Rubber: Costs or Benefits to the Lao PDR?

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Contents

List of Tables and Figures

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ABBREVIATION

ADB	Asian Development Bank
Arc GIS	Association of Southeast Asian Nations
ASEAN	Association of Southeast Asian Nations
BCR	Benefit Cost Ratio
BFIDC	Bangladesh Forest Industries Development Corporation
CBA	Cost Benefit and Analysis
CP	Cleaner Production
EEPSEA	Economy and Environment Program in South East Asia
ERI	Environment Research Institute
FAO	Food and Agriculture Organization
FDG	Focus Group Discussion
FDG	Focus Group Discussion
FRC	Forestry Research Center
GDP	Gross Domestic Product
GIS	Geographic information system
GMS	Great Mekong Sub Region
GPS	Global Positioning System
GPS	Global Positioning System
IRR	Internal Rate of Return
IUCN	International Union for Conservation of Nature and Natural Resources
Lao PDR	Lao People Democratic' Republic
MAF	Ministry of Agriculture and Forestry
NAFES	National Agriculture and Forestry Extension Service
NAFRI	National Agriculture and Forestry Research Institute
NGO	Non Government Organization
NGPES	National Growth and Poverty Eradication Strategy
NPV	Net Present Value
NPV	Net Present Value
NR	Natural Rubber
NTFPs	Non Timber Forest Products
NUOL	National University of Laos
PV	Present Value
SPSS	Statistical Package for the Social Sciences
SR	Synthetic Rubber
Sumernet	Sustainable Mekong Research Network
UNESCO	United Nations Educational, Scientific and Cultural Organization
VRIG	Vietnam Rubber Industry Group
WREA	Water Resources and Environment Administration

SUMMARY

Increased world rubber consumption and attractive prices has been the dominant driving force behind the current boom in rubber markets in New Asia, (China, India and the ASEAN Countries) that has resulted in the rapid expansion of the area of rubber cultivated. Great Mekong Sub Region - GMS countries are among the six top rubber producing countries in the world[1].

Rubber tree plantations were first introduced in Lao PDR in 1930 at Bachiang District, Champassak Province (Southern Part), but it never caught the attention of policy makers, traders, business groups and other stakeholders until the end of 1990s. The high income from latex sale in 2003 by small Lao producers marked a turning point in rubber production in Lao PDR. Starting in 2004, many foreign companies have been investing in rubber trees plantations in Lao PDR. While rubber cultivation is expanding rapidly in Lao PDR, policy, regulations, planning, institutional arrangements, and information that supports these enterprise has not kept pace with developments.

There have been few studies undertaken on rubber plantations in the country, most have focused on the impacts to socio-economic, environment, and livelihood of the local communities and on appropriate techniques. But there have been no studies using the spatial data, GIS and environment economics valuation tools in assessing the sustainability of rubber production.

The overall goal of this policy study is to promote rubber development and land use in a sustainable manner. The specific objectives are to: (i) assess the current situation and trends of rubber development in Lao PDR; (ii) Identify existing relevant policies, legislation and measures in place, potential and existing socio[2]-economic and environment impacts from rubber development, and the involvement of women in rubber development; (iii) analyze the costs and benefits and costs effectiveness of rubber development[3], compare them with those of NTFPs and cash crops (paddy rice, corn or banana, etc...) accordingly to the real situation of each targeted province and villages; (iv) investigate rubber plantation in the target areas utilizing GIS mapping; (v) learn from GMS countries experiences; and (vi) provide pertinent suggestions to concerned Lao PDR policy makers at all levels on sustained rubber development and the suitable alternatives to poverty alleviation and environment's resources sustainability for further appropriate policy implications.

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[1] Thailand ranks 1st, Vietnam 5th and China 6th, while Indonesia is 2nd, Malaysia 3rd and India the 4th

[2] Social impacts study would include (i) role of women; (ii) impacts on the community livelihood; (iii) relation between owners of rubber plants and workers, and others

[3] Costs and benefits would mostly focus on land conversion of forested area to rubber tree plantation; and the cost effectiveness on the appropriate farming system, such as on the rubber intercropping. NAFRI would be in charge of studying different options of rubber farming system accordingly to its role and its research proposal. This proposal would assist NAFRI on the cost effective farming system through the use of the Environment Economics Tools. Use of this tool and analysis will be done by ERI Environment Economic Team.

Luang Nam Tha, Oudomxay (Northern provinces), and Champassack (southern province) provinces are the study targeted provinces, due to the differences of ecology, culture, history and farming systems. Two villages in each province were investigated, and the extent of women's participation was identified. Costs benefits analysis (CBA), SPSS and Excel programs were used to compare costs and benefits from cash crops/NTFPs, with those from rubber plantation (smallholder self investment, smallholders under contract farming, and large rubber concession plants).

Field findings indicated that: (i) the rubber smallholders' self investment type of model had the highest net benefit, followed by cash crop/NTFPs, rubber smallholder contract farming, while the rubber large scale benefit/costs ratio was negative, indicating that it was not profitable; (ii) Lao women play a valuable role in all households' decision making (in the case of rubber, they are also involved in the decisions related to rubber or cash crop plantation size and all related expenses and the price of latex sold); and (iii) there is weak legislation implementation, a lack of strong coordination between concerned authorities in allowing concessions for large rubber tree plantations, and issues arising from establishment of large scale rubber plantations.

According to experiences from other countries[4], rubber could be developed in a sustainable manner if there is the appropriate use of intercropping during the first three or fourth years of rubber tree plantation, law enforcement, no forest encroachment, national land use, smallholders self investment to be financially and technically supported, and the private sector to be involved in rubber processing only.

In the case of Laos, rubber tree plantation should not be systematically replicated over the entire country, and further studies need to be done in a more consistent way. Smallholders self investment might be the most suitable case to be promoted. Urgency and priority is to be given to national land use before allocating any concession to any development investment project (not only related to rubber tree plantation, including hydro power and mining development) and comparative studies on CBA within rubber, jatropha, eucalyptus, teak, eagle wood, ecotourism, hydropower and mining, should be undertaken.

[4] Bangladesh, Cambodia, China, India, Indonesia, and Vietnam

1. INTRODUCTION

1.1 Background

Increased world rubber consumption and attractive prices is a main driving force behind the boom of rubber market in New Asia, (China, India and the ASEAN Countries) as well as the rapid expansion of cultivated area. Great Mekong Sub-Region - GMS countries are among the six top producers in rubber in the world[5]. Rubber development has been considered by GMS governments as one of the appropriate options to eradicate opium, stabilize shifting cultivation and poverty alleviation in their countries[6].

Rubber provides not only valuable income to smallholders, villagers and large scale production owners, and contributes to national GDP, but it is also recognized as "green produce, such as providing very good wood products with economical price, which is highly appreciated in the world market"[7]. Nevertheless, it has been also been recognized that land conversion from forest areas to rubber monoculture has negative environment implications, such as loss of biodiversity, decreased soil quality, rapid soil erosion, and reduced carbon sink[8].

If rubber development in the GMS is not appropriately managed, it might have cumulative impacts to the livelihood of smallholders, local communities in the region and the Mekong River, such as decreased sedimentation, loss of biodiversity resources, reduced Mekong water level, etc. Tremendous research efforts from China, India, Indonesia, Malaysia, Thailand and Vietnam have shown that rubber intercropping[9] might be an appropriate solution to protect farmers from price instability and environmental risks of rubber monoculture[10].

Laos, which is at the initial stages of rubber development, could learn from experiences from these countries, such as issuing policies or legislations disfavouring forest clearing for rubber plantations and encouraging rubber growing on the farmer's own degraded shifting cultivation land[11]. This is consistent with government policies on food security, reduction of deforestation, poverty alleviation and shifting cultivation.

