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Socio-Economic and Environment Impacts
from Rubber Tree Plantation in Hat Nhao
and Houay Dam Villages, Luang Namtha
Province, Lao PDR

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Environment Research Institute (ERI)
Science Technology and Environment Agency (STEA)
Vientiane, Lao PDR

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Keywords: Rubber trees, Environment, Growth

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ABOUT MEKONG INSTITUTE

The Mekong Institute (MI) is an inter-governmental organization working in the six Greater Mekong Subregion (GMS) countries (Cambodia, Lao PDR, Myanmar, Thailand, Vietnam and Yunnan Province of China) to provide capacity building activities for government officials, members of private enterprises and civil society involved in the development of the subregion. MI has been serving the human resource development (HRD) needs of the GMS since 1996. The New Zealand Government conceived Mekong Institute as a development assistance project for the countries of the GMS, intended to evolve into a regionally governed, autonomous institution. The institute is situated on the campus of Khon Kaen University in Northeastern Thailand. NZAID, the Thai Government, Khon Kaen University and other national and international partner agencies funded this project from 1996-2003.

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1. Public Sector Reform and Good Governance

- a. Leadership in Public Service Reform
- b. Leadership in Competitive Enterprise
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2. Rural Development and Project Management

- a. Transboundary/Regional Project Management
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Joint Summit Declaration THE THIRD GMS SUMMIT Vientiane, Lao People's Democratic Republic 30-31 March 2008 "ENHANCING COMPETITIVENESS THROUGH GREATER CONNECTIVITY"

Plan of Action for GMS Development, 2008-2012

Source: (<http://www.adb.org/Documents/Events/2008/3rd-GMS-Summit/default.asp>)

Human Resource Development: Implement the new strategic framework and action plan for cooperation in education, health, labor, and other social development areas, broaden and deepen the scope of the Phnom Penh Plan for Development Management, support the mandate and mission of the Mekong Institute, and enhance the prevention and control of communicable diseases in border areas.

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Photos: Left (Group presentation in training program) and Right (MI Learning Resource Center)

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ACRONYMS AND ABBREVIATIONS

CPI	Committee for Planning and Investment
CBA	Cost-Benefit Analysis
ERI	Environmental Research Institute
ETC	Environmental Training Centre
FAO	Food and Agriculture Organization
Ha	Hectares
IUCN	International Union Conservation Natural
MAF	Ministry of Agriculture and Forestry
MASL	Mean Average Sea Level
MI	Mekong Institute
NTFP	Non timber Forest Product
NGOs	Non Governmental Organizations
STEA	Science Technology and Environment Agency
WERA	Water Resource and Environment Administration

ABSTRACT

This research examines the socio-economic and environmental impacts of rubber tree plantation at Ban Hat Nhao and Ban Houay dam. The research also examines the existing policies, legislative and economic measures on the development of the rubber tree plantation and to suggest appropriate mitigation measures in order to ensure the rubber tree plantation is sustainable. The two villages are located in Luang Nam Tha province in Northern part of Lao were selected for the study. These two villages have been engaged with rubber tree plantation more than a decade.

Keywords: Rubber trees, Environment, Growth

Socio-Economic and Environment Impacts from Rubber Tree Plantation in Hat Nhao and Houya Dam Villages, Luang Namtha Province, Lao PDR

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Sounita Phichit⁴ and Bouphavanh Keomixay⁵

1. Introduction

Rubber tree, *Hevea brasiliensis*, was introduced in the 19th century in South and Southeast Asia from its native South America. Rubber plantations around the world presently cover some 9 million ha, with almost 95 percent in Asia and more than 75 percent are found in Indonesia, Thailand and Malaysia. The growth and market for rubber in developed countries is saturated, but is booming in China, India and ASEAN countries. After a long decline, rubber price rose in 2002¹ (see Figure 1). The increase in price is due to increased in market demand, especially in China where import rose to 24 percent in 2003.

Rubber was first introduced into Laos in 1930, with the first rubber tree plantation in Champassack Province, by French planters during the colonial period. The first site was selected in Bachiang District, Champassack Province, about 9-13 km far from Pakse Municipality on the road to Bolaven Plateau (see Figure 2). The planting area was in a 4-plot design, each plot of about 0.5 hectares. The trees have an average age of 76 years.

In 1990, Phathana Khet Phoudoy Company at Khammouane Province introduced rubber seedlings (RRIM 600) from Thailand. The seedlings were planted in Thakek District on a 80 ha land. In 1992, the same variety of seedlings was planted in Hinboun District, Khammouane Province on a 23ha land. Between 1992 and 1996, Bane (village) Hat Nhao in Luang Namtha Province, northern part of Laos, sharing the border with China, established rubber over 342 hectares in the form of smallholdings. In addition, the villagers from Sangthong District, Vientiane Capital City also planted rubber in a 3.5 ha land in 1996.

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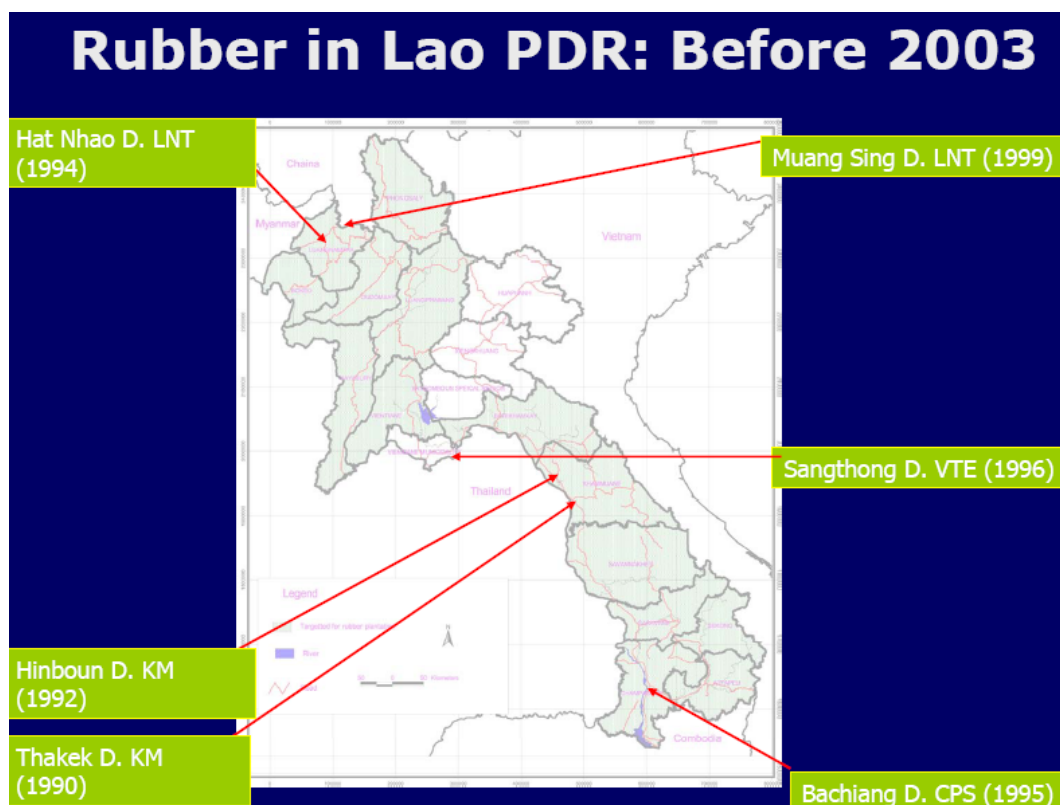
¹ John Raintree, " Inter Cropping with Rubber Risk Management", Improving Livelihood in the Uplands of the Lao PDR, NAFRI, NUOL, December 2005, Vientiane, Lao PDR

Figure 1: Rubber Price on the Singapore Commodity Exchange



During the same year, the villagers in Thapabath District, Vientiane capital city, also planted rubber trees in a vicinity of a 4-ha. land. However, despite the increased in rubber tree expansion, rubber production has not caught the attention of Lao policy makers, traders, business groups, and other stakeholders until the late 1990s.

