for of 12,500 kip per person.

Increased investment in rubber in recent years has also increased the demand for cheap agricultural labour. While some farmers in villages along the Chinese border began planting rubber more than 10 years go, rubber is still a new and expanding crop. New planting of rubber requires burning and clearing of old swidden and fallow lands. In all three sub-districts, we found that Akha people who have traditionally cultivated upland rice were often hired for the clearing of rubber field during April and May. While some farmers continued to hire Akha in the land preparation process, wealthy farmers often hired Chinese labourers instead who were more experienced in rubber planting for higher wages.

Thus, we observe increased demand for agricultural labour as a result of commercialisation of agricultural production. In particular, there is a seasonally high labour demands for sugarcane during the harvest season and for rubber during the land preparation and planting. The shortage of labour is currently met by the use of upland Akha and Chinese labour. It is often the upland Akha people that have resettled in new villages that are becoming dependent on agricultural wage labour as they do not have access to land. In the meantime, commercialisation of agricultural production has also created new economic opportunities for some farmers as they increasingly become involved in agricultural trade and investment. For example, a village leader in Lomeu has become an intermediary between villagers and Chinese sugarcane processing company to manage sugarcane production in Mom sub-districts. His job is to check farmer's credit and production of sugarcane in villages throughout the Mom sub-district that have contracted with the factory, and to contact companies during the time of harvest. Others like the farmers in Donechai have become a farmer-trader, who collects agricultural products in different villages (i.e. maize, rice) and sells them to Chinese traders through their network of relatives. Still some wealthy farmers in Donechai are starting to invest in rubber planting in nearby Akha villages, by providing credit to Akha farmer and sharing the incurring profit from rubber production.

3.4 Drivers of change

As we have seen in the last two sections, we observe a trend of decreasing forest area while increasing land use intensification in both upland and lowland areas facilitated by commercialisation of agricultural production. This is also changing how upland and lowland people allocate their labour in agricultural production, and changing their livelihood basis. What then are the driving forces behind the last decade of land use and socio-economic transformation in Sing district?

3.4.1 Government policies

A numbers of government policies have influenced demographic distribution and people's access to resources in Sing district. While there has always been a dynamic movement of population in Sing district, the recent demographic movement was instigated by combinations of government policies. Among these is the restriction on shifting cultivation and opium eradication in the upland areas. While the government restriction on shifting cultivation has been called forth since the 1980s, efforts to zone

and re-territorialize forest areas during the 1990s begin to constrain upland farmers' access to forest land and their customary land use practices.

Relocation of upland villagers, removing them from their original villages and confining them under new administrative space also began in the 1990s as part of the government effort to consolidate remote villages with less than 50 households. Concurrently, upland villages themselves gradually began to relocate to areas of lower elevation and near the roads during the early 1990s as rural development projects provided public services in 'focal sites' for development. There was a significant movement of upland people to lowlands was particularly induced between 2003 and 2005 as the local government used stringent measures to enforce the central government policy to eradicate opium production. Spontaneous migration increased population pressure in the lowland areas and increased competition over land.

3.4.2 Trade and investment

While government policies had definite impacts on upland people's relationship with their environment and space, other factors also contributed in the transformation of land use and socioeconomic environment in Sing district. Road development and opening of the regional border in Pangthong in 1992 had significant impact on local agricultural production as this not only opened market for local farmers in Sing district, but also brought in new crop varieties, technology, investments and labour from China. Introduction of new crop varieties and agricultural inputs significantly improved agricultural production for lowland farmers.