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[5] Thailand ranks 1st, Vietnam 5th and China 6th, while Indonesia is 2nd, Malaysia 3rd and India the 4th

[6] Kanok Rerkasem, *Uplands Land Use,* Thailand, 2000

[7] Joerg Balsiger, *Asia-Pacific Forestry Sector Outlook Study: The Utilization, Processing and Demand for Rubber wood as a source of Wood Supply,* FAO Forestry Planning and Statistics Branch, Rome, Italy, 2000

[8] John Raintree, *Intercroping with Rubber for Risk Management: Improving Livelihoods in the Uplands of the Lao PDR,* NAFRI, NAFES, NUOL, Vientiane, Lao PDR, 2005

[9] Examples of rubber intercropping systems in Asia: (i) Rubber and Livestock; (ii) Rubber and Food Crops (rice, maize, cassava, peanuts and banana); (iii) Rubber and Cash Crops (tea, coffee, sugar cane, pineapple, chili, cardamom and medicinal plants)

[10] John Raintree, *Intercroping with Rubber for Risk Management: Improving Livelihoods in the Uplands of the Lao PDR,* p.43, NAFRI, NAFES, NUOL, Vientiane, Lao PDR, 2005

[11] Raintree, *Intercroping with Rubber for Risk Management: Improving Livelihoods in the Uplands of the Lao PDR,* p.45, NAFRI, NAFES, NUOL, Vientiane, Lao PDR, 2005

Unlike other GMS countries (Cambodia, China, Thailand and Vietnam), Laos is expected to import labour from China and Vietnam for rubber tapping in approximately 20 years. Significant negative social implications could arise if they are not properly addressed through effective regulations and strong enforcement related to this issue.

Rubber tree plantation was first introduced in Lao PDR in 1930 at Bachiang District, Champassak Province (Southern Part), about 9 -13 km far from Pakse town on the road to the Bolaven plateau. The planting area was in a 4-plot design, each plot of about 0.5 hectares. The trees are still alive today at an age of 76 years old. Local people call them "*cao-su*" trees. The villagers around these plantations previously tapped the resin (latex) just for fun and used them to trap the small animals, insects and birds. Nobody paid attention to these trees and considered them as a less significant compared some local tree species.

In 1990, Patthana Khet Phoudoy Company at Khammouane Province (Central Part) introduced rubber seedlings (RRIM 600) from Thailand. The seedlings were planted in Thakek District in an 80-ha block. In 1992, the same variety of seedlings was planted in Hinboun District, Khammouane Province on 23-ha. A 400 ha plantation was established in 1994, in Hat Nhao village, Luang Namtha Province, northern part of the country. Plots of 3.5-4 ha of rubber were respectively planted in Sangthong and Thaphabath Districts, Vientiane Capital in 1996. However, rubber production has never caught the attention of policy makers, traders, business groups, and other stakeholders until the end of the 1990s.

In 2003, the high income from latex sale, rubber harvesting and marketing by some Lao producers (early rubber growers in year 1990 to 1994) was the turning point for the industry. Many rubber growers (villagers, local companies) began to find interest in the crop. During that period, in Ban Hat Nhao, Luang Namtha Province, an 8 to 9-year old rubber plantation could provide 1,360 kg/ha/year of latex equivalent to 8,840,000 kip or nearly USD 880 (based on 2005 US Dollar rate).

Starting from 2004, many foreign companies have been investing in rubber tree plantations in Lao PDR, either directly or indirectly through businesses with the government. For example, Chinese companies are prominent in the northern part of the country, while the central region is dominated by Thai companies and the southern by Vietnamese.

To date, several provinces of Lao PDR, except Houaphanh and Xieng Khuang, are reported to have rubber tree plantations or at least included in the provincial development plan for implementation. Lao PDR is currently experiencing a sudden, rapid and largely uncontrolled expansion of rubber cultivation. It is clear that demand for rubber in the world, specifically in neighbouring countries is influencing foreign investment in rubber planting in Laos. Some industry experts predict that the estimated actual 20,000 hectares of rubber plantations will increase to 220 000 hectares by 2010 in the country.

While rubber cultivation is expanding rapidly in Lao PDR, governance, including institutional arrangements, planning, policy, regulation and the information that supports this, is not keeping pace. At the same time, recent events such as the Vientiane Smallholder Rubber Workshop in June 2006 and the NAFRI Rubber Stakeholder Meeting held in December 2006 have highlighted many concerns about the economic, social and environmental impacts of the rapidly expanding sector including the rapid, unplanned and uncontrolled landscape change and lack of information, transparency, and accountability in the sector.

Few studies have been done in rubber plantations in the country, mainly on the impacts to socio-economic, environment, and livelihood of the local communities; and on appropriate techniques. However there are no studies mixing the use of spatial data and environment economics valuation tool, notably on the costs and benefits has been carried out. In order to provide pertinent data and information to concerned Lao policy makers and private sectors on the appropriate ways to promote and the development of rubber tree plantations in a sustainable manner in the country, contributing to poverty alleviation, there is a need to rely on solid social, environmental and economic proof, specifically on the costs of social and environmental damages. Since it is a perennial crop with a long pre-bearing period, the flows of costs and returns of this crop are spread over a number of years with varying magnitude. The expenditure during pre-bearing stage constitutes the investment cost on the crop, investment in this to a certain extent under uncertain economic situations. Before making such an investment growers and financial institutions should have a clear understanding about the capital and costs involved and returns likely to be received to ascertain the viability of the investment. All future cost and benefits are discounted to obtain their present value. Thus, this study attempts to determine whether costs or benefits from rubber tree plantation, if there are costs, how to reduce or stop them and if there are benefits how to develop this option.

1.2 Goal and Specific Objectives

The ultimate goal of the Study is to promote rubber development and land use in a sustainable manner in the country, which would contribute to rural households' income, national poverty alleviation and environment's resources sustainability.
The specific objectives are to:

- Assess the current situation and trends of rubber development in Lao PDR;
- Identify existing relevant policies, legislation and measures in place;
- Identify potential and existing socio[12]-economic and environment impacts from rubber development;
- Identify involvement of women in rubber development;

[12] Social impacts study would include (i) role of women; (ii) impacts on the community livelihood; (iii) relation between owners of rubber plants and workers, and others

- Analyze the costs and benefits and costs effectiveness of rubber development[13], compare them with those of NTFPs and cash crops (paddy rice, corn or banana, etc...) accordingly to the real situation of each targeted province and villages;

- Investigate on rubber plantation in target area by utilizing GIS map;

- Learn from each GMS countries experiences in this area[14]; and

- Provide pertinent suggestions to concerned Lao PDR policy makers at all levels on the sustained rubber management and the suitable alternatives to poverty alleviation and environment's resources sustainability for further appropriate policy implications.

1.3 Research Questions

In order to reach the above mentioned goal and specific objectives, the research questions are as follows:

(i) What is the current situation and trends of Lao PDR rubber tree plantation?

(ii) What are the existing policies, legislation, measures and incentives in place?

(iii) What are the main social economic and environmental impacts from the rubber tree plantation?

(iv) What are these costs and benefits from rubber development, specifically from land conversion? If there is a benefits, how to make it sustained?

(v) How are women involved in rubber development?

(vi) What relevant suggestions to be submitted to concerned policy makers at all levels for further appropriate policy implications?

1.4. Scope and Limitation

The Study focussed on three provinces, two in the Northern: Luang Nam Tha, Oudomxay, and one in the Southern: Champassack for comparative analysis, due to differences of ecology, culture, history and farming systems. Two villages in each province were investigated. GPS combined with the Environment Economic Tool, specifically the Costs Benefits Analysis, were applied for field data analysis as present in the Methodologies section.

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[13] Costs and benefits would mostly focus on land conversion of forested area to rubber tree plantation; and the cost effectiveness on the appropriate farming system, such as on the rubber intercropping. NAFRI would be in charge of studying different options of rubber farming system accordingly to its role and its research proposal. This proposal would assist NAFRI on the cost effective farming system through the use of the Environment Economics Tools. Use of this tool and analysis will be done by ERI Environment Economic Team.