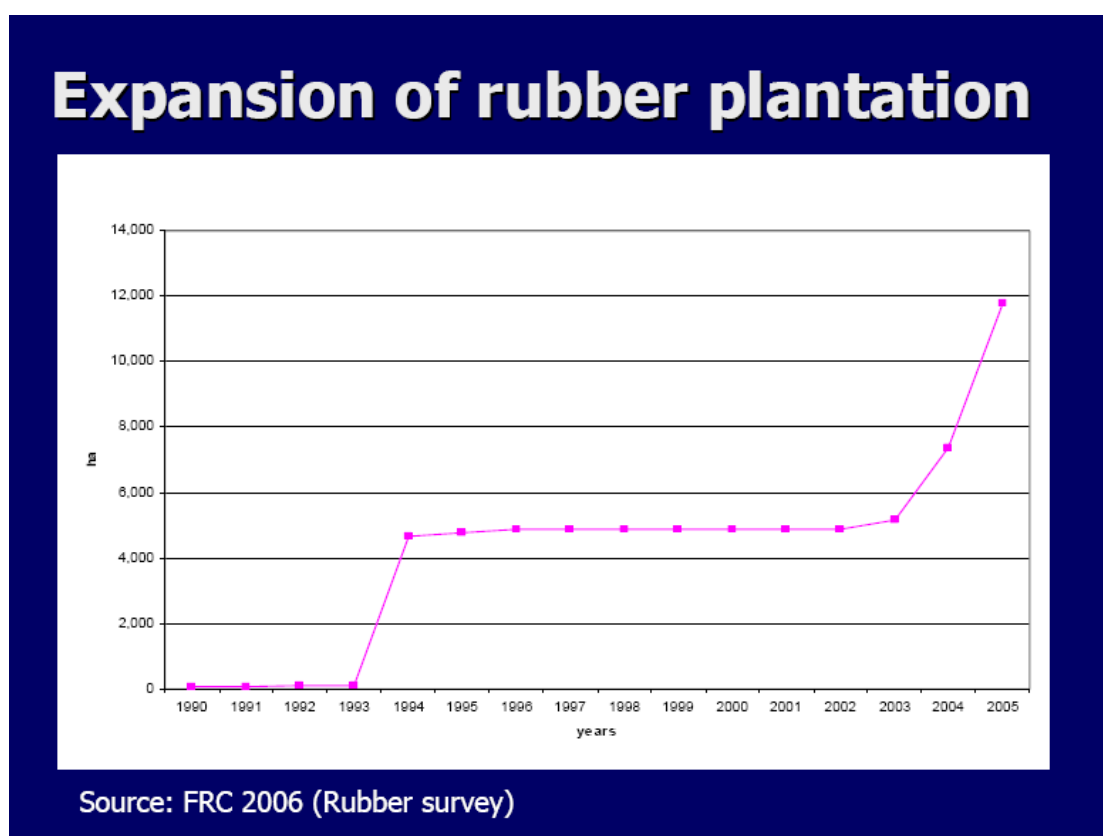
Figure 2: Rubber in Lao PDR (Before 2003)



In 2003, the attractive income from latex sale, rubber harvesting and marketing by some Lao Producers (early rubber growers, during the years 1990 to 1994) became a turning point for Lao's rubber tree plantations. During that period, an 8 to 9-year old rubber tree of Bane Hat Nhao, Luang Namtha Province, could produce 1,360 kg/ha/year of latex equivalent to 8,840,000 kip or nearly USD880 (based on 2005 dollar).

Many rubber growers (such as villagers and local companies) start to recognize the economic profit from this crop. Since then, the rubber planting in Laos has increased steadily as many individuals, private sector entities (both domestic and foreign), and state sector entities have responded to the high rubber prices and the growth in demand from neighboring countries (see Figure 3). To date, most of the Lao PDR provinces, except Houaphanh and Xieng Khouang, are reported to have rubber tree plantations or at least included in the provincial development plan for implementation.

Figure 3: Expansion of Rubber Plantation in Lao PDR



Beginning 2004, many foreign companies have invested in the rubber tree plantations in the Lao PDR. For example, the Chinese companies are prominent in the northern part of the country, while the central region is dominated by Thai investors and the south by the Vietnamese.

Rubber is considered as one of the alternatives to stop opium cultivation, to stabilize slash and burn shifting cultivation, to ensure food security and contribute to poverty alleviation at the national level. It is also expected to become one of the main exports of the Lao PDR.

1.1 Research Problem Statement

Rubber trees planting have been rising rapidly in the Lao PDR, especially in the Northern provinces, where the average of the land slope is more than 16%. Due to its rapid expansion, rubber tree plantations are dominating other cash crops and trees plantation (such as eucalyptus, local species, teak, etc), and is invading some villages protected areas².

The National Tourism Administration has reported its concern on the increase expansion of rubber tree plantations near the National Protected Areas, such as the National Nam Ha Protected Area, which is declared as the first national pilot eco tourism area and the ASEAN Biodiversity Area³. A recent survey by NAFRI⁴ in the Southern provinces reported the incidence of felling of natural timber along Lao-Vietnam border by the local authorities and communities to pave the way for rubber tree planting. This will be a risk to biodiversity and forest conservation due to land use conversion. If a large scale of rubber monoculture is expanding rapidly without proper social and environment considerations, this would consequently affect the livelihood of concerned villagers and ecosystem of the related plantation area.

According to interviewed relevant people in Namtha and Sing Districts, Luang Namtha province, rubber tree plantations have some impacts on the social and ecology system (e.g. impact on biodiversity, climate, soil quality and water resources abundance), the weather is getting hotter and the level of water in the streams and main rivers has been reduced thereby affecting the livelihood of local people whose income depends on fishing⁵. However, there is lack of systematic and well defined policy implementing mechanisms and guidelines on rubber tree planting, and the impact of environment assessment to determine the extent and appropriate area for planting rubber along the landscape continuum. In addition, Lao farmers who have been planting rubber trees lack the knowledge on the rubber variety selection, on the appropriate management of the plantation, and on the simple manufacturing process including the markets.

² Report of the Vientiane Provincial Science Technology and Environment Office, 2005, Lao PDR

³ National Tourism Administration Annual Report, 2006, Vientiane, Lao PDR

⁴ NAFRI: National Agriculture and forestry Research Institute, Ministry of Agriculture and Forestry, Vientiane, Lao PDR

⁵ Annual Report of Luang Namtha Provincial Water Resources and Environment Office, 2006, Luang Namtha, Lao PDR

There are limited studies on the socio and economics impact of rubber tree plantations in the Lao PDR, specifically at Bane Hat Nhao and Bane Houay Dam, Luang Namtha Province. This study would provide relevant information and data not only to the concerned provincial and central authorities but also to concerned farmers in order to steadily improve the rubber tree plantation management in a sustainable manner and to contribute to poverty eradication, development of community knowledge, and environment resources sustainability.

