



# Hanging in the Balance: Equity in Community-Based Natural Resource Management in Asia

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# Impacts of Cash Crops on Rural Livelihoods: A Case study from Muang Sing, Luang Namtha Province, Northern Lao PDR

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## ***Abstract***

*The landscape of Northern Lao PDR is a tapestry of mountainous terrain dissected by river valleys, and is rich with both ethnic and biological diversity. Poverty levels are high and most people have traditionally depended on swidden agriculture for their subsistence. The government of Lao PDR seeks to stop swidden farming, which it views as environmentally degrading, and to reduce poverty by promoting the adoption of permanent commodity-oriented agricultural crops. Growing market demands for sugar and rubber in China, and the success of a model rubber plantation in Luang Namtha province, have resulted in a boom of sugar cane and Para rubber plantations. This paper investigates the impact of cash crops on livelihoods and land tenure of local people in Sing District, or Muang Sing. The study focuses on equity, particularly in terms of access to land and natural resources among local people after the introduction of cash crops. We examine issues of land tenure, the implications of transitioning from self-sufficient food production to market based production, outside influences on agricultural production and land use, and government policies on swidden cultivation, opium eradication, land allocation, and village consolidation.*

## 1. Introduction

The Millennium Ecosystem Assessment (MEA 2005) focused the world's attention on widespread poverty and equity issues, particularly in the least developed countries. With its annual per capita Gross Domestic Product (GDP) of approximately US \$350 and a Human Development Index of 135 out of 147 (UNDP 2004) Lao PDR is considered to be one of the least developed countries in the world. The Lao government seeks to graduate from this classification by 2020 (GOL 2004). Many development programs have been implemented that have had significant impact on the utilization of natural resources and the livelihoods of rural people. The results, so far, show an increasing penetration of market forces into many sectors of the economy and the opening up of opportunities for resource exploitation. During this process, the government and political institutions have had to grapple with challenges emerging from the reorientation of economic policies from a highly centralized economy to a more open and free market system, which is known in Lao PDR as the New Economic Mechanism, or Re-thinking (Rigg 2003).

The Lao government introduced the New Economic Mechanism (NEM) in 1996 to reform from a planned economy to a market-based economy. The program also urged farmers to transition from subsistence-based production towards cash-crops. Throughout the 1980s and 1990s, the government promoted agricultural intensification and cash-crop production (rice, maize, soy beans), as well as industrial tree planting (teak, eucalyptus, rubber), in order to improve the livelihoods of rural people and to develop the national economy. Integration of rural farmers into the market has become a key issue in the 2000s.

Poverty is high in the uplands of the northern provinces, particularly in remote upland areas that have limited infrastructure and limited access to social services and markets, including education and health care. The percentage of people who live under the poverty line is estimated to be 38.6% of the population (UNDP 2001).

While government programs have been struggling to achieve the development goals, agricultural intensification in the upland areas has been difficult due to lack of basic infrastructure and financial resources. Recently however, increasing demand for cash crops in China is rapidly transforming the upland landscape in northern Laos. Not only are rural farmers engaged in cash-crop production, including maize, sugar cane, and rubber, but Chinese farmers and small-scale entrepreneurs are crossing the border in southern Yunnan province of Sipsongpanna (or Xishuangbanna) to become involved in agricultural intensification in northern Laos. While we believe that political stability is facilitating regional economic integration, we also believe that a scarcity of agricultural lands in southern Yunnan province is promoting Chinese farmers and small-scale entrepreneurs to cross the international border between China and Lao PDR in order to invest in rubber and other cash crops. Farmers in Lao PDR are responding differently to the current situation. While some lease out their seasonally uncultivated field, others become involved in longer-term contract farming with Chinese farmers and entrepreneurs.

In the current paper, we discuss the findings of a study conducted in the Sing District of Luang Namtha province where traditional farming practices have been changing gradually in response to the economic transformation and regional market integration. The study investigates the impact of cash crops, mainly sugar cane and rubber, on equity. In particular, we examine how cash-crop production affects household economy and access to resources. We also investigate cash-crop expansion and land tenure changes in the village. The current study demonstrates that the rapid expansion of cash crops such as rubber will have a long-term impact on equity within villages, and in particular will have a negative impact on the livelihoods of poor people. There is an urgent need to investigate the forces that are driving the change towards cash-crop production, and how this is changing local people's access to resources in order to seek a more sustainable resource management strategy in the upland areas of northern Laos.

This paper is divided into five sections. Following this first section, which has provided an overview of the study, the second section describes project methodology; the third section presents background information about land use, government policies and the current status of rubber plantations; the fourth section discusses the impacts of rubber plantations on equity and peoples' livelihoods; and the final sections suggest project conclusions and policy recommendations.

## 2. Methodology

In our study, a team of researchers and students from the Faculty of Forestry (including the authors) conducted interviews with local government officials, village leaders, and village households in Sing District four times between January 2004 and July 2005. Interviews at the local government level included three offices: the district agriculture and forestry office, the district planning office (DPO) and the Lao-German Cooperation Project. In all three offices we asked questions concerning their local development strategies and their assessment of the current situation regarding agriculture and forestry in upland areas. In the interview with the DPO, we also asked about foreign investment and trade especially along the border areas.