[14] China, Thailand and Vietnam would be in a good position to share their experiences, including the success and failure to Cambodia and Laos

During its field work in the North, the research team faced flooding in Luang Nam Tha, which restricted them reaching the targeted village. Therefore another one with less field study was selected.

2. LITERATURE REVIEW

The literature review will focus on: (i) Rubber History; (ii) World Rubber Status and Trend; (iii) Case Studies Findings; (iv) Status and Trend of Rubber in Lao PDR; (v) Relevant Policies or Strategies, Legislations and Programs in place; and (vi) Lao Case Studies Findings.

2.1 World Rubber History

The **Pará rubber tree** (*Hevea brasiliensis*), often simply called **rubber tree**, is a tree belonging to the family Euphorbiaceae, and is the most economically important member of the genus *Hevea*. It is of major economic importance because its sap-like extract (known as latex) can be collected and is the primary source of natural rubber. The Pará rubber tree initially grew only in the Amazon Rainforest. Increasing demand and the discovery of the vulcanization procedure in 1839 led to a boom in that region, enriching the cities of Belém and Manaus. The name of the tree derives from Pará, the second largest Brazilian state that contains Belém as capital, main city and tech-financial centre.

There had been an attempt made, in 1873, to grow rubber outside Brazil. After some effort, twelve seedlings were germinated at the Royal Botanic Gardens, Kew. These were sent to India for cultivation, but died. A second attempt was then made, some 70,000 seeds being sent to Kew in 1875. About 4% of these germinated, and in 1876 about 2000 seedlings were sent, in Wardian cases, to Ceylon, and 22 sent to the Botanic Gardens in Singapore. Once established outside its native country, rubber was extensively propagated in the British colonies. Rubber trees were brought to the botanical gardens at Buitenzorg, Java in 1883.[1] By 1898, a rubber plantation had been established in Malaya, and today most rubber tree plantations are in Southeast Asia and some also in tropical Africa. Efforts to cultivate the tree in its native South America were unsatisfactory.

2.2. World Rubber Status and Trend

Rubber plantations around the world presently cover some 9 million ha, with almost 95 percent in Asia and more than 75 percent of production from the three largest producers: Indonesia, Thailand and Malaysia. Further, Asia-Pacific producers such as China, India, Vietnam and Sri Lanka account for another 18 percent. Rubber trees are generally grown on large estates or in smallholdings, the latter often in rubber-based agro forestry 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.

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 saw log and sawn wood availability is projected to increase from 2.8 million m^3 to 4.18 million m^3 and 0.84 million m^3 to 1.25 million m^3 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 decline.

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 of increased demand from foreign markets. Assuming the production 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 m^3, most of which was used by sawmills.

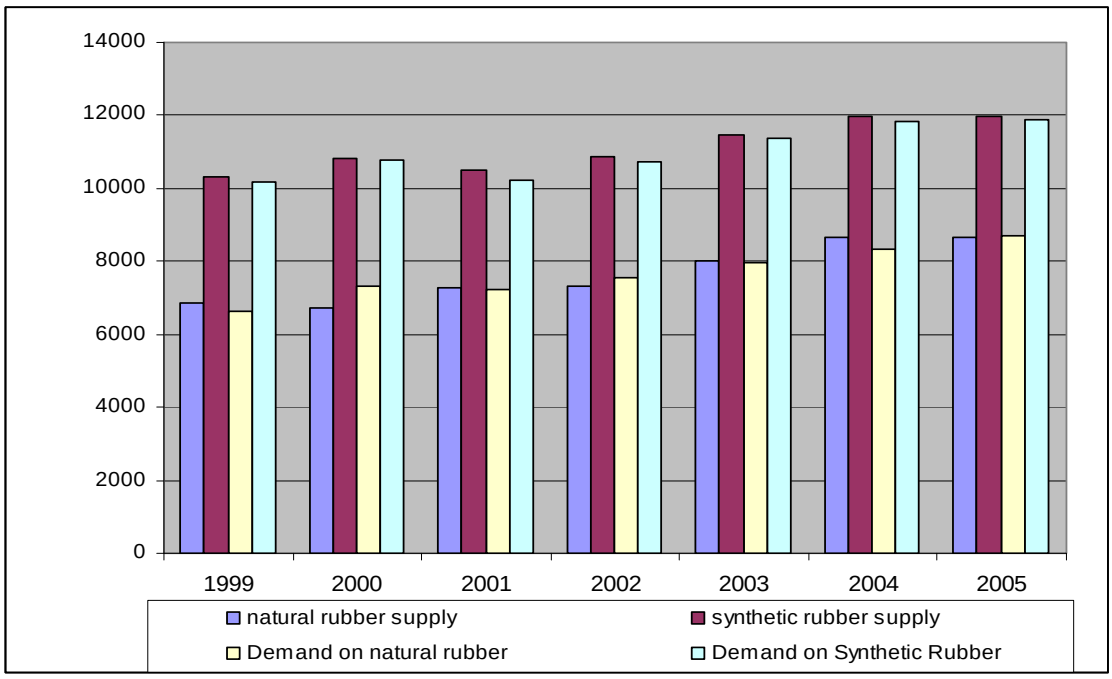
Environmental concerns amongst consumers will increasingly shift preferences to wood products obtained from plantations. This will give rubber wood an advantage over some of the more traditional tropical woods used in furniture and wood-based panel manufacturing. Recent strides in rubber wood plantation 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.

The world production of natural rubber (NR) in 2005 amounted to 8.872 million tons or an annual increase of 4.0 percent, while its demand amounted to 8.706million tons or an annual increase of 4.7 percent during 1999-2005 (see Figure 1.) The world production of synthetic rubber (SR) in 2005 amounted to 11,953 million tons or an annual increase of 2.5 percent, while its demand amounted to 11,881 million tons or an annual increase of 2.7 percent during 1999-2005 (see Figure1).

Figure1: World natural and synthetic rubber demand and supply, 1999-2005

(Unit: 1,000 tons)



Sources: International Rubber Consortium Limited, 2006

On the world market, the price would average at $2,200 per ton. The world produces about nine million tons of natural rubber a year and consumes most of it, leaving a delicate balance between supply and demand. However, a recent conference on world rubber industry in Thailand predicted that global demand would jump by more than 6 percent for the rest of the year. Thailand, Indonesia, Malaysia and Vietnam are all gearing up for a rise in production on the hope of favourable weather and better yields. But any rise in output would be absorbed by growing demand in China, India and Europe, analysts said.

Rubber prices in Tokyo have risen 44 percent in the past two years partly because of surging demand for automobiles in China, the world's second-largest vehicle market. China is the biggest buyer of Vietnamese rubber, accounting for about 66 percent of the country's natural rubber exports last year. China has to import 1.75 million tons of natural rubber for its surging tire industry this year - a near 9 percent

rise over the last year. India's tire industry is also booming and boosted imports by up to 20 percent to 100,000 tons of natural rubber in the year ending March 2008.

Vietnam, a neighbouring country of Lao PDR, earned $254 million from rubber exports in the first quarter, to mainly to China, South Korea, Japan and the U S, a year-on-year 5.6 percent down due to globally falling prices. Of the figure, $101 million came from the Chinese market, which, as Vietnam's biggest buyer, accounted for about 66 percent of the country's natural rubber exports in 2007. It was expected to ship roughly 780,000 - 820,000 tons of rubber in 2008, a rise of between 12 percent and 17 percent over the last year.