1.2. Research Objectives

The specific research objectives include the following:

- to examine the existing policies, legislative and economic measures in place related to the rubber tree plantation development;
- to examine the socio-economic and environmental impacts (positive and negative) of rubber tree planting in Hat Nhao and Houay Dam Villages, Luang Namtha Province;
- to suggest appropriate mitigation measures in order to ensure sustainable rubber tree plantation in Hat Nhao Village, Luang Namtha Province

1.3. Scope of Research

Hat Nhao and Houya Dam Villages located in Luang Namtha Province, are the target areas of our research study. Rubber tree plantation started in Luang Namtha in 1992 with the assumption that it could be one of the alternatives to the local communities to halt opium, stabilize their slash and burn shifting cultivation and to also increase their family income. Due to the attractive revenue from the rubber tree in the 2002, and increased in demand from China, rubber trees planting has spread rapidly in Luang Namtha and the Northern Provinces of the country.

Rapid expansion of the plantation obliges villagers to destroy natural forest area, which could be risky to the district, provincial protected areas as well as of the National Nam Ha Protected Area conservation, which has been declared as the ASEAN Biodiversity Area. Thus, it would engender high risk of ecosystem and biodiversity implications of the National Nam Ha Protected Area.

1.4 Institutional Arrangement

The research team consists of concerned staffs from the Environment Research Institute (ERI), National Agriculture and Forestry Research Institute (NAFRI), the National Politics and Administration Institute, National Lao University, including the relevant counterparts from targeted province and villages. ERI is the leading institution in conducting this study, liaising with the Mekong Institute and coordinating with all relevant institutions and persons.

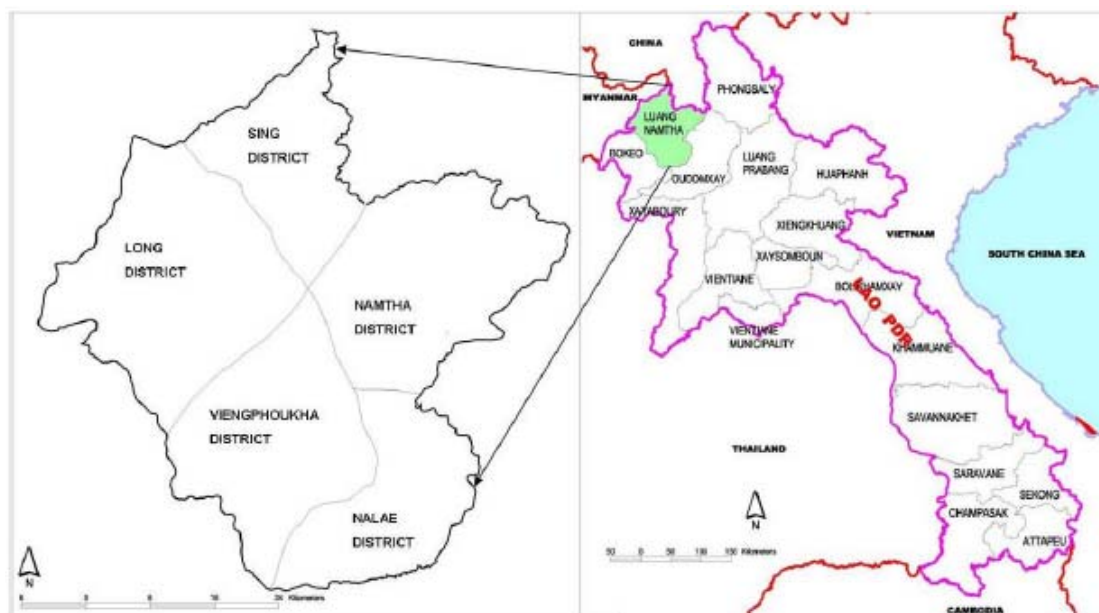
1.5. Description of study sites

Our study focuses on two villages, namely Ban Houay Dam and Hat Nhao of Namtha District, Luang Namtha Province.

1.5.1 Luang Namtha Province

Luang Namtha Province is located in the Northern Region of Laos, lying between 20°30' and 21°30' north and 100°30' and 102°00' east (see Figure 4). It shares a border of 140 km with China in the north, 130 km with Myanmar in the west, 230 km with Oudomxay Province in the east and 100 km with Bokeo Province in the southwest. The province is divided into five administrative districts, namely Namtha, Sing, Long, Viengphoukha, and Nalae (PPCO, 2005). Luangnamtha Province is a centre for commerce between China, Laos, and Thailand.

Figure 4: Location of Luang Namtha Province, Lao PDR



1.5.2 Namtha District

Namtha District is located at the north western part of Luang Namtha Province, sharing border with China in the North and Phongsaly Province in the West. It is the Capital City of the Province.

1.5.3 Ban Hat Nhao

Hat Nhao is a Hmong village located some two km from the district centre and near the main road to Muang Sing. The village is located on acid upland soils in mountainous

terrain at latitude of 21°00' N and an elevation of about 900 m. Rainfall averages 1,500 mm and is concentrated in May-October.

The village was established in 1975. Presently there are 91 households in the village with a total of 156 families. The total village population size is 874 people of which slightly over half are females. According to the Head of the village information about 44 percents of the village households are consider as well off, almost a quarter are less well off, and about a third are in the mid level.

In the first phase (1994-1996) 341 hectares were planted with rubber trees but about 75 hectares were killed by a heavy frost in 1999. In the second phase (2003-05) a further 296 hectares were planted. The tapping of 266 hectares land commenced in 2002 making Hat Nhao the first rubber-producing village in Laos. It is reported recently that there is an increased in land demand for rubber tree plantation. The household were given land based on available household labor to cultivate rubber trees in a contiguous zone (zonal approach). It is considered as old fallow in the classified agricultural land of the village.

1.5.4 Ban Houay Dam

Ban Houay Dam is a Khmu village situated on the main road to the Boten border and closer to the border of China. The village was established about 120 years ago by Khmu people. They came from three respective provinces, namely: Phongsaly, Luang Prabang, and Houa Phan. Currently, the village has 62 households with 70 families. The total population is 363 people. The village is next to the Houy Dam stream in a relatively narrow valley, particularly to the east where the hills rise fairly steeply. The elevation of the village is 713 masl and the location is 210, 3.0 N 1010, 35.E.

The village involvement with rubber tree began in 1995, the villagers was introduced and trained about rubber by a technical from the LNT PAFO and training was provided in Muang La, China.

2. Literature Review

2.1 Rubber History

In the early 1900s up to 1912, profits accrued from rubber production allowed investors to recover their capital investments within 2-3 years of production. From the onset of the First World War until the middle of the 20th century, although rubber prices were substantially lower, it was still commercially profitable to engage in the production.

A decline in the late 1970s in world demand for rubber was further compounded by a world recession and a stagnant world commodity market; however it was corrected by strong recovery in the mid-80s. This prompted all Natural Rubber producing countries

to ratify an agreement reached in 1981 during the first International Natural Rubber Agreement (INRA 1), which made provisions for stabilizing the world price of rubber by maintaining a large international buffer stock which accumulated during low prices and were disbursed when prices were high.

The rubber industry was established in South and Southeast Asia at the end of the 19th century after the rubber tree, *Hevea brasiliensis*, was introduced from its native South America. Rubber plantations around the world presently cover some 9 million ha, with almost 95 percent in Asia and more than 75 percent of the three largest producers are Indonesia, Thailand and Malaysia. Further Asia-Pacific producers such as China, India, Vietnam and Sri Lanka account for another 18 percent.