At the village level we selected a total of 7 villages in four sub-districts (including Mom, Xiengkheung, Xay and Nakham) and interviewed members of the village authorities, including both political and administrative leaders of the village, to learn about the village history, agricultural practices in each village, and their experiences with selling crops to China. We also conducted semi-structured interviews with households that planted cash crops such as sugar cane, maize, and rubber. Villagers were grouped by the amount of land they owned (Table 1). Families who have sufficient land to meet their food requirements and can invest in different types of commercial crops were placed into the first group of well-off families. Families who have sufficient land to meet their subsistence food requirement and who still use traditional cultivation methods (including paddy rice production, upland shifting cultivation and small

household gardening) were placed into the second group of middle-level families. Families that do not have sufficient land to meet their subsistence food needs throughout the year were placed in the third group of poor families.

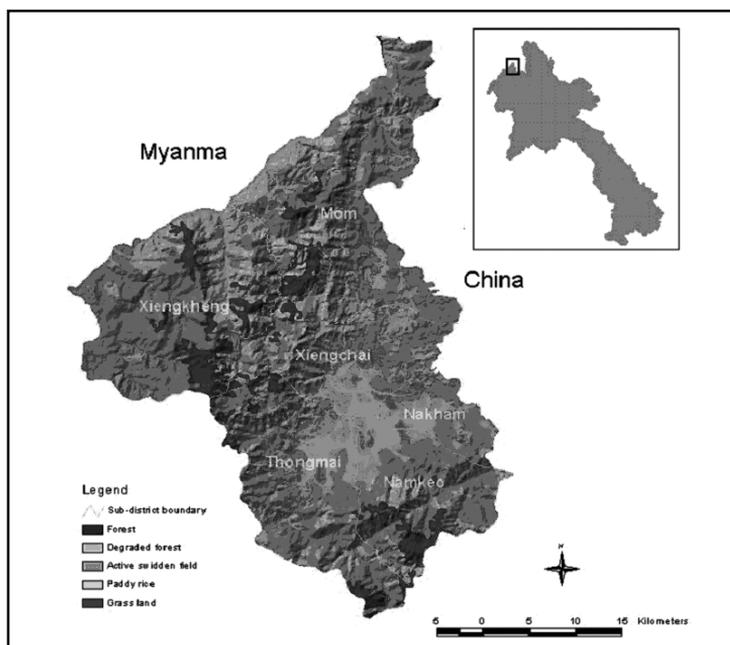
**Table 1: Characteristics of Households in the Research Site**

Class	Numbers of HH interviewed	Average land holding (plots)	Farming characteristics
Well-off	6	5-6	Paddy rice, swidden, sugar cane, rubber and livestock raising
Middle	7	3-4	Paddy rice, swidden, sugar cane, rubber and livestock raising
Poor	5	3	Swidden rice, hire labor, NTFP gathering and hunting and some livestock mainly small animal as poultry

*Note: HH=household*

### 3. Background

Sing District or Muang Sing is located approximately 70 km to the north of the center of Luang Namtha province. It borders Myanmar to the northwest along the Mekong River and China to the north along a land border (Figure 1).

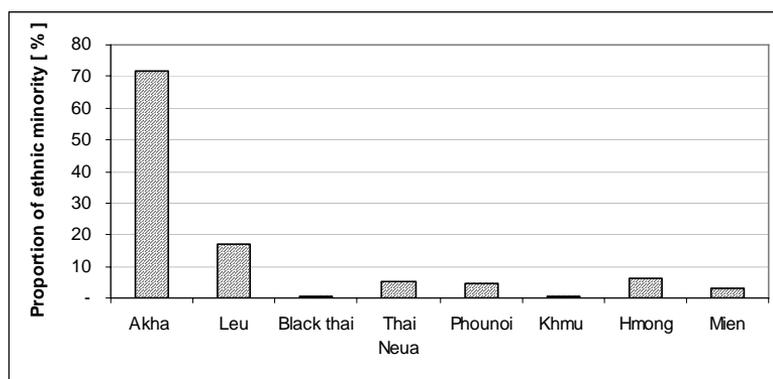


**Figure 1: Sing District**

A majority of the district is mountainous and has little potential for perennial agriculture development. The district is divided into 6 sub-districts and 95 villages. There is a total of 30,578 inhabitants of which the majority is Akha people who comprise about 70% of the total population (Figure 2).

Traditionally, Akha live in small villages with people of their own and kinship lineage. Their daily life is highly dependent on the forest as they consume many kinds of wild vegetables and meat. It is difficult to estimate the value of these products as has been studied in other parts of northern Laos (Foppes 2003). Akha have a long tradition of swidden cultivation practices.