The Vietnamese government has recently supported the expansion of rubber areas even in sub-optimal regions and in neighbouring countries such as Laos and Cambodia .Vietnam's rubber plantation area is expected to rise to 1.7 million acres by 2010. The sector has over 70 latex processing plants each with a production capacity of 20,000 tons per year. "The high demand and favourable price of natural rubber in recent years has encouraged the government to support the expansion of rubber areas even in sub-optimal regions and in neighbouring countries such as Laos and Cambodia," said Tran Thi Thuy Hoa, secretary-general of the Vietnam Rubber Association. Vietnam's rubber plantation area is expected to rise to 1.7 million acres by 2010. Vietnam is considering an increase in its natural rubber output by 30 percent to 2010 by expanding plantations and improving yields at smallholders. The nation will increase output of the material used to make tires and shoes to 700,000 tons over three years from 540,000 tons last year, Hoa said. The Vietnam Rubber Corporation is the country's largest natural rubber producer with output of 325,900 tons in 2006, or 60 percent of the nation's production. The Vietnam Rubber Industry Group (VRIG) will pump US$18.7 million into processing rubber and industrial crops in Laos.

Under the 30-year project, VRIG's Quasa-Geruco joint stock company will be in charge of cultivating rubber and timber as well as building a rubber -processing plant in Laos' Savannakhet Province. Quasa-Geruco has a chartered capital of VND120 billion (US$7.5 million) contributed by VRIG's seven members. The group recently disclose a plan to spend VND2 trillion ($124.8 million) to develop 136,000 hectares of rubber trees in the Vietnamese Central Highlands provinces by 2010. Vietnam rubber prices rebound on mounting global demand. Vietnam General Rubber Corporation (Geruco) therefore forecast a steady increase in export prices in the near term, buoyed the aforesaid demand.

Vietnam's export rubber price was expected to enjoy a 10 percent jump on the world market for the rest of 2008, fuelled by increasing demand and thin supplies, analysts said. They also forecast that Vietnamese-source rubber shipments to China – the world's largest rubber importer – would see price hikes of 20 percent to US$2,400 per ton from the current $2,000.

2.3 Case Studies Findings

2.3.1 Bangladesh Case Study

The Rubber Rehabilitation and Expansion Project (ADB, reevaluation study No.28, 1997) 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 points to 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 a 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 re-vegetate 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 Cambodia Case Study

Rubber industry plays a leading role in socio-economic development in Cambodia (The NGO Forum on Cambodia). Natural rubber helps create jobs and generate income for farmers and help conserve the environment. According to the research, Cambodian rubber first started from 1910 during the colonial era on 150 hectares and the big scale started from 1921 to 1968 by big French companies and the local private sector. At present, Cambodia is one of 23 rubber producing countries in the World. Cambodia has a total planted area of nearly 70,000 ha in 2006. This size of the planted area is still small compared to total available 350,000 ha of land favourable for rubber tree plantations, especially red or basal fertile soil.

A study has been carried out on the impacts of rubber plantation in Tum Ring, Cambodia. Tum Ring is a small commune located in Sandan district in Kampong Thom province, about 230 km north of Phnom Penh. The commune is made up of eight villages, with population of around 2,000 people in 2001. Tum Ring used to have dense valuable forests and a large amount of wild animals. The commune is located in the middle of one of Cambodia's largest forest areas.

The study purpose aims to (i) identify the impacts of the rubber plantation on the local people; (ii) find out issues and constraints in the project implementation; (iii) identify whether the rubber plantation is economically profitable; and (iv) identify options and recommendations on ways to minimize negative impacts of the rubber plantation. Various methodologies and tools were used to support the study such as household surveys, participatory rural appraisal, cost benefits analysis etc.

Findings show that rubber plantation locations are inappropriate, where mature forests were the basis of local peoples' livelihoods for generations. Forests have been cleared without serious consideration of consultation with and the participation of local people, whose livelihoods have traditionally depended on shifting agriculture on forest plots and NTFP harvesting. Many villagers had traditional claims to high-value resin trees throughout the surrounding forest. People have been deprived of forest resources and their lands; they have had to take risks and to rely on uncertain returns from a long-term investment in rubber.

The project, aiming at promoting villagers' planting of 'family scale rubber', is poorly organized. Villagers have not been given any training on rubber plantation and have not been given land titles. There is no formal or written agreement between the rubber company and the local people on family scale rubber plantation, and no alternative livelihood for people during the pre-latex production period.

Furthermore, the cost-benefit analysis shows clearly that the costs have exceeded the benefits of the project, and the net present value (NPV) is negative. This shows that the project is not profitable; the development should not proceed because the large forest area yet to be cleared would incur more costs than benefits. Limiting the plantation to its current size and protecting the remaining forests would be the only option to prevent excessive negative impacts on the local people and the environment.

The study has suggested to: (i) keep the remaining forests; (ii) improve implementation of the 'family scale rubber plantation' on the cleared area; and (iii) improve the planning of rubber development in the country[15].

2.3.3 China Case Study

The study Environmental and Socioeconomic Impacts of Increasing Rubber Plantations in Menglun Township, Xishuangbanna, Southwest China (Mountain Research and Development) presents information that illustrates dramatic land use changes in Menglun Township, with special emphasis on rubber expansion. In addition, the study links these changes with socioeconomic data and the physical conditions of the township to demonstrate how the landscape and economies of the villages changed accordingly.

To support the study, a spatial database was developed from 3 sources: (i) land use and land cover maps derived from independent supervised classifications of a February 1988 Landsat TM image and a March 2003 Landsat ETM image; (ii) records from field surveys; and (iii) a digital elevation model (DEM) derived from digitized topographic maps. In addition, secondary data, including statistics on population, agricultural production, and income and expenditure between 1988 and 2003 were collected from local government offices. Local officials were interviewed for land use history and details about implementation of relevant policies. Finally, Geographic Information System spatial analysis functions (overlay, buffer, and area tabulation) were used to analyze the process and character of land use and land cover change.

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[15] Details is provided at Annex

The study found that rubber plantations were expanded rapidly between 1988 and 2003. Over this period the total area under rubber grew from 4042 ha to 13,104 ha: an increase of 324%. The majority of new rubber plantations were in forest areas (4150 ha, 42%), and fallow fields (3001ha, 23%) (Table 1).

Socioeconomic changes have also been observed and summarized in table 2. The most obvious change in the economic structure of Menglun (based on gross income) over the last 15 years is the expansion of agriculture (an increase of over 11%); this includes rubber plantations, paddy fields, fallow land, and fruit trees.

Table 1: Changes in major land use and land cover types in Menglun from 1988 to 2003. Figures given show area (ha) per type and year, and relative change

Index (R). The bolded R values are equal or close to 1 or –1, indicating a very significant change (increase or decrease) in area

Area(see figure1)	year	land use type and relative change Index 1988-2003				
		paddy	fallow	rubber	forest	Shrub land
Nature Reserve	1988	27	131	66	4668	265
	2003	34	10	268	4146	643
	R	0.11	-0.86	0.6	-0.06	0.42
State Farm	1988	112	70	2561	703	296
	2003	168	17	3106	186	145
	R	0.2	-0.6	0.1	-0.58	-0.34
Botanic Garden	1988	10	257	53	141	88
	2003	3	0	115	57	363
	R	-0.58	-1	0.37	-0.42	0.61
Changed	1988	320	871	0	613	283
	2003	264	0	1276	320	112
	R	-0.11	-1	1	-0.31	-0.43
Man'e	1998	245	525	111	514	74
	2003	231	0	957	178	5
	R	-0.03	-1	0.79	-0.48	-0.88
Manbian	1988	183	1026	130	909	372
	2003	165	19	1628	322	267
	R	-0.05	-0.96	0.85	-0.48	-0.16
Mannadu	1988	37	126	252	2153	451
	2003	53	0	1834	416	565
	R	0.19	-1	0.76	-0.68	0.11
Daka	1988	169	1181	0	3208	2529
	2003	126	77	1788	2580	2293
	R	-0.15	-0.88	1	-0.11	-0.05
Mengxing	1988	308	196	849	3028	1321
	2003	364	124	2024	1321	1716
	R	0.08	-0.22	0.41	-0.39	0.13
TOTAL	1988	1426	4408	4042	16.331	5730
		4.30%	13.20%	12.10%	48.70%	17.10%
	2003	1407	249	13.104	9859	6139
		4.20%	0.70%	39.10%	29.40%	18.30%
	R	-0.01	-0.89	0.53	-0.25	0.03