2.2 World Rubber

Rubber trees are generally grown on large estates or in smallholdings, the latter often in rubber-based agroforestry systems. Smallholdings dominate Asia, with shares of 96, 86 and 84 percent in Thailand, Malaysia and Indonesia, respectively. Only in Vietnam, China and Papua New Guinea do estates account for more than half of the total area. Estate rubber areas have been declining throughout the region, a trend that will likely continue in the medium term, largely because of the higher profitability of other crops, such as oil palm. Due to its susceptibility to insect and fungal attacks, rubber wood has to be processed shortly after the trees are cut. Many experts have argued that rubber wood cannot be economically produced from remote and fragmented smallholdings, even though smallholder resources are usually included in projections.

Rubber wood has traditionally been used for fuel wood and charcoal in rubber processing, steel industries, tobacco curing and brick manufacturing. Most rubber wood has been burned at the clearing site, except in the wood-scarce countries of South Asia. Although there exists a large number of rubber tree clones with different properties, they are generally replanted after 25-35, when they yield 100-200 m³ per hectare, the lower ranges being more typical for smallholdings.

Large-scale industrial utilization started with sawn wood production in Malaysia and Thailand during the 1980s. Malaysia has promoted the development of its downstream rubber wood industry with an export quota and in 1994 a complete ban on sawn wood. Consequently, Malaysia has the most diversified rubber wood industry with various types of wood-based panel plants and furniture mills. Today, apart from traditional uses, rubber wood is used primarily for furniture, furniture parts and wood-based panels.

The furniture market in rubber wood in Thailand accounts for 60 percent of total production of wooden furniture. The production of rubber wood furniture is predicted

to increase as a result increased in demand from foreign market. Assuming the growth of rubber wood processing grows by 8 percent/year in Thailand and Malaysia and no growth from other countries using rubber wood then rubber wood in Laos can potentially meet the demand in Thailand due to completion of the North-South Economic corridor that provide potential markets for latex and rubber wood to access other markets beside the Chinese market.

There is limited information about rubber wood utilization. The most recent comprehensive study was carried out by the International Trade Center in the early 1990s. Consumption of rubber wood logs in 1991 was estimated to be about 2.5 percent of Asian tropical log production or 4.6 million m³, most of which was used by sawmills. In 1993, the wood-based panels sector used some 1.1 million m³ of rubber wood, in large part because of the rapidly growing MDF sector. Thailand, Malaysia and Indonesia in 1994 had a total of 12 MDF plants, out of which six were rubber wood. Six more were planned for the following three years.

It is very likely that the above figures have increased since the early 1990s, although the 1997 Asian financial crisis and its aftermath have probably somewhat dampened rubber wood's development. According to various estimates and projections, today's combined rubber wood log availability in Indonesia, Thailand and Malaysia alone is more than 6.8 million m³.

Environmental concerns in consumers will increasingly shift preferences to wood products obtained from plantations. This will give rubber wood an advantage over some of the more traditional tropical woods used in furniture and wood-based panel manufacturing. Recent strides in rubber wood plantation certification confirm this development. On the other hand, rubber wood has to be able to compete with increasingly abundant softwood plantation species, particularly New Zealand pine.

Where rubber tree planting programs are effective and economically accessible, rubber plantation areas can be maintained, as in Thailand, secure rubber wood supplies can provide the investment security necessary for expanded rubber wood utilization. In Thailand, for example, potential sawlog and sawn wood availability is projected to increase from 2.8 million m³ to 4.18 million m³ and 0.84 million m³ to 1.25 million m³ from 1997 to 2012, respectively. Further, the Asia-Pacific producers including China, India, Vietnam and Sri Lanka together account for another 18 percent. Indonesia, Thailand, China and Vietnam are increasing their production, while Malaysia and Sri Lanka are experiencing a decline⁶.

⁶Adrian Whiteman, Joerg Balsiger, Jamal Bahdon, "Asia-Pacific Forestry Sector Outlook Study: The Utilization, processing and demand for Rubberwood as a source of wood supply", Forestry Policy and Planning Division, Rome, Regional Office for Asia and the Pacific, Bangkok, December 2000.

2.3 Regional Examples

2.3.1 Bangladesh Case Study

The Rubber Rehabilitation and Expansion Project was conceived in the context of the Government's policy to produce rubber in the Chittagong and Sylhet regions in Bangladesh on land which is unsuitable for food crops. Rubber was promoted for its potential to generate employment and save foreign exchange. Through the rehabilitation of 5,100 hectares (ha) of existing plantations and new planting of 5,048 ha (of which 3,790 ha would be on four new estates), the project was expected to yield 11,500 tons of dry rubber annually during peak years of the plantations.

The project was supported by a bank loan of \$20 million, approved in August 1980. The Government-owned Bangladesh Forest Industries Development Corporation (BFIDC) was the Executing Agency for the project. Overall, the project is considered unsuccessful; however, it has demonstrated that high-yielding rubber trees can be cultivated in Bangladesh. Recent private sector involvement in rubber production has indicated that rubber plantations, if properly and professionally managed, could be a financially viable venture.

Experience from the project suggests the need to carry out a domestic resource cost analysis to determine the conditions that would make it profitable for Bangladesh to promote rubber production to substitute imports. The promotion of rubber production should be based on the results of research and scientific experiments on various agronomic aspects of rubber cultivation under local conditions. The reevaluation findings also indicate that a conducive policy environment needs to be created to stimulate active private sector involvement in development of the rubber sector. The Government should (i) develop an efficient marketing system for rubber products, (ii) adopt land use policies allowing long-term leases of unutilized public land for rubber plantations, (iii) improve basic infrastructure in rubber growing areas, (iv) institute a regulatory framework to strengthen Bangladesh's competitiveness in rubber production, and (v) review the role of BFIDC and initiate measures to privatize BFIDC's rubber estates.

Rubber plantations in other Asian countries have demonstrated that women can be employed especially in tapping and nursery activities. Women are generally believed to be more adept in handling bud grafting, bud-bank maintenance, and tapping. In Bangladesh, however, women's work in plantations is discouraged by social and cultural tenets. Women have benefited indirectly when families were accommodated in plantation housing. Even if the accommodation remains below the envisaged standards, there are benefits from reliable water supply, availability of firewood and electricity, provision of transport in medical emergencies, and facilities for schooling on or near the plantations.

If large contiguous tracts of land are converted into monoculture rubber plantation, the natural biodiversity could be disturbed or destroyed, with long-term negative environmental effects. Damaging effects could also result from the unbalanced use of fertilizers, eventual exhaustion of the natural soil condition, and possible contamination of runoff water. Furthermore, the substantial amounts of water used in the processing of raw latex are contaminated with acidic chemicals. This water is neither treated nor is its disposal controlled. The government agency concerned needs to monitor closely the environmental impact of rubber plantations. The smoking of treated and pressed rubber sheets requires substantial amount of wood, most of which has to be purchased by the plantations. Replanting of trees for firewood should be promoted.

Nevertheless, there are positive environmental effects when barren or grass-covered slopes, which cannot revegetate and would be vulnerable to periodic grass fires, are brought under rubber cultivation. Terracing and planting of rubber trees under the project proved to be technically feasible and environmentally acceptable measure to prevent further degradation. The soil is protected from erosion, and the growing trees shed leaves and branches, which, if left to decompose naturally and return the nutrients to the soil. If nitrogen-fixing ground cover is cultivated in the plantations, the environmental benefits can be further increased.

2.3.2 China Case Study

Xishuangbanna, a tropical mountainous prefecture of Yunnan Province, bordered by Myanmar in the west and Laos in the south, has become the second biggest locus for natural rubber production in China at the expense of its rainforests since the 1950s, when the People's Republic of China established ten state-run rubber tree plantation farms.