The Tai Lue is the second largest ethnic group in the district. Tai Lue people prefer to settle in lowland areas near rivers or streams where there is potential for paddy rice development. They primarily plant rice, beans, different kinds of vegetables, and fruit trees as well as raise livestock. Tai Lue communities have a long tradition of trading cash crops, such as sugar cane, maize, and ginger as well as livestock and non-timber forest products (NTFPs) with Chinese farmers. They have been pioneers in terms of growing a variety of cash crops according to market demands from China. Presently, the Tai Lue population in Sing District is 6,882 people or about 13% of the total population.

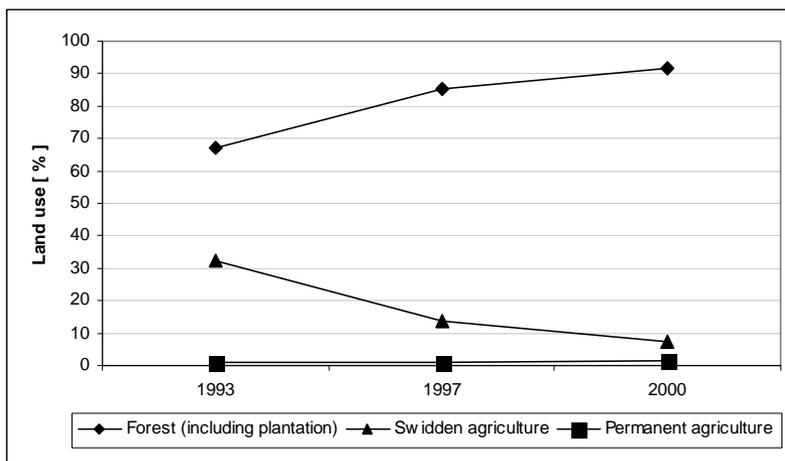


**Figure 2: Ethnic groups in Sing District**

Generally, all ethnic groups and communities in Sing District have a long tradition of upland farming. Major crops in the upland areas include rice, maize, cassava and opium. Rice is the main staple food, which is mainly produced for household consumption. Maize and cassava are used to feed livestock such as pigs and poultry. Major sources of cash income include opium, livestock and NTFPs. Many of these communities regard forest and land as common property that anybody can access and use. As pointed out by Rigg (2003), traditional swidden practices are now changing due to several factors, including population increase, consolidation of villages, and government policies on shifting cultivation and opium elimination.

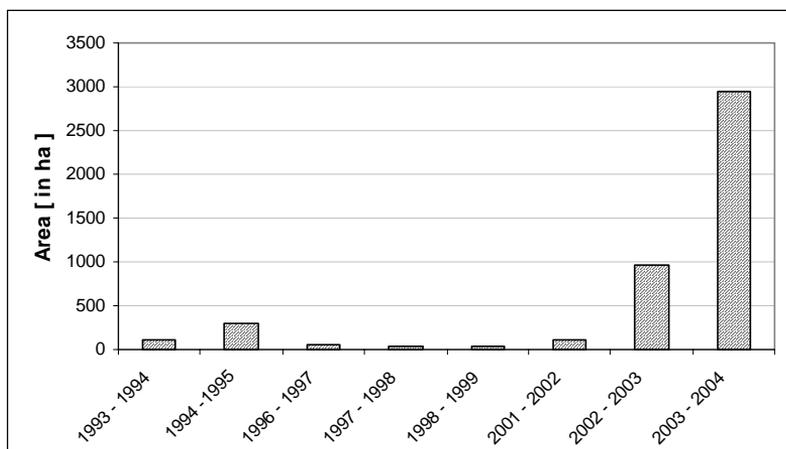
When we look at forest-cover change in northern Laos (Luang Namtha, Luang Prabang, Udomsay and Bokeo provinces), forest cover increased from 65% to 91%

between 1993 and 2003. Meanwhile swidden agriculture decreased sharply from 32% to 8% during the same period while permanent agricultural land did not change significantly. Figure 3 does not indicate rubber as a separate category, as it is classified as forest.



**Figure 3: Forest Cover and Land Use in Northern Lao PDR**

Among the choices of cash crops available to farmers, rubber is expanding the most rapidly. In Luang Namtha province the area of rubber increased from 120 ha in 1994 to 2,950 ha in 2004. In 2004, the National Agriculture and Forestry Research Institute (NAFRI 2005) conducted a land suitability assessment for industrial tree plantations in the Luang Namtha province, which suggests 62,600 ha or 6.7% of the provincial land area is appropriate for tree plantations. The current rubber area represents only 4.7% of this suitable area. However, the rate of increase has more than doubled between 2003 and 2004, as shown in Figure 4.



**Figure 4: Rubber Plantation Area in Luang Namtha Province**

Small-scale farmers plant most of the rubber grown in Lao PDR. The case of Ban (village) Hat Yao Luang Namtha province is the most well known among the villages that began to plant rubber almost 10 years ago. Hmong farmers in Hat Yao are now tapping and exporting latex to China. Their demonstrated success, as well as encouragement from Chinese entrepreneurs, have caused a boom in rubber planting throughout Lao PDR (Alton 2005, Bluhm *et al.* 2005).