Table 2 Change of economic structure in Menglun from 1988 to 2003, based on RESSMG (1988–2003)

Industrial sectors	1988		2003		Change
	Gross income (10^4yuan)	(%)	Gross income (10^4yuan)	(%)	(%)
Agriculture	246.2	55%	2981.7	67%	11.39%
Forestry	51.2	11%	306.6	7%	-5%
Livestock raising	110.5	25%	258.6	6%	-19%
Fishery	12.1	3%	71.5	2%	-1%
Industry	10.2	2%	478.9	11%	8%
Construction	N/A	N/A	155	3%	-
Transportation	11.5	3%	72.6	2%	-1%
Services	N/A	N/A	79.4	2%	-
Others	4	1%	69.9	2%	1%
Total	445.7	100%	4474	100%	-

The study concluded that the situation observed in Menglun seems to be indicative of general land use trends in Xishuangbanna. These results are also likely to have greater regional relevance, particularly as rubber plantations expand into neighbouring countries (a large-scale expansion of rubber is planned by Chinese interests in northern Laos). The rapid development of cash crops at the expense of traditional agriculture suggests that the economy of this area has jumped from the 'first phase,' dominated by agriculture, to the 'second phase,' characterized by the loss of traditional agricultural land, and increases in urbanization and economic crops. These changes may well lead to better socioeconomic conditions for local communities, but there is a risk in depending too heavily on one or two crops, particularly now, in a largely unprotected free market environment. The loss of traditionally flexible farming systems must be carefully monitored. Similarly, the loss of biodiversity is also of great concern.

2.3.4 India Case Study

It is believed that farmers all over the world usually adopt new crops because they perceive that they will be more profitable than their current alternatives. Of course, innovation carries an array of risks. Some of these risks are particularly intense in relation to tree crops, where long term investments (that have involved years of deferred income) can be wiped out by climatic misfortune, market disruptions or regulatory intrusion. Farmers sometimes make mistakes. Sometimes they badly miscalculate. Sometimes they are unlucky.

Since cost of cultivation and maintenance of rubber plantation in South Konkan region of Maharashtra is rather low on account of cheap labour, the study on Economic Evaluation of Rubber Plantation in the Konkan Region**,** India **(**Shri. P.J.Kshirsagar, Regional Fruit Research Station, Vengurle) wants to show that the said region is considered suitable for rubber production. It is known that rubber is a perennial crop with long pre-bearing period and having the flows of costs and

returns spreading over a number of years with varying magnitude. Expenses during the pre-bearing stage constitute the investment cost on the crop. Such an investment may be exposed to a certain extent to uncertain economic situation. Before making decision, farmers and financial institutions should have clear understanding about the capital and cost involved, and returns likely to be received ascertain the viability of the investment.

For that, all future cost and benefits have to be discounted to obtain their present value. Following criteria are used to decide the profitability of an investment: (i) payback period (undiscounted); (ii) net present value (NPV); (iii) benefit cost ratio (BCR); and (iv) Internal rate of return (IRR). The study results are shown in the following tables:

Table 3: Per hectare cost of establishment of Rubber plantation up to eight year

Year	Rubber(Rs.)
1	20,608
2	3,954
3	3,705
4	3,592
5	3,544
6	3,342
7	2,690
8	2,510
	43,945

Table 4: Economic viability of Rubber

Sr. No.	Criteria	Particulars
1	Pay back period (undiscounted)	12 years
2	NPV at 12% discount rate 14% discount rate 16% discount rate 18% discount rate	0.46 lakhs 0.26 lakhs 0.13 lakhs 0.04 lakhs
3	B.C. ratio 12% discount rate 14% discount rate 16% discount rate 18% discount rate	1.80 1.53 1.30 1.10
4	IRR	19.19%

Table 5: Economics of annual production of Rubber

Sr. No.	Particulars	Rubber
1	Yield/ha kgs	1,116.00
2	Gross value (Rs)	30,132.00
3	Input cost (Rs.)	9,906.00
4	Total cost (cost c) (Rs)	25,054.65
5	Net return at input cost (Rs)	20,226.00
6	Net return at total cost (Rs)	5,077.35
7	Output-input ratio	3.04
8	Benefit cost ratio	1.20
9	Cost per kg. Of Natural rubber	22.45

Cost benefit ratio was 1.20 at cost C, while benefit cost ratio at input cost it comes to 3.04. For both cases, it is more than one and can be considered favourably as it is profitable one. Per kg cost of producing rubber is Rs. 22.45 having Rs. 4.55 profit for grower at present price of Rs. 27/- per kg of natural rubber.

We can observe from the study that environment concerns were not taken in consideration as it should be. Moreover sensitivity analysis may be useful to illustrate impact of the economic condition uncertainty.

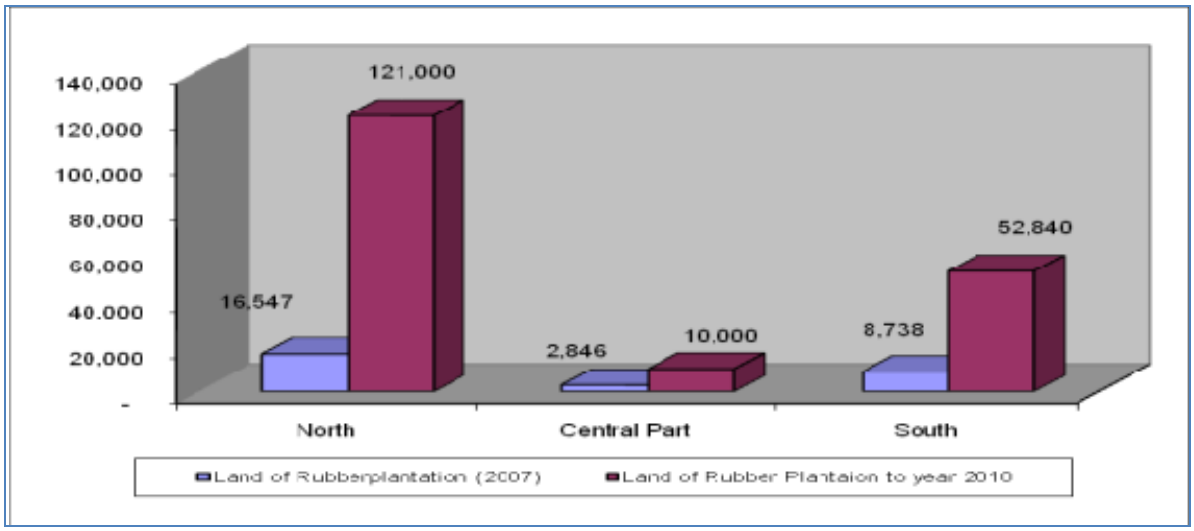
2.4. Situation and Trends of Rubber in Lao PDR

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 poppy 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 2010[16]. The northern part of Lao would be the most cultivated areas, followed by the Southern and Central Lao (see Figure 2).