A study had been done to describe and analyze the dynamic changes in natural resource management (including land-use practices in agriculture and forest management) by the Akha people in Daka and Baha Villages, Xishuangbanna during these transformations⁷. The Akha, a Tibeto-Burman speaking group, formerly practiced subsistence shifting cultivation until recently; they have now taken up intensive cash cropping, specifically rubber tree plantation. Rubber was first introduced into Xishuangbanna in 1948, but the plantation was initiated since 1953 after professional inventory and programming. The rubber plantations mainly consisted of state farm and rural plantation in Xishuangbanna. The development of state farm is divided into five different phases. The first phase investigates land resource suitable for rubber plantation including experimental plantation from 1951 to 1955. The second phase establishes the state farm and undertake productive plantation from 1956 to 1961. The third phase adjusts the state

⁷ Fu Yongneng, Guo huijun, Chen Aiguo, Cui Jingyun, "Rubber development by smallholder farmers in Xishuangbanna, Yunnan, China, a case study from Daka and Baka", Xishuangbanna, Yunnan, China, 2006

farm and enhances techniques of management and plantation from 1962 to 1969. The fourth phase investigates the natural environment suitable for plantation and the chilliness resist plantation technology from 1970 to 1976. The fifth phase carries out the chilliness resist plantation technology in rapid and high standard plantation. At the same time, reform tapping system was implemented to improve economic profit from rubber trees.

To determine suitable spatial arrangements for planting rubber in order to facilitate long-term rubber-based intercropping systems. For example, (1) single row; (2) double row; (3) three row systems; as well as, (4) three plant triangular; (5) four plant square cluster systems of planting.

3. Findings from Lao Studies

3.1 Situation and Trends of Rubber in Lao PDR

The world increased in demand for rubber has stimulated strong market prices. In recent decades the uplands of Southeast Asia have experienced major changes due to economic growth in the region. This change is a result both of increasing integration with the regional economies of Southeast Asia, particularly southern China, including government policies directed towards upland development (Thongmanivong and Fujita, 2006). Most of the changes in agriculture have been driven by market forces and foreign investors, particularly from China. The government policy of stabilizing slash and burn shifting cultivation practices, halting opium puffy cultivation and improving road access has helped drive the change. Foreign investors see the abundant land of Laos as offering good potential for rubber production. The expected rubber tree planting is from 180,000ha to 200,000ha by the year 2010⁸. The northern part of Lao would be the most cultivated areas, followed by the Southern and Central Lao (see Figure 5).

Figure 5: Rubber Planting by Region in Lao PDR

Rubber planting by region in Lao PDR		
Region	Current (ha)	Planned area by 2010 (ha)
Central	1,500 - 2,000	10,000
Southern	2,500 - 3,000	50,000
Northern	7,000 - 7,500	120,000
Total*	11,000 - 12,500	180,000

* Estimation is based on interviews with PAFOs across the country. Currently planted area ranges between 11,000 to 12,500 ha while planned area for rubber ranges between 180,000 to 200,000 ha.

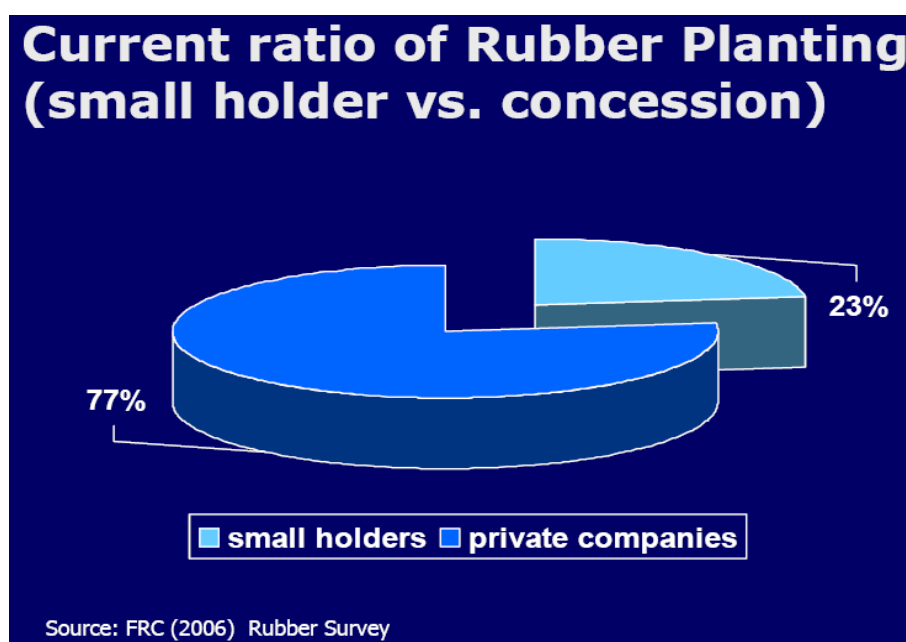
Source: FRC (2006) Rubber Survey

⁸ Source: National Agriculture and Forestry Research Institute (NAFRI) 2006, Vientiane, Lao PDR

In Northern Lao transition underway from subsistence production based on shifting cultivation to commercial production. The most extensive and rapid change in the uplands of Northern Lao is the expansion of smallholder rubber. This has been made possible due to robust global demand for rubber, especially from China, and the interest of foreign investors from China, Vietnam, and Thailand. While rubber provides an attractive investment opportunity for foreign investors, the Lao government envisages it as one of the options in stabilizing shifting cultivation, stopping opium production and generating income for upland farmers. However, with a relatively small area having been planted with rubber and an even smaller area in production, there is little information currently available on the potential economic returns to smallholder producers that can be used as a basis for the promotion of the crop by the government (Manivong et al, 2003).

Rubber is planted rapidly in both small and large scale throughout Lao PDR. Private capital, almost entirely foreign, from small scale business to large companies is the primarily catalyst of rubber expansion in the country (see Figure 6).

Figure 6: Current Ratio of Rubber Planting (Small holders vs Concession)



There is modest knowledge about rubber trees either by the private and public sectors. The Ministry of Agriculture and Forestry is still studying the planting of rubber trees and processing of the rubber latex in order to provide the necessary technical support to Lao farmers. Initial research related to rubber has just been initiated at the central level. A Vietnamese research institute and NAFRI have performed a land suitability study in the south, focusing on rubber and cashew nuts. They had identified suitable land for rubber tree cultivation in five provinces (Savannakhet, Saravan, Sekong, Attapeu and Champasak). Furthermore, credit and institutional support available to assist Lao

farmers wishing to plant rubber tree are still insufficient or inadequate. Consequently, the Lao government seeks foreign capital and investment from China, Thailand and Vietnam.

3.2 Relevant Policies, Legislation and Economic Incentives

“A top priority for the Government of the Lao PDR is to modernize the agriculture and forestry sector in a manner that fully meets sustainable practices and that achieves food security and better livelihoods for all Lao people. The goal of poverty eradication and graduation from LDC status by 2020 depends on a more productive agriculture and forestry sector. Farming defines the character of the country and working the soil, and raising of livestock and fishery are second-nature to the Lao multi-ethnic population. It is a character that the government is committed to protecting. In addition to strengthening the quantity and quality of agricultural output, this requires management of the Lao PDR’s forests in a manner that both conserves this essential resource and encourages sustainable forestry practices⁹”. Article 19 of the National Constitution stipulates the roles of all Lao citizens, entities to protect the national environment, and several sectoral laws have been also promulgated, such as the Agriculture, Forestry, Environment, Water, Health, Industry and other laws. Several national priority programs have been promulgated and implemented, such as on Land and Forest Allocation Program.