Agricultural investment was boosted particularly by the Chinese companies which began operating in the late 1990s. In addition to rice, these companies contracted with local farmers to produce maize, sugarcane, pumpkin, banana, bell peppers and watermelon. Once the investors collected the products, they exported them back to China. Usually under the contract farming system, investors provide crop varieties, and chemical inputs to local farmers on credit. The cost of investment is subtracted from the sales of agricultural products by the investors. Contract farming is highly popular as investors provide all inputs to farmers on credit. In some instances, such as sugarcane, investors also provide technical advisors to teach local farmers about the ways of planting and maintaining the field. Rubber is among the newest list of crop that is being promoted by the companies. There are approximately 10 nurseries operating in Sing district today and are selling rubber seedlings to local farmers. There are also some local farmers that are relatively wealthy and are beginning to invest in rubber plantation in neighbouring villages.

3.5 Increasing competition for land and questions on social equity

While our study has shown increased population density in the lowlands, and increased commercialisation of agricultural production, what are the consequences of these changes on community land and resource use practices? One of the obvious consequences is the increased pressure on land use in the lowland areas. Over the years, agricultural land in the lowland has become scarce due to increased population and their needs for productive land. In order to ease the pressure, a transition towards more intensive and productive use of land is necessary. However, this may be achieved by socially marginalizing the migrant population as they become entrenched in agricultural wage labour relationships.

Increased competition over land is also raising conflicts between villages over access to communal resources. While villages shared resource use in the past,

increased commercialisation of agricultural production and the population pressure has induced competition over land. Communal resources which allowed members of different villages to share in the past are particularly subject of conflict as resource users began to claim their legitimate rights. The problem was particularly pertinent in Oudomxin and Namdet Mai which used to share land and forest in the past with other neighbouring villages. While village boundary delineated village boundary of Oudomxin in 1997, Namdet Mai continues to encroach into the forest area in Oudomxin, which is now a village commons under the management of Oudomxin village. However, people of Namdet Mai also claim their customary rights to the land, and have been clearing fallow lands into sugarcane and rubber production.

The expansion of rubber production is also affecting land tenure in the villages. Areas which were reserved (or *chap chong*) by families are increasingly converted into rubber fields. While in the past, resource access on reserved land was unrestricted, conversion of such land into permanent rubber field strengthens private ownership of land. Furthermore, conversion into rubber field resulted in extermination of a range of food and other items collected in the forest. This particularly affects poor households in the village whose livelihood basis depended on the use of such natural products.

While government policies such as the land and forest allocation was intended to improve the sustainable use and management of resources in each village, the rapid demographic and economic changes in the last decade is overwriting the local resource management plans. This relates to the lack of continuous process to plan and manage resources at the village level following the land and forest allocation. The plan is also activity, and lacks considerations of overall landscape. The lack of systematic follow up by the district agriculture and forestry officers after the implementation of the land and forest allocation further leaves little motivation for the local villagers to continue resource management.

3.6 Conclusion

Our study shows an increasing trend of population concentration in the lowland areas of Sing district in the last decade. Concentration of population in the lowland area has been caused by a combination of government policies and increased economic opportunities in the agricultural sector. While population movement has been historically dynamic, relocation of upland population to areas of lower elevation began in 1990s. The first stage of movement was triggered by increased assistances to the upland households. Rural development projects that provided rural infrastructure as well as government policies restricting shifting cultivation and opium cultivation, and efforts to consolidate remote villages facilitated relocation of upland population. At the same time, commercialisation of agriculture in the lowland areas has increased the labour demand, thereby allowing the absorption of migrant population.