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

Figure 2: Rubber Planting by Region in Lao PDR

(Unit: ha)

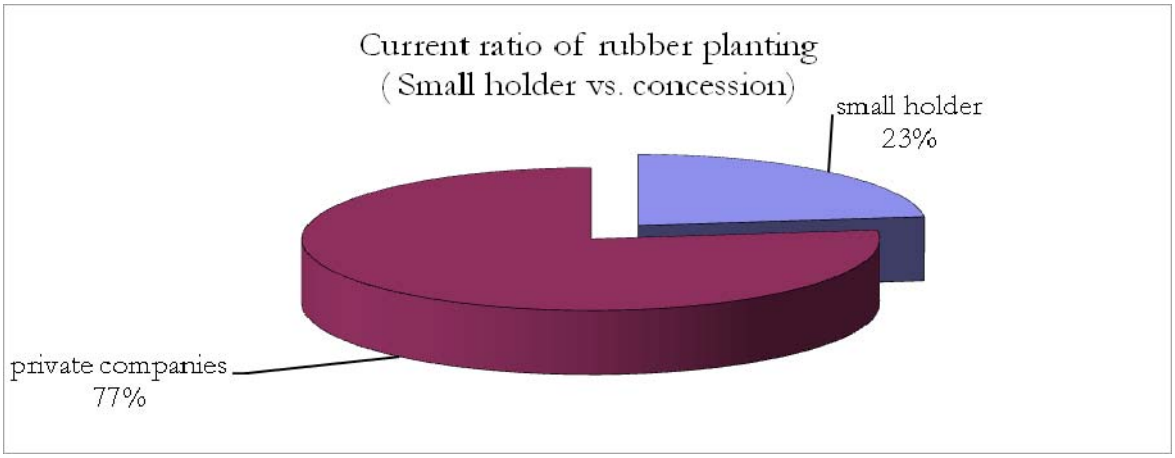


Source: FRC (2007) Rubber Survey.

In Northern Lao a transition is 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 3).

Figure 3: Current Ratio of Rubber Planting (Smallholders vs. Concessions)



Source: FRC (2006) Rubber Survey

There is modest knowledge about rubber trees either in 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.

Until now, there is uncertainty on the total land area of rubber tree plantation in the country, specifically the smallholders' size. Facing the too rapid expansion of rubber tree plantation and complains from Lao farmers and local authorities, the Lao Government has ordered the stop of any new rubber tree plantation concessions. The National Office of Land Use Management is conducting an inventory on the land use at the national level, and was due to submit the result to the National Assembly in December 2008.

2.5 Relevant Policies, Strategies, Legislations and Programs

"A top priority for the Government of the Lao PDR is to develop the agriculture and forestry sectors in a manner that fully meets sustainable practices and that achieves food security and better livelihood for all Lao people. The goal of poverty eradication and graduation from LDC status by 2020 depends on a more productive agriculture and forestry sectors. 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 will 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 practices[17]". Recent promulgation of the revised Forestry Law, in December 2007, a pilot project on the Sustainable Forest Development and Community Involvement, a loan from the World Bank and grant from the Finish Government are illustrating this attempt. Moreover, there was an adoption of the Women Law in 2006, promoting the rights and roles of women in development process at the equal foot as men, as well protecting them from any abuse.

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, Stabilize Slash and Burn Shifting Cultivation Program, etc...

Rubber is expanding so rapidly in Laos that concerned public institutions have not had the time to frame and issue relevant policies, legislations, measures and incentives to effectively ensure sustainable rubber development at the national level, which can contribute to the effective implementation of the National Growth and Poverty Eradication Strategy - NGPES.

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 sectoral Environment, Forestry, Agriculture, Road, Health and Industrial Strategies. The National Assembly had promulgated the Land Use Law in October 2008 in order to ensure the sustainable use of land resources.

2.6 Lao Case Studies Findings

According Stevan Schipani, an expert in Sub Mekong Tourism Development Project, Luang Namtha - UNESCO, ecotourism might be a better option than rubber tree plantation contributing to poverty alleviation in Luang Namtha province. The study estimates the financial benefit from ecotourism 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 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 ecotourism and rubber tree plantations in Luang Namtha, but this cannot be developed at the same place and at the same time.

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[17] Committee of Plan and Investment – CPI, "*National Growth and Poverty Eradication Strategy*", p.58, Vientiane, Lao PDR

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.

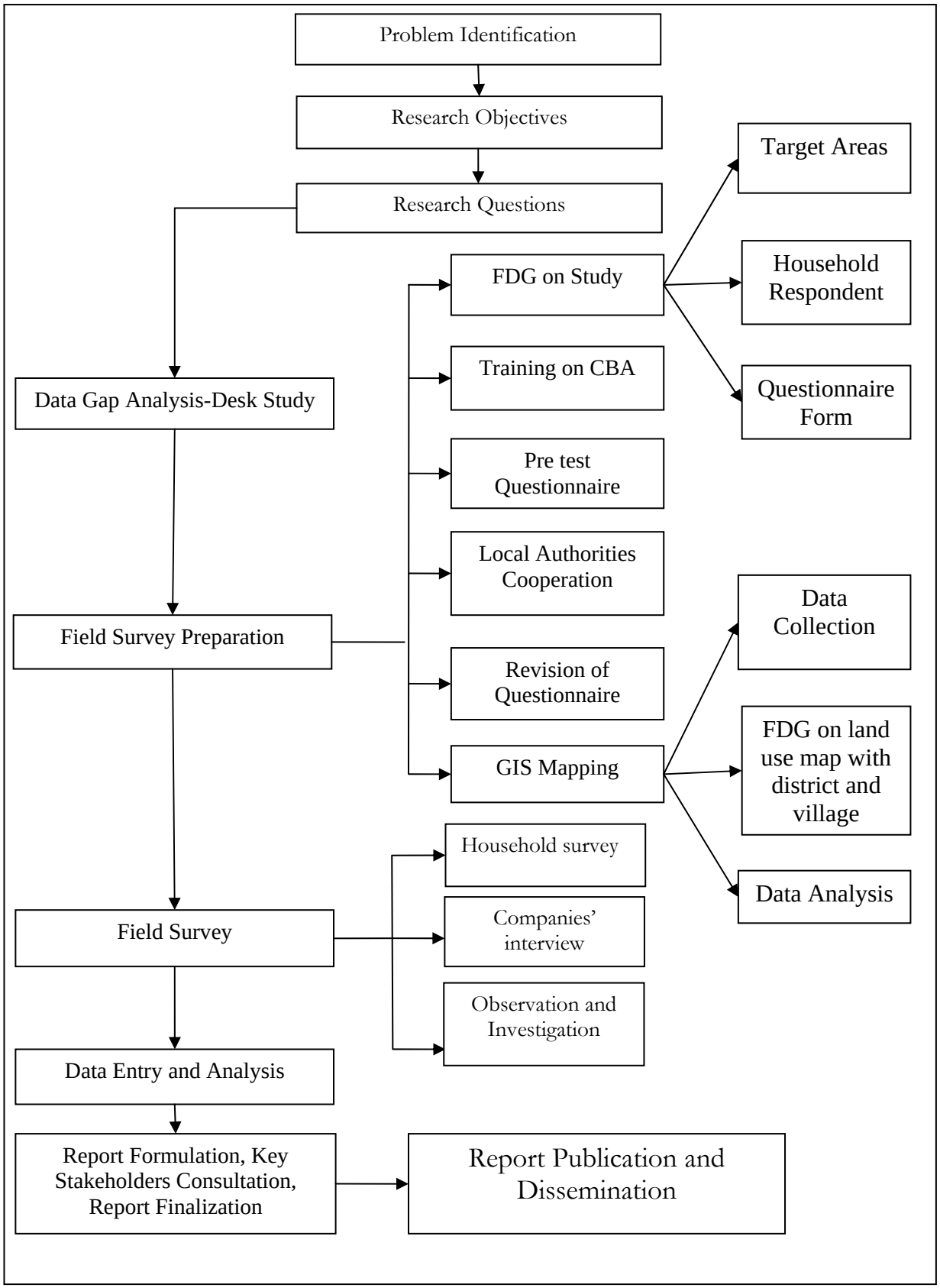
A NAFRI report on the Intercropping with Rubber for Risk Management (NAFES, NAFRI and NOUL, 2005) has pointed out that rubber intercropping could minimize environmental risks of rubber monoculture and increase rubber yield productivity in both short and long term, according to intercropping system experiences 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 (Alton, Bluhm, Sananikone, 2005). 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.

3. METHODOLOGY

After having identified study problems, research objectives and questions were formulated through detailed desk studies, discussion with key stakeholders at the central and provincial levels. Training on Costs Benefits Analysis had The Team had taken five months for field preparation.