Rubber is expanding rapidly in Lao that concerned public institutions have not had the opportunity to formulate and issue relevant policies, legislation and economic incentives related to rubber in order to ensure sustainable rubber development, which can contribute to the national poverty alleviation programs. However, there are clear government policies on the sustainable development of the country focusing on the harmonization of the three main 2020 economic plans: the National Socio-Economic Strategy and the National Five Years Socio-Economic Plans; the National Growth and Poverty Eradication Poverty Strategy (NGPES); and the National Environment, Forestry, Agriculture, Road, Health and Industrial Strategies.

3.3 Lao Rubber Studies Findings

According Stevan Schipani, an expert in Sub Mekong Tourism Development Project, Luang Namtha - UNESCO, eco tourism might be a better option than rubber tree plantation contributing to poverty alleviation in Luang Namtha province. The study estimates the financial benefit from eco tourism around the protected area. This kind of tourism provides valuable benefit to local people as well as contributing to natural resources and traditional culture protection. Rubber tree plantations near the protected

⁹ Committee of Plan and Investment – CPI, “National Growth and Poverty Eradication Strategy”, p.58, Vientiane, Lao PDR

area may generate less household income and engender negative impacts to biodiversity resources in the long term. However, there is potential possibility to develop both eco tourism and rubber tree plantations in Luang Namtha, but this can not be developed at the same place and at the same time.

A study on the economics of smallholder rubber production in Northern Lao by Manivong and Cramb (2007) has shown that given current market conditions and subsidized credit support with low interest rates, investment in smallholder rubber production in the uplands of Northern Lao can be profitable. Rubber can be considered as one of potential alternatives for poor upland farmers, in line with the government policy of stabilizing shifting cultivation and supporting new livelihood options in poverty reduction. There are also other areas in Luang Namtha Province that appears to be economically suitable for rubber. The role for government, as in other countries where smallholder rubber has played a significant role in rural development, is to ensure the provision of good quality planting material and financially assistance to smallholders including roads and marketing of rubber.

A NAFRI report on the "Intercropping with Rubber for Risk Management" has pointed out that rubber intercropping could minimize environmental risks of rubber monoculture and increase rubber yield productivity in both short and long term, according to intercropping system experiences in Asia, such as rubber and livestock; rubber and tea; rubber and food crops (rice, maize, cassava, peanuts and banana); rubber and cash crops (tea, coffee, sugarcane, pineapple, chili, cardamom and medicinal plants). For example, Lao could adopt the rubber-cardamom agro-forestry system and the rubber-tea agro-forestry system. The advantages of intercropping include: (i) increased in income; (ii) improved ecological sustainability and rubber yield because of reduced runoff and soil erosion; (iii) buffering the microclimate for rubber trees and maintenance of moderate temperatures at the northern end of rubber's climatic range; (iv) intercropped rubber has approximately 21 times less soil erosion than slash-and burn agriculture and about 17% less than mono-cropped rubber. The introduction of intercropping in the Northern, Central and Southern parts of the country could steadily contribute to sustainable rubber development in the Lao PDR.

In 2005, the Lao-German rural development program in the mountainous areas of Northern Lao carried out a study on technical and ecological aspects of the cultivation of *Hevea brasiliensis* at Muong Sing, Luang Namtha Province. It analyzed the cultivation practices in order to make recommendations for technical viability, economic feasibility and assessed legal criteria of contract formulations between small farmers, Chinese companies and district agricultural authorities. The study showed that the poorest villagers would be abused by foreign and local rubber private sectors if there are no appropriate protective measures from the Lao government. In addition, there will be a potential social issue, such as migration of labors from neighboring countries in the near future to work in the rubber plantations.

4. Methodology and Data

4.1 Data collection

Secondary data and information were collected from concerned institutions and persons, such as the NAFRI, the Ministry of Agriculture and Forestry (MAF), the Ministry of Industry and Commerce, Department of Foreign Investment of the Committee of Planning and Investment (CPI), the National University of Lao, the Environment Department of STEA, IUCN, FAO, NGOs, Civil Societies, Luang Namtha Province and others. In addition, a focus group discussion was held at the Environment Research Institute (ERI) with relevant staffs from NAFRI, the Faculty of Forestry and key stakeholders to prepare for the field work including, formulation of the questionnaire and the selection of targeted population from the province, district and villages to be interviewed.

Two villages were selected for this study with a total of 91 households in Ban Hat Nhao village and 62 households in Ban Houay Dam. The total number of households (n) included in the survey was determined by the following the formula:

$$n = \frac{N}{1 + Ne^2}$$

Where: n = sample size;
N = total number of households in the area; and
e = desired margin of error

A total number of 74 households in Ban Hat Nhao and 54 in Ban Houay Dam were interviewed using a structured questionnaire. The interviewed households included both those who planted and those who did not plant rubber trees. In addition, relevant personnel from the Provincial Divisions, such of Agriculture and Forestry, Planning and Investment, Water Resources and Environment Office, the Governor Cabinet, head of concerned villages, as well as senior officials were also interviewed.

A focus group meeting was conducted at the target sites. The main purposes of the meeting were to: (i) inform key stakeholders in the targeted province and villages on the main purposes of the study; (ii) obtain relevant information from these key stakeholders pertaining to the survey questions, and (iii) to revise and finalize the questionnaire before the interview.

5. Results and Discussion

After completing the field survey, the team compiled and analyzed the data using SPSS and excel. The study examines the socio-economic and environment impacts arising from rubber tree plantation in Villages Hat Nhao and Houay Dam.

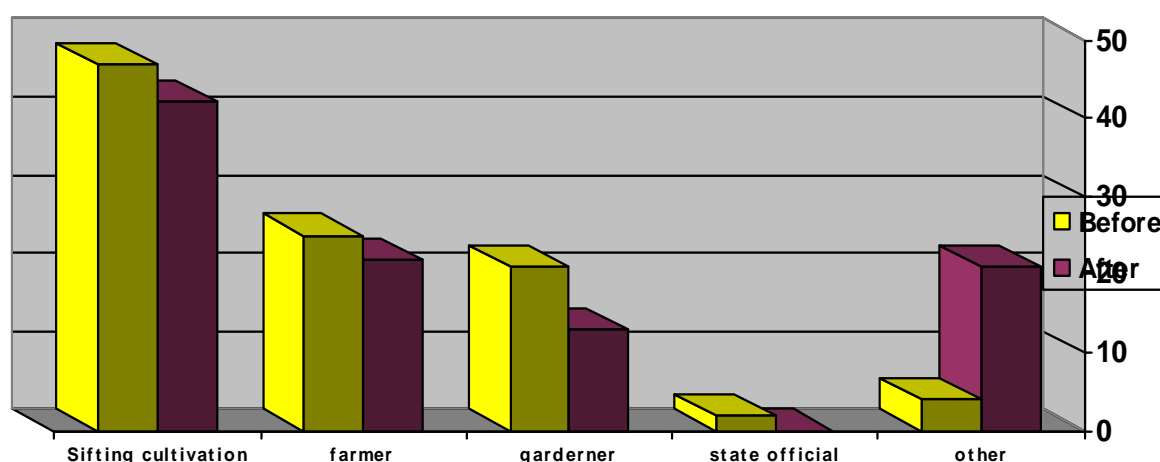
The research team undertook an intensive five days field study at Ban Houay Dam and Hat Nhao. The team interviewed the heads of targeted villages and households in both villages, as well as key relevant local authorities and private sectors in Nam Tha District and Luang Namtha Province using a structured questionnaire (see appendix).

5.1 Ban Houay Dam

5.1.1 Social Impacts

The team interviewed a total 52 households in Ban Houay Dam village. Most interviewees were between 18-40 years old. The main occupation of the respondents before and after rubber tree planting include shifting cultivators, farmers, gardener and state officials (see Figure 7).