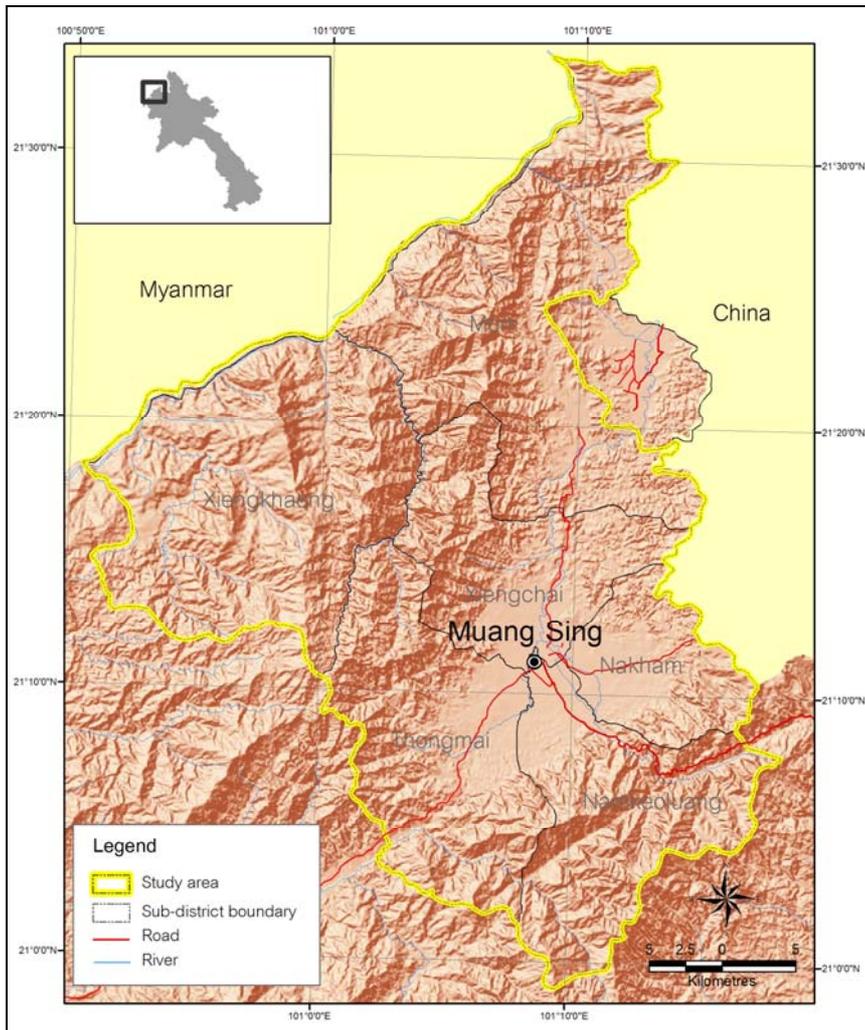
As a result, we observe increased population density and increased intensification of lowland agricultural land, while upland areas are being depopulated. The result of spatial analysis however, shows decline of forest area from 50 percent in 1973 to 30 percent in 2004. The area of forest remains at 30 percent in the last 5 years without significant recovery of forest areas. This means that while the upland farmers are abandoning their former villages and migrating to lower elevation, this is not leading to natural reforestation of the uplands. Over the years, forest areas have become fragmented and degraded. In the meantime, we see that commercial agricultural production is particularly expanding into areas of former swidden and fallow lands with the introduction of crops such as sugarcane, maize and rubber. However, for

commercial agriculture production access to road is an important factor. As a result, land use is increasingly becoming competitive in lowland and highland areas along the road. While swidden and fallow lands had been part of communal land where individual farmers reaped their harvest for household consumption, farmers are now claiming private rights to land as they shift towards commercial agricultural production. This also signify that the changes of land use and livelihoods in Sing district, is moving from flexible land use and property relationship that could be adjusted at both household and village levels depending on their need and availability of household labour, towards more permanent land use focusing on commercial agriculture and more exclusive definition of individuals' relationship with land and resources.