Figure 4: The research process



3.1 Study Area

Two provinces representing the North, and one in the South, due to the very rapid expansion of rubber tree plantation areas were selected as the study sites. Luang Nam Tha Province, reflecting the first area where rubber has been successfully harvested, while Oudomxay and Champassak, where rubber has been planted and is expanding, for comparative study (Costs and Benefits) within the North and the South (see Figure.3). Smallholders are the majority in the North, while the South is characterized by large concession farming.

Field studies were undertaken in two villages of each province: one representing rubber plantation, while the other on any rubber plantation; and a number of 35 households of each village were interviewed, in order to ensure effectiveness of comparative study between those who have planted rubber and those who have not opted for rubber. The specific target area was determining base on site observation, consultation and focus group discussions with related local authorities. According to the different sites on rubber plantation in each province is not clear with the number of households planting rubber, team research had chosen sampling by 70 questionnaire forms per province (see Table.6).

Moreover, there is also comparison between the smallholders (contract farming and no contract farming) and concession farming. The team would like to compare the costs and benefits from these different types of farming. Derived from the data of each provinces is not clear on household who plant or do not plant rubber, so the team survey had prepared questionnaire forms in two type (see Appendix.1 questionnaire form). A total of 210 households had been interviewed, as described below.

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

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

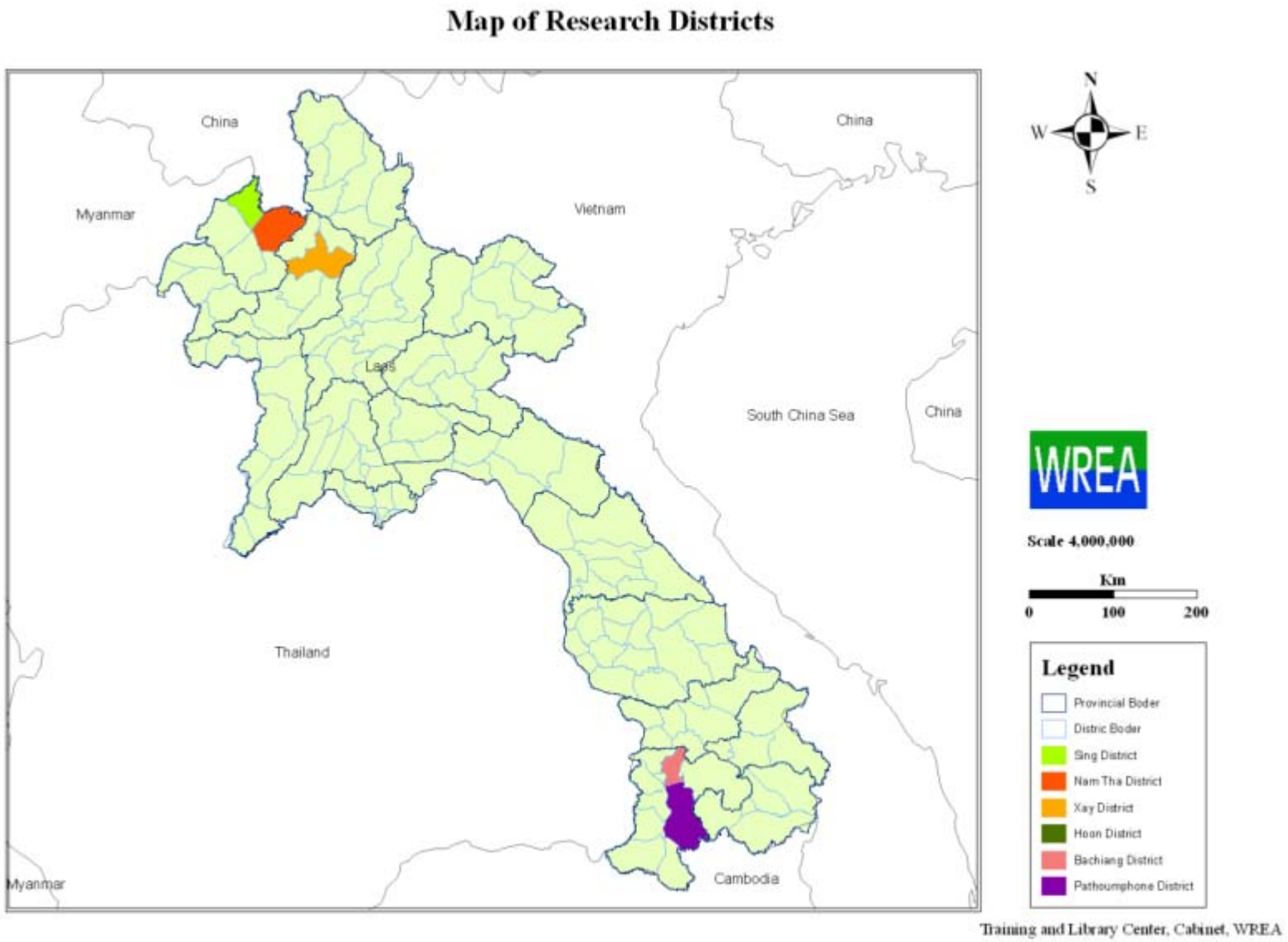
$$n = \frac{442}{1 + 442(0.05)^2} = 210 \text{ households}$$

Table.6: Sampling selection

Targeted Provinces	Households Interviewed
Luang Nam Tha	**70**
Oudomxay	**70**
Champassak	**70**
Total	**210**

In addition to households, concerned authorities from the central to the village level were also interviewed for getting information related to policies, legislations in place and implemented, as well on the socio-economic and environment situation of concerned provinces, districts and villages.

Map 1: Research Areas



3.2. Study Area Profiles

3.2.1 Luang Namtha Profiles

Luang Namtha Province, one of the northern provinces of Lao PDR, is bordering Myanmar to the northwest (130 km), Oudomxay Province to the South and East (230 km), Bokeo Province to the southwest (100 km), and China in the north 140 km. This mountainous province is very sparsely populated with only 151,100 inhabitants. And total area about 9,352 Km^2, with density of about 16 people/Km^2, with in the area Namha National Protected Area also located in this province. The average population growth rate between 1999 and 2004 was 3.32 percent. The province has the largest number of ethno-linguistic groups in the country.

There are five districts: Namtha (The capital), Sing, Long, Viengphoukha and Nalae. Long, Viengphoukha and Nalae districts have relatively limited lowlands and seem to be less economically active, less wealthy and have poorer infrastructure. The economy is based on agriculture constituting 78 % of the provincial production. Services and industry contribute 12 % and 10 % respectively. The major exports are minerals, agricultural produce (including livestock) and non-timber forest products (NTFPs) accounting for 43%, 30% and 13% of total exports respectively. In 2002, 66.72% of people can assess to clean water service and 40,12% have toilet. In 2004, about 7,194 households doing shifting cultivation with in the area of 5,676 ha (NAFES/MAF, 2004)