Figure 7: Occupation of Respondents Before and After Rubber Tree Plantation in Ban Houay Dam



The village involvement with rubber tree planting began in 1995 with the technical assistance of Luang Namtha Provincial Agriculture and Forestry Office (PAFO) which provided the initial rubber tree planting training to interested villagers and sending one representative to be have further 10 days training in China.

At the beginning, only 18 households decided to plant rubber and created a committee prior to planting, establishing regulations to control cattle, such as obliging fencing and setting penalties for cattle owners who did not control their stock. The latter regulation penalized cattle owners the cost of each seedling their cattle ate.

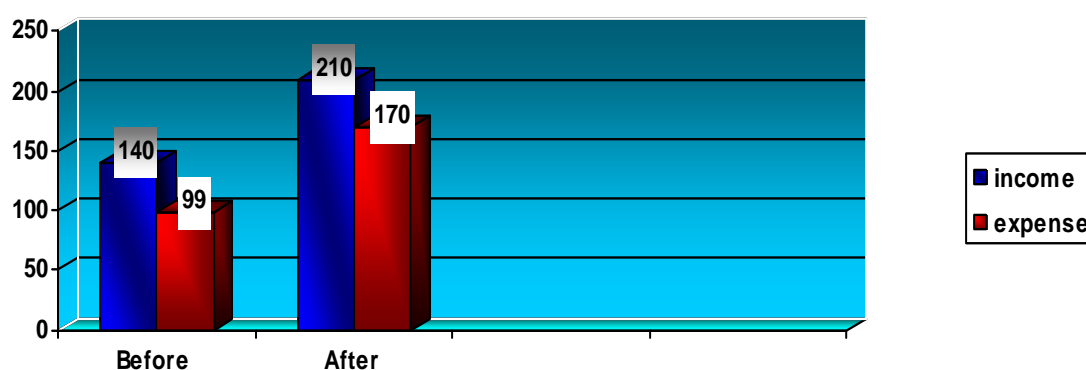
Most rubber small holders in Ban Houay Dam village do not possess adequate knowledge on the appropriate way to plant rubber trees. However, the small holders in Ban Hat Nhao have more technical experience in rubber tree planting and tapping latex.

Therefore, Ban Houay Dam small holders rely on Ban Hat Nhao experiences to assist them in tapping the latex. Women are also heavily involved in planting, maintaining small rubber trees, tapping, and harvesting in addition to taking care of their children and household duties. Furthermore, children, from the age of 12 years and older also help in the rubber plantation.

5.1.2 Economic Impacts from Rubber

The main household incomes are from gardening, livestock and shifting cultivation before planting rubber trees. The average household income is about US\$140 per month. With rubber tree plantation, the monthly household income is increases to about US\$210 per month. Figure 8 shows the difference between the households' income before and after rubber tree plantation.

Figure 8: Household income before and after rubber tree plantation (Ban Houay Dam Village)



The increased in the households' expenses were mainly from the fertilizers, tools for tapping latex from rubber tree, rubber seeds, and other related costs in order to ensure good rubber productivity (see Table 1). There are clear evidences that those who have been selling their rubber latex have better standard of living than the others who do not posses rubber tree plantation and rely on shifting and restraint cash crop cultivation.

Small holders borrow from various sources, such as the Agriculture Promotion Bank, and the Foreign Rubber Companies. However, majority of the small holders would prefer to borrow from Chinese Rubber Companies in form of rubber seedling and reimbursing with rubber latex.

Table 1: Average Households Expenses Before and After Rubber Tree Plantation

Expense	Before rubber tree plantation	After rubber tree plantation	Unit
Total sample	39, 430, 000	68,630,000	Kip /Month
Average	986,000	1,670,000	Kip /Month

5.1.3 Environment Impacts

The respondents reported some changes in weather, such as the climate is warmer than usual and the rainy season comes later since planting rubber trees in the village. There is also some external pressure on their land use and forest resources. For example, some local businessmen have attempted to get concession on their agricultural and forested land for rubber tree plantation purposes.

In addition to planting rubber, the villagers practice their shifting cultivation, gardening and collecting NTFPs in the forest but at a lesser extent than before. They still plant rice, maize, and other crops. However, the rubber monoculture in the village would bring cumulative impacts in the long term, specifically if this be expanded to the protected areas in the village, if there are no appropriate actions or measures taken to prevent such rubber cropping.

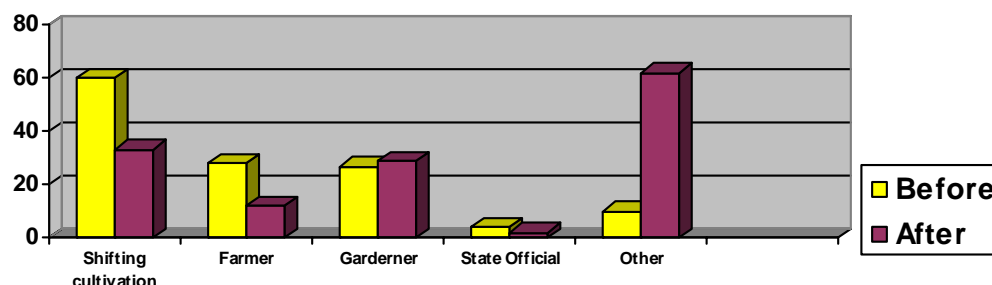
5.2. Ban Hat Nhao

5.2.1. Social impact

The interview covers 76 households including 69 men and 7 women. The interviewees are between 18-60 years old. The occupation of the respondents in the village is mainly housewife (27%) and farmers (24%) (see Figure 9).

Before the introduction of rubber tree plantation campaign in Ban Hat Nhao, villagers mostly do shifting cultivation, gardening, and are provincial and district public officials as well as working at the private sectors.

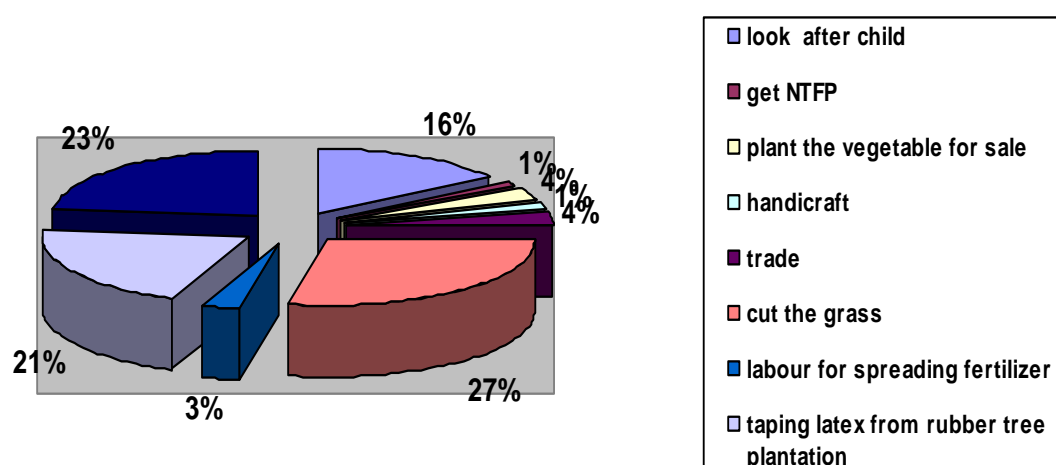
Figure 9: Respondents Occupation Before and After Rubber Tree Plantations in Ban Hat Nhao



More than 96 percent of households in the village engaged in rubber tree plantation to their 16 years experiences in planting rubber trees. Production has rapidly increased since the first sale of latex in 2003. In addition, there were more advertising campaigns from the core rubber producing companies which buy all latex produced and provided technical assistance rubber tree growers.