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Appendix 1 Map of northern Laos



Appendix 2 Research site in Sing District, Luang Namtha Province



Appendix 3 Numbers of household samples

Sub-district	Village	Ethnicity	Numbers of households interviewed
Xiengkheng	Eula	Akha (Pouly)	9
	Xiengkheng	Lu	9
Mom	Mom	Lu	11
	Lomu	Akha (Jicho, Pouly)	7
Nakham	Donechai	Lu	5
	Namdet Mai	Akha	9
	Oudomxin	Yao	11
Total			61

Appendix 4 Schedule of the fieldwork

Dates	Activities	Sub-district	Villages	Participants
19/12/2003	Preliminary fieldwork		Chaoup	Yayoi, Thone, Sithong, Sompone, Vonglakone, Chinese student, Peter
23/12/2003		Mom	Boukkou	Yayoi, Thone, Sithong, Sompone, Vonglakone, Chinese student
24/12/2003		Mom	Paphukkao	Yayoi, Thone, Sithong, Sompone, Vonglakone, Chinese student
24/12/2003		Mom	Bouaknyaxaykao	Yayoi, Thone, Sithong, Sompone, Vonglakone, Chinese student
		Mom	Chavangmai	Yayoi, Thone, Sithong, Sompone, Vonglakone, Chinese student
25/12/2003		Xay	Chappoukeun	Yayoi, Thone, Khamla, Vonglakone
		Xay	Xay	Yayoi, Thone, Khamla, Vonglakone
26/12/2003		Xiengkhang	Xiengkhang	Yayoi, Thone, Khamla, Vonglakone
		Xiengkhang	Eula	Yayoi, Thone, Khamla, Vonglakone
		Xiengkhang	Loku	Yayoi, Thone, Khamla, Vonglakone
		Xiengkhang	Paxang	Yayoi, Thone, Khamla, Vonglakone
		Xiengkhang	Muto	Yayoi, Thone, Khamla, Vonglakone
		Xiengkhang	Chaphutone	Yayoi, Thone, Khamla, Vonglakone
		Thongmai	Phyer	Yayoi, Thone, Khamla, Vonglakone
30/12/2003		Nakham	Oudomxin	Yayoi, Thone, Khamla, Vonglakone
04/01/2004		Nakham	Oudomxin	Yayoi, Sithong, Jeff
05/01/2004		Mom	Mom	Yayoi, Sithong, Jeff
21/02/2005	Household data collection	Mom	Lomeu	Yayoi, Thone, Duangta, Anousone
22/02/2005		Mom	Lomeu	Yayoi, Thone, Duangta, Anousone
		Mom	Mom	Yayoi, Thone, Duangta, Anousone
23/02/2005		Mom	Mom	Yayoi, Thone, Duangta, Anousone
24/02/2005		Mom	Mom	Yayoi, Thone, Duangta, Anousone
05/04/2005		Xiengkhang	Xiengkhang	Yayoi, Thone, Kai
06/04/2005		Xiengkhang	Eula	Yayoi, Thone, Kai
07/04/2005		Xiengkhang	Eula	Yayoi, Thone, Kai
09/04/2005		Nakham	Oudomxin	Yayoi, Thone, Kai
10/04/2005		Nakham	Namdet Mai	Yayoi, Thone, Kai
11/04/2005		Nakham	Donechai	Yayoi, Thone, Kai
06/06/2005	Follow-up data collection		Sing	Yayoi, Thone
12/06/2005			Sing	Yayoi, Thone
23/09/2005			Namtha	Yayoi, Thone (with Nick)
30/09/2005			Namtha	Yayoi, Thone (with Nick)
10/07/2006	Final workshop		Sing	Yayoi, Sithong, Khamla, Thone

Appendix 5 Household interview questions

Household Survey

Q1. Name of the household member interviewed

Q2 Years of residence in the current village
(If resettled from other place where, when, why?)

Q3. Numbers of household members

Q4. Main agriculture production 2003-2004
(Types of products, location of area, total production, amount sold, unit price of product)

Q5. Main agriculture input 2003-2004
(Types of products, type of agricultural labour, season, labour days, numbers of labour, unit cost of labour, capital input, cost of capital input)

Q6 Land parcel
(Types of land, area, ownership, year of use)

Q7 Household asset
(Types of asset, monetary value)

Q8 Household income (2003-2004)
(Sources of main household income for agriculture and non-agriculture activities, whose income, amount earned)