### **3.1. Government Policy on Land and Cash Crop Production**

Since the New Economic Mechanism was introduced in the mid 1980s, the government has promoted many development and conservation programs to attain the dual objectives of improving the national economy and protecting the natural environment. A number of new regulations and laws were issued in the 1990s. These include the National Socio-Economic Development Plan and Development Strategy, and Land Use Planning and Land Allocation (LUPLA)<sup>1</sup>.

LUPLA is a particularly important national program, which decentralizes natural resource management to the village level, and encourages villagers to protect and use land effectively (Eklind and Johansson 1997). Under the LUPLA, village boundaries are defined, and land use areas are zoned. Normally, village land is divided into categories based on the availability of resources such as forest, agriculture and residential land. Following the Forest Law, forests are classified further into five main categories, which include: (1) protection forest, (2) conservation forest, (3) production forest, (4) regeneration forest and (5) degraded forest. Forests are defined as community property, with the exception of degraded forests, which can be allocated to individual households for agricultural purposes.

Government officials began implementing LUPLA in Sing District in 1995 using a participatory approach that involves villagers from the beginning. Currently, LUPLA has been completed in 54 villages, or about 60% of the total villages in the district. In combination with the government's effort to voluntarily relocate upland villagers to lower elevations where they can access public services, local officials are under pressure to finish LUPLA in the remaining villages by the end of 2005. A recent study by Rock (2003), however, suggests that LUPLA is being implemented too rapidly due to a shortage of financial resources.

LUPLA regulations allow villagers to use land for swidden cultivation and to maintain long-term usufruct rights to their land, while prohibiting farmers to leave land fallow for more than three years. Agricultural land parcels that remain unused for more than three years revert back to the community as common property. As a consequence, farmers living in villages where LUPLA had been conducted are forced to plant something on their land to retain their use rights. As a result, many farmers plant trees such as rubber to insure their claim over land, even if the government did not designate the area for rubber plantation.

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<sup>1</sup> It is also known as the Land and Forest Allocation (LFA)

Village relocation and consolidation are other important issues in Muang Sing. In upland areas, villages are sparsely located and access to public services such as schools and hospitals is difficult. Therefore, many upland villages with small populations are encouraged to relocate or to consolidate with neighboring villages so that government services can reach them more easily.

In 1990, the Lao PDR agreed to cooperate with the United States and the United Nations to substitute opium with other cash crops like coffee or mulberry trees. In 1992, the government established the Narcotics Control Agency in order to eradicate opium production. According to the Sing DAFO officer, they believe that they have successfully eradicated opium production from the district. However, finding adequate alternative cash crops for the upland farmers remains a big challenge. So far the district government offices are encouraging farmers to grow cash crops such as sugar cane, Job's tears<sup>2</sup> and maize. In the upland areas, they are also promoting livestock production for export to Thailand. However, cash crops production remains a challenge as market prices fluctuate depending on market demand.

## 4. Results and Discussion

### 4.1. Cash Crops and Low Income Households

Increased demand for natural rubber in China is significantly affecting traditional farming systems in the upland areas of Sing District. However, the impact differs among families within a village. Based on our fieldwork, pioneering families who were the first to arrive in a village tend to have access to more land with better soil quality. Today, these families have successfully intensified their land use and constitute the well-off and middle-income families. On the other hand, our survey indicates that low-income farmers have less access to land. Furthermore, their fields tend to be further from the road and difficult to access compared to other classes of families.

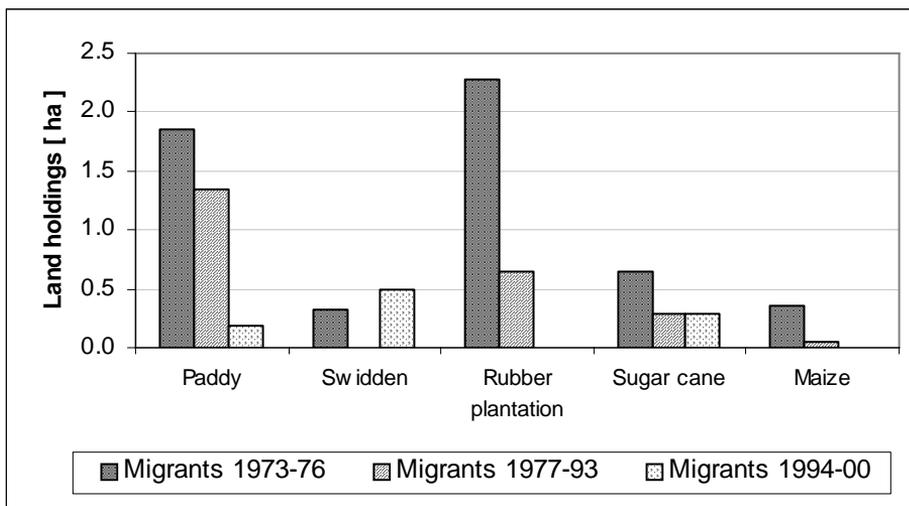
Below is a quote from a villager in Lomue village telling why he continues to grow upland rice instead of seemingly more lucrative cash crops:

*“My land is located far away from the road and the village. It is difficult to arrange transportation if I grow crops other than rice. If I plant rubber, I won't have enough land to produce rice for my family. I don't have any paddy field as I arrived in this village quite late. It is therefore, quite hazardous for my family to wait for 7 to 8 years to know results of planting rubber.”*

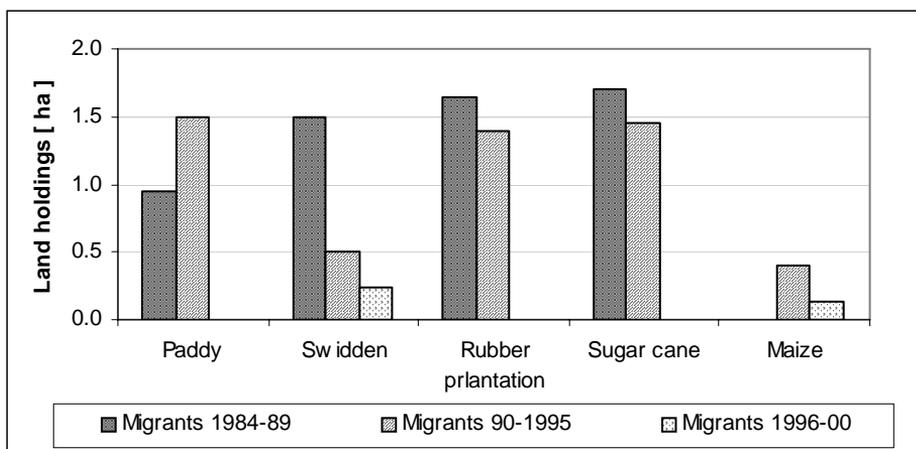
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<sup>2</sup> Job's tears (*Coix lacryma-jobi*) is a plant that looks like maize; the fruit has droplet-shaped, pearly white and very hard cover; it is commonly used as food, medicine and bead jewelry for women such as bracelet, necklace, etc. This plant may be called by different names depending on the location such as David's tears, Saint Mary's tears or Christ's tears.

For Mom village (Figure 5) we see the size of landholding according to the time of migration: 1973-76, 1977-93 and 1994-2000. Meanwhile, for Lomue village (Figure 6), the trend is divided into the following time periods: 1984-89, 1990-95 and 1996-2000. In both villages, land-tenure patterns appear similar. Land holding differs significantly among villagers depending on their settlement history. The earlier the farmers settled in the village the more access they have to paddy and other agricultural lands.



**Figure 5: Land Holding by Type and Period of Migration in Ban Mom**



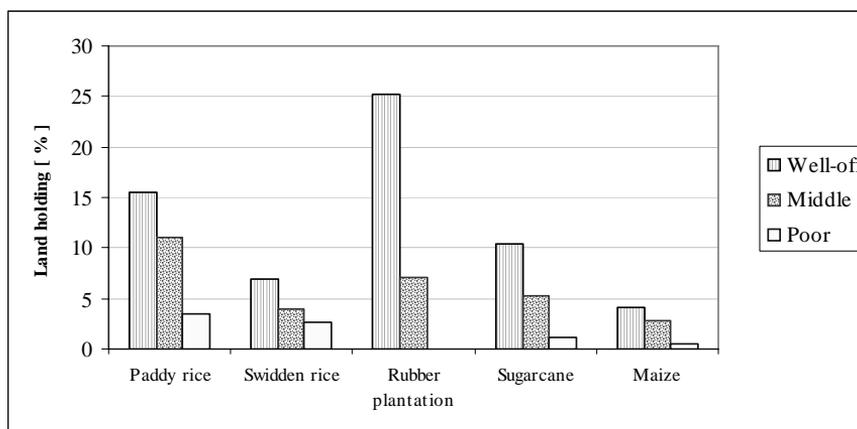
**Figure 6: Land Holding by Type and Period of Migration in Ban Lomue**

Figures 5 and 6 also show the different land-use practices in the two villages. The Akha in Ban Lomue have a long tradition of swidden cultivation while the Tai Lue in Ban Mom are traditionally lowland paddy farmers. Figure 5 shows that on average, early settlers in Mom village tend to have larger land holdings. For instance,

the average size of a paddy is 2.8 ha, and the average size of a rubber field is above 2.3 ha. The Mom were among the first to convert their swidden fields and fallow land into sugar cane and rubber. In contrast, the newest settlers in the village that arrived from 1994 to 2000 have limited access to paddy fields (0.6 ha), as well as other agricultural land suitable for cash crops.