On the average the labor for land preparation, nursery work and the planting of the trees for one hectare required 436 persons, from household labour and hired labour. Similar to Ban Houay Dam village, women are also engaged heavily in rubber tree planting and processing (see Figure 10).

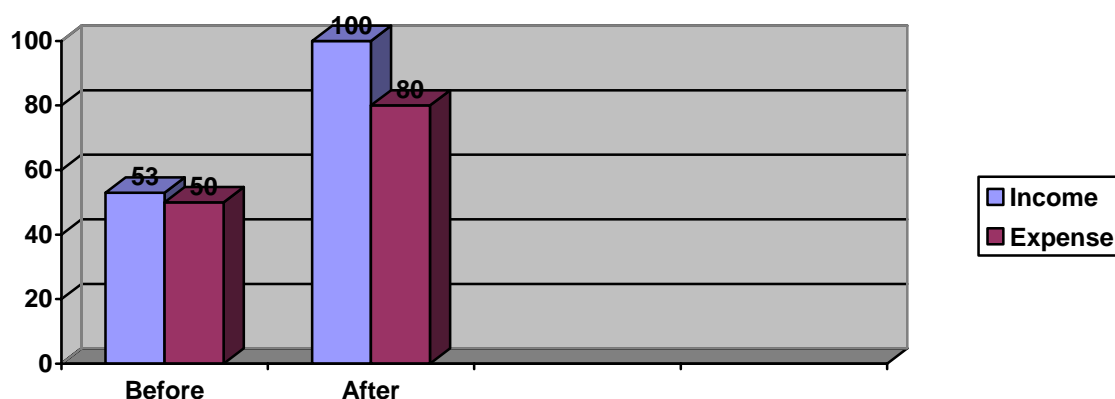
Figure 10: Women Occupation after Rubber Tree Plantation in Ban Hat Nhao Village



5.2.2 Economic impact

Before selling rubber product, the income for each household in Ban Hat Nhao village averages US\$53 a month. Since the introduction of rubber tree planting the average household income has increased to almost US\$120 (see Figure 11).

Figure 11: Ban Hat Nhao Household Income and Expenses Before and After Rubber Tree Plantation



Initially 47 percent of total of respondents use their own money to plant rubber trees while others borrow from the Agricultural Promotion Bank. Moreover the local people in the village strongly believe that rubber tree plantation can provide them a better living standard.

Fifty-one percent of the small holders are members of the rubber sale group who received some benefits from local buyers or rubber companies who go directly to the farms to buying latex. The price of seeds is cheaper compared to the market price. On other hand, the price of latex is decided by traders. Local small holders on average tap 620 kilograms of latex per month. The highest weight of tapping latex can reach 4,000 kilograms and the minimum is about 100 kilograms a month. The price ranges from US\$ 0.5 to US\$ 1.0 based on the bargain between latex buyers and local small holders. Some Chinese rubber companies provide seeds and training to local growers and the share of yield for both local the growers and the company is 50/50 (grower 50% and company 50%).

5.2.3 Environmental impact

Similarly to Ban Houay Dam villagers, Ban Hat Nhao villagers also reported climate change. They notice small change on wildlife population, such as lesser birds and local rats, decrease in insect population particularly in the rubber tree plantation areas. About 44.7% of respondents reported that the elder persons could not stand to be near the rubber trees due to their unpleasant odor, which causes them headache. Moreover,

some cows and buffaloes died from the indigestion eating the rubber tree leaves. The size of the mono rubber tree plantation in Ban Hat Nhao is much larger than the one at Ban Houay Dam. This would be a high risk to cumulative environment impacts in the future if no any appropriate measures are undertaken, such as introducing a mixture rubber tree planting with other crops similar to those in Indonesia, Thailand and specifically in China, where the geographical and ecosystem are quite similar to those of Ban Hat Nhao and Ban Houay Dam.

6. Summary and Conclusions

Due to the very rapid expansion of rubber tree plantation in the country, there are no any relevant regulations to ensure sustainable of rubber tree development. There are clear policies and appropriate incentives to enable local farmers to access loans and information on world rubber markets. There is also a lack of study on: (i) the appropriate technology or techniques to select and develop relevant rubber species or varieties as well as planting and tapping the rubber trees; (ii) the socio-economic and environment impacts including the costs and benefits of rubber tree plantations; and (iii) the identification of appropriate foreign markets and traders that could benefits local small holders.

The Ban Houay Dam and Ban Hat Nhao cases have revealed the risk exposures of Lao rubber farmers to foreign and local rubber private sectors due to their poor knowledge in rubber processing, including rubber value added products. They also lacked an understanding of the rubber world market because many of the small rubber holders have little education.

Rubber tree plantation could be developed in a sustainable manner according to experiences from other countries in the region, such as Indonesia and China which practice inter-cropping. These experiences would have to be studied properly before introducing to the Lao's rubber tree growers. Research on the appropriate rubber technology transfer is still at the infancy stage. Relevant legislations have not been promulgated in order to ensure protection of small rubber holders' rights and benefits.

The findings from this research have some policy implications to concerned authorities at the central and provincial levels on developing rubber tree plantations in the country.

The villagers are directly exposed to economics abuse from foreign and local rubber investors or traders due to their lack of experience in planting rubber tree and processing rubber latex. Furthermore, the rubber tree growers lacked an access to credit to develop their rubber tree plantation. The roles of local banks, such as the Agriculture Promotion Bank should be encouraged to actively engage in assisting the small rubber

holders in obtaining competitive loans. The risks of rubber mono culture, specifically its cumulative impacts on the daily life of small rubber holders living in the remote areas should be addressed by the local authorities critically. The northern part of the country is mostly mountainous with high slope and rubber plantation areas would be highly exposed to mud sliding during heavy rainy season, as it has occurred in some neighboring countries. Moreover, rapid expansion of rubber at a large scale could affect the forested areas and their biodiversity resources.

6.1 Policy Implications

In order to steadily promote and develop rubber tree plantation in a sustainable manner, including poverty alleviation, halting opium production, stabilizing slash and burn shifting cultivation and protecting the environment, several strategic options have been proposed:

- a Farmers, both male and female, need to be trained in all aspects of para rubber tree cultivation practices, including: establishment, maintenance, tapping, processing, marketing, and timber sales and negotiation. Farmers should be made aware of the opportunities, costs, and returns in selling other forms of rubber with value added, such as clean cup lumps, raw rubber sheets, raw liquid latex, and smoked rubber sheets. There also needs to be training on rubber grower association formation, which could potentially lead to a rubber cooperative or appropriate agro community base, where they would have the opportunity to learn more about the rubber market.
- b Clear policies and appropriate measures from the Agricultural Promotion Bank to enable the farmers, such as rubber small holders to obtain loan with low interest and repayment scheme;
- c Local Community- Extension-technology transfer research interaction is vital. Extension staffs should constantly be in contact with rubber researchers and local small holders, such the proposed Luang Nam Tha Experiment Station representing the Northern part of the country, and NAFRI networks representing the Central and Southern part of the country. This includes relevant field information concerning opportunities in rubber, problems and constraints in technology transfer research program. Technology transfer could rely on China, Thailand, Vietnam or Indonesia, such as inter cropping, high yield rubber tress, and prevention of environment impacts such mud sliding and soil quality.
- d Land concession to foreign and local investors in rubber tree plantation at a large scale should be addressed by the local governments. This includes promulgation of relevant pieces of legislation ensuring the rights and profits of small rubber holders, including land tenure

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