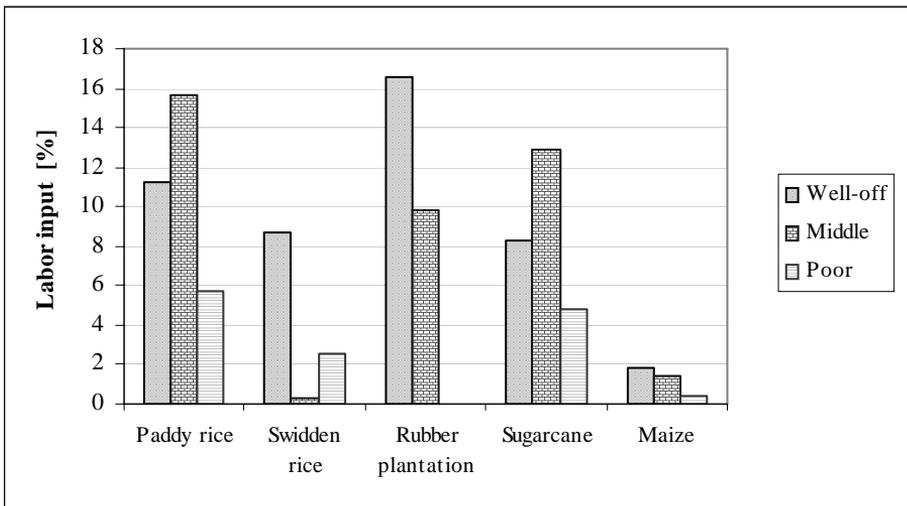
In Lomue village (Figure 6), those that settled between 1984 and 1989 have larger swidden (1.5 ha) and sugar cane fields. In contrast to Mom, families that settled between 1990 and 1995 also tend to have sizeable area of sugar cane field (1.5 ha). New settlers in Lomue are dependent on swidden, as was the case in Mom village; however, average land holdings are smaller than those of new settlers in Mom.

Figure 7 shows land use in two villages based on household economic status. When Chinese traders invited villagers to grow sugar cane for market, wealthy and middle-income families converted their swidden fields near the road to sugar cane. More recently, farmers are planting rubber on the same type of land. Poor families have not been able to take advantage of the opportunity to plant sugar cane and rubber for several reasons. First, their swidden fields tend to be located further from the road and hence require additional labor inputs to get the product to market. Second, poor villagers cannot plant sugar cane and rubber in their swiddens because they do not have paddy fields. Without access to paddy on which to grow their food crops, these households cannot afford to convert their only land resource to cash crops. Third, some poor villagers expressed concern that even if they grew sugar cane for the market, that the quality of their cane might not meet the traders' requirements. Finally, if a farmer chooses to plant rubber he has to wait seven or eight years before he sees a benefit. Poor households cannot afford to plant rubber in their swidden because it would leave them without any source of food for a number of years. Wealthy and middle-income families can plant sugar cane and rubber in their swidden fields, because they have paddy fields for meeting their food requirements.



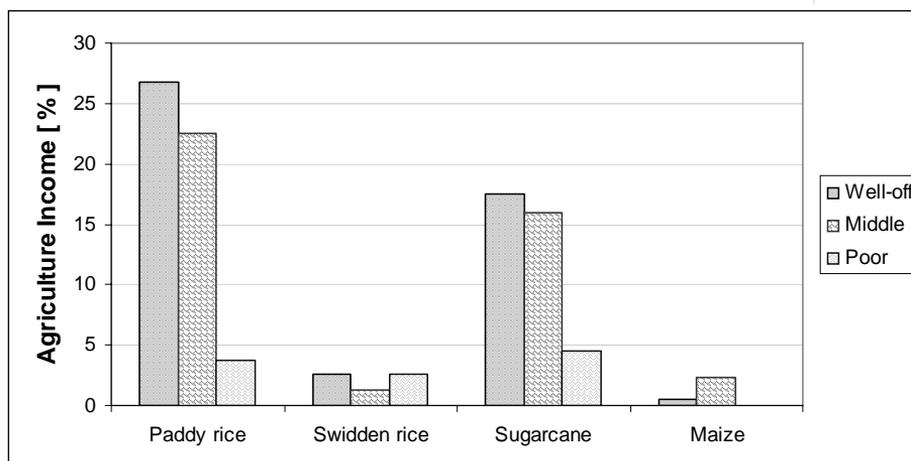
**Figure 7: Percent of Land by Land-use Practice and Household Economic Status**

Figures 8 and 9 show agriculture labor and income according to the household's economic status. In-depth interviews with village households in the two villages suggested that villagers earned income from different sources. The main sources of income for well-off families were primarily paddy rice and sugar cane, as rubber is not yet tapped commercially in these villages. Middle-income families also benefited from paddy rice production and sugar cane but not as much as well-off families. This is because they have less land for paddy and cash crop production than well-off families. Poor households focused their labor on sugar cane and swidden production, as they have no paddy fields. However, we need to be cautious in labeling households as poor because their low income may be related to their stage in the family cycle. New families that have just separated from their parents are classified as poor, as well as families that have recently moved down from upland areas. The availability of land places limits on all families for both paddy and cash crops. Farmers, who do not grow rice to meet their food needs, usually have to work for other families in order to earn income for purchasing food. These families also access forest resources in order to collect NTFPs including bamboo shoots and vegetables for domestic consumption. Our interviews suggest that on average, well-off families earn more than 10 million kip (US \$925) per year, while middle and low income households earn about 5 to 10 million kip and less than 5 million kip per year respectively (Figure 9).



**Figure 8: Labor by Land-use Practice and Household Economic Status**

Sugar cane production boomed in the district in 2000 when the price of sugar cane was about 130-135 yuan per ton (US\$15.80-\$16.50). Sugar cane production took the form of contract farming where local farmers signed a contract with sugar cane processing companies in China directly or indirectly. Sugar cane processing companies provided seedlings, fertilizer and other inputs, and villagers with land near the road were encouraged to plant sugar cane. The company subtracted the costs of



**Figure 9: Household Income by Land-use Practice and Economic Status**

input and gave the remaining profit to the farmers. Sugar cane saplings can be harvested consecutively for three years; therefore, in the second, third, and fourth years most of the profits went to farmers unless they purchased fertilizers or pesticides on credit. In the first few years after the boom, farmers earned high income from sugar cane, however, the price began to plunge as more farmers began to grow sugar cane (Manivong *et al.* 2003).

In the aftermath of the sugar cane boom, many well-off and middle-income families began to plant rubber in their former swidden fields as an alternative to sugar cane. Meanwhile, some of the poor farmers who were interviewed also planted rubber as they became involved in contract farming with private investors and farmers and received capital inputs. In some cases, farmers not only received capital inputs but also became indebted to investors as they could not produce enough rice for household consumption. As a result of indebtedness, some farmers had to forfeit their future share of income from rubber production.

According to the villagers, many farmers along the border began to plant rubber on a contractual basis with Chinese farmers on the other side of the border. The contract is an informal arrangement between Akha or Tai Lue farmers on both sides of the border. The Chinese farmers provide capital, seedlings or technical support and the Lao farmers contribute land and labor. When the latex is harvested, profits are divided between the two farmers. Sometimes the share is 60% for the Chinese and 40% for the Lao farmers.

Rubber planting can also cause social tensions. In Mom village, for example, a poor man was killed because he stole rubber seedlings from another well-off family. Conflicts between villages are also on the rise as rubber reinforces private land tenure regimes in areas that were used as common property in the past (i.e. swiddens and fallows).

## 4.2. Natural Forest Encroachment and Biodiversity Destruction

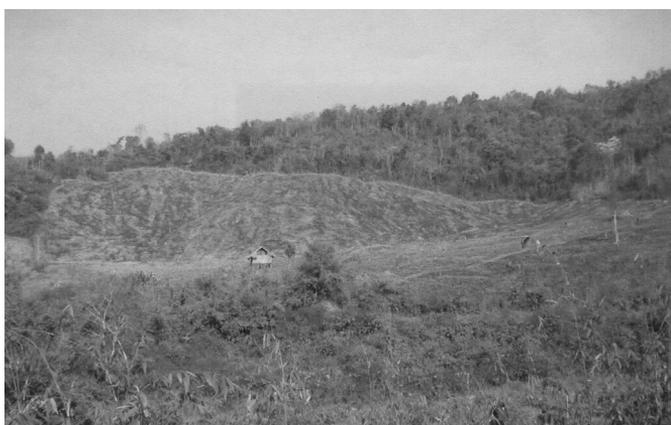
Villagers have wanted to plant more rubber since the market began to boom in 2004 but have been limited by a lack of land. As a consequence, many forests have been cleared to plant rubber. In Ban Lomue, for example, villagers encroached on the village's protected area to grow rubber. In Ban Oudomsin and Ban Namdeth Mai, villagers are involved in a dispute concerning a conservation forest of about 40 ha that was cleared for rubber. Villagers in each village argue that the land belongs to their village. The headmen of both villages have agreed to stop the encroachment, but villagers continue to clear land. The conflict has been submitted to the district office for resolution. As previously discussed, in many villages the LUPLA was not effectively implemented and areas delineated as village forests are often regarded as common property. In these cases it is relatively easy for farmers with capital and power to convert these lands to private property and then to plant rubber. Figure 10 shows a piece of land cleared by a family to prepare for the rubber in Mom village. The clearing encroaches on the village's conservation forest.

Villagers in Muang Sing have traditionally depended on natural forests, especially poorer households, as major sources of food (wild meats and vegetables) and income. Natural forests provided benefits for their daily life for which it is difficult to estimate a value. However, the majority of people do not recognize the forests' immeasurable value. We found in our interviews that the forests were a major source of income for many people. Approximately 60% of the income villagers earned came from NTFPs such as bamboo, rattan shoots, cardamom, Meuak bark (*Debregaesia hypoleuca*), and wildlife. Many of these products were sold or exported overseas, mainly to China. Approximately 25% of villagers' income came from handicrafts, 15% from sugar cane and other cash crops, and only 10% from rice production.

Income from the forest, however, while the largest single source in the village, is relatively small. Seeing the potentially much greater income they could get from rubber, a majority of villagers have begun to see rubber as more important to their long-term future than continuation of the forests. A villager in Ban Don Chai stated that he used to buy NTFPs from villagers around Muang Sing to sell in China. But the amount of NTFPs villagers can now collect is less than five years ago, so he is changing his strategy from selling NTFPs to planting rubber. He did not know if the reduction in the availability of NTFPs was related to the expansion of rubber production.

There is little information and literature on biodiversity in Muang Sing. However, through the fieldwork we observed a number of cases of wildlife utilization. Trapping instruments were found in all villages, wild meat can be seen in the market and wildlife dishes can be ordered in the restaurants. Going to the forest to hunt or capture wildlife is common in all villages. Villagers, particularly ethnic minorities, have a long tradition of collecting wildlife for food, medicine or trade. According to Tizard *et al.* (1997) many large mammals, amphibians, reptiles, fish and birds exist at Nam Ha National Protected Area. At least 38 large mammals and 288 species, many of which are key species of conservation concern, can be found in the protected area. As once

forested areas are converted into rubber plantations, collecting NTFPs and hunting will be concentrated in the remaining forests. Increasing rubber areas will threaten wildlife habitats.



**Figure 10: Land Cleared for Rubber Planting near Conservation Forest**

### **4.3. Rubber Plantations and Risk**

Farmers in Muang Sing, particularly in Mom sub-district, began planting rubber about 8 years ago. At that time about 40 families planted rubber in their swidden fields. In 1999 many of these trees died because of an unusual frost that swept across the region killing thousands of trees across the border in China. Even though their trees died villagers still had to pay back the capital their relatives from China had invested. Interest rates depended on negotiations between partners. Some families had to return the investment plus 40%, 50% or even 60% interest.

In Lao PDR there is no experimental research on rubber production, and most of the technical information has been gained from experiences in China. Rubber production varies according to the variety and quality of the seedling. Lao farmers have little knowledge about rubber. They cannot identify which varieties are best suited for different environments. Villagers even have difficulty identifying which variety they are buying. It is difficult to tell whether a young rubber seedling will be productive or not. Successful rubber propagation also depends on the age of seedling. A seedling should be a least one-year old before it is grafted onto a rootstock. If seedlings are grafted when they are too young, they may die young or yield less rubber.

Grafting is another important issue for rubber production. Two weeks after grafting you should be able to tell whether the graft was successful or not. But it is difficult for villagers to know which grafts were successful. If they buy an unsuccessful grafting, the rubber tree will grow up to produce less latex.

Currently there is no problem with excessive rubber production in Lao PDR because most trees are not old enough to be tapped. In addition, the demand from China is high while their rubber trees are relatively old. Chinese factories import approximately 70% of their rubber from other countries such as Thailand and Malaysia

(Manivong *et al.* 2003). However, we do not know what will happen in the future. Even though the demand in China is currently high, the rubber growing areas in other countries in the region such as northern Thailand, Myanmar, Vietnam and Cambodia are also increasing. History suggests that sooner or later the price of rubber will fall.

Government officials may classify rubber as forest cover but a rubber plantation does not have an under story (bushes and grasses), nor any wildlife. Domestic animals will not graze in a rubber forest. Farmers in Lao PDR have traditionally seen raising livestock as an important source of income and labor. Domestic animals such as cattle and buffalo are normally left to graze freely in the forest. People are not used to raising animals in specific pasture areas. The enormous portions of the landscape devoted to rubber plantation will certainly impact traditional animal raising activities in the future. Many villagers are concerned with this issue already. In addition, they will face labor shortages. Rubber plantation requires a large amount of labor and villagers will not have time to take care of livestock. Some villagers suggested that they will not need other income earning activities if they have a large area of rubber and that income from rubber products will be sufficient for their households needs. This places them at great risk if anything should happen to their rubber trees (frost, fire, or pests) or the rubber market crashes.

## 5. Conclusion

The study shows that rubber plantations have had an impact on the economy, society and physical environment of rural areas. Farmers that invest in rubber tend to have high expectations of income accruing from rubber, but it is a long-term investment and there are a number of factors that can severely impact this investment. In Lao PDR there is no experimental research on rubber production, most of the technical information is from experiences from China, making it difficult to predict future impacts.

Many forest areas have been cleared without recognizing the negative, but difficult to assess, impacts on people whose livelihoods have traditionally depended on forests. Most of the people who grow rubber are mainly from wealthier families, while poor farmers are losing access to agricultural land. There is an urgent need to investigate the forces that are driving the change towards cash-crop production, and how this is changing local people's access to resources in order to seek a sustainable resource management strategy in the upland areas of northern Laos.

Rubber does not bring equitable financial benefits to farmers. Those who can mobilize capital and labor at the right time can gain more while those who cannot eventually lose out. Poor farmers who cannot invest will likely end up becoming laborers on their own land.

There is a need to revise the LUPLA and the follow-up activities of the plan. Suitable land for rubber plantations should be defined and remaining natural forests

in good condition must be protected. Instead of promoting only one option for stabilizing swidden cultivation, integrated farming systems should be promoted for sustaining rural livelihoods. Diversification of cash crops will ensure farmers' income better than mono-cropping and it will also help to reduce farmers' exposure to risk from uncertain markets.

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