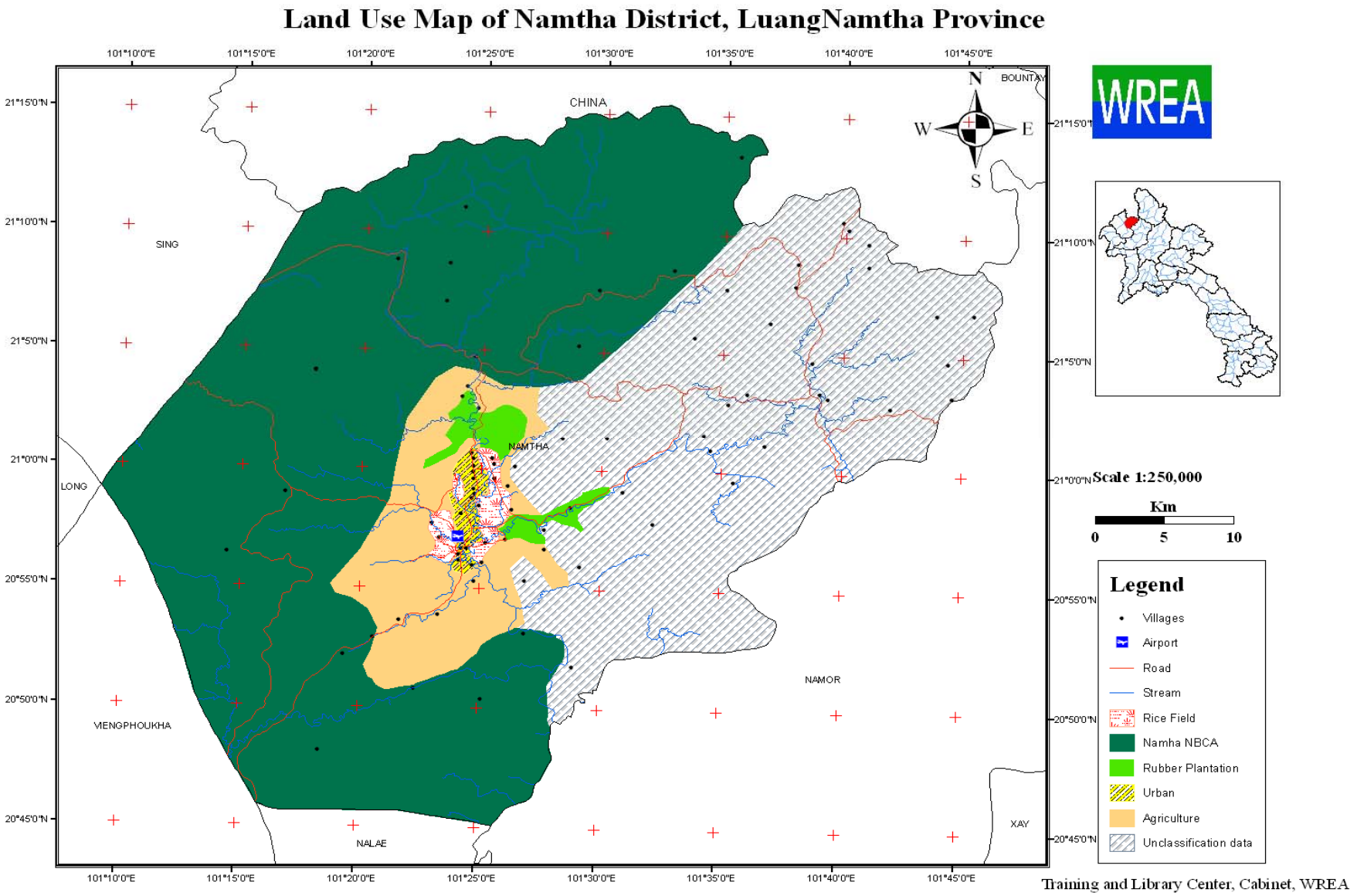
- *Namtha District*

Namtha District is located at the north western part of Luang Namtha Province, sharing borders with China in the North and Phongsaly Province in the West. It is the capital city of the Province with 80 villages. Rapid expansion of trade with China and the tourism boom have contributed to provincial economic growth It has undergone substantial development over the past decade partly due to the rapid expansion of the Chinese trade and the boom in tourism (see Map 2).

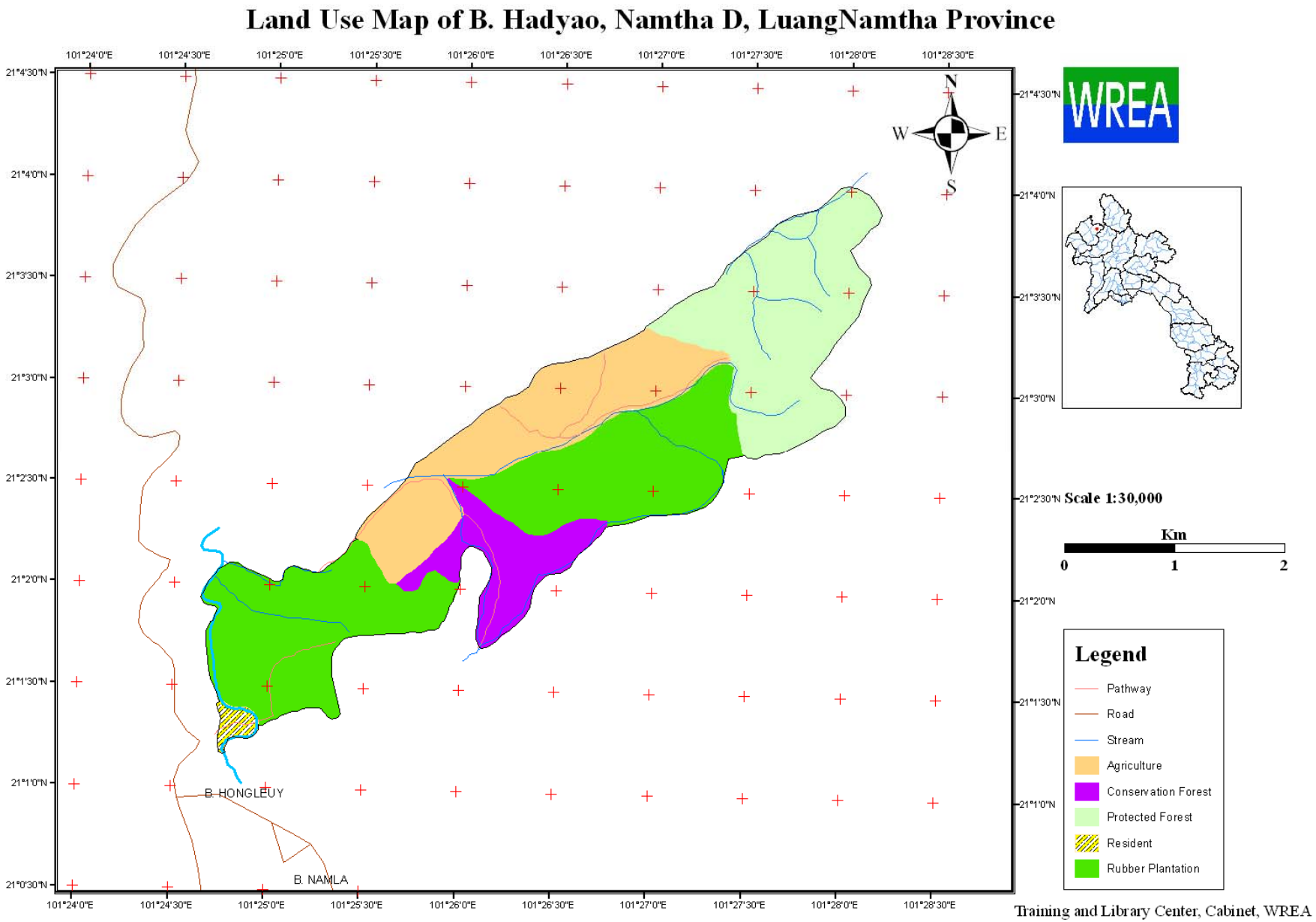
Hat Nhao village is among Ban Hong Leuy and Ban Namla villages of Namtha District. It is located two km from the district centre and near the main road to Muang Sing. It was established in 1975. Presently there are 146 households in the village, relying mainly on rubber tree plantation. According to the Head of the village information about 45 percents of the village households are considered as well off, almost a quarter are less well off, and about a third are in the mid level.

It was the first village to initiate rubber plantation in the Northern Province, due to the villagers' relatives' assistance from China and it succeed. Success from this village has boomed rubber in the entire country even thought there still has the problem on sharing the benefit between broker and villagers.

Map 2: Land Use of NamTha District



Map 3: Land Use of Ban HadYao, Namtha District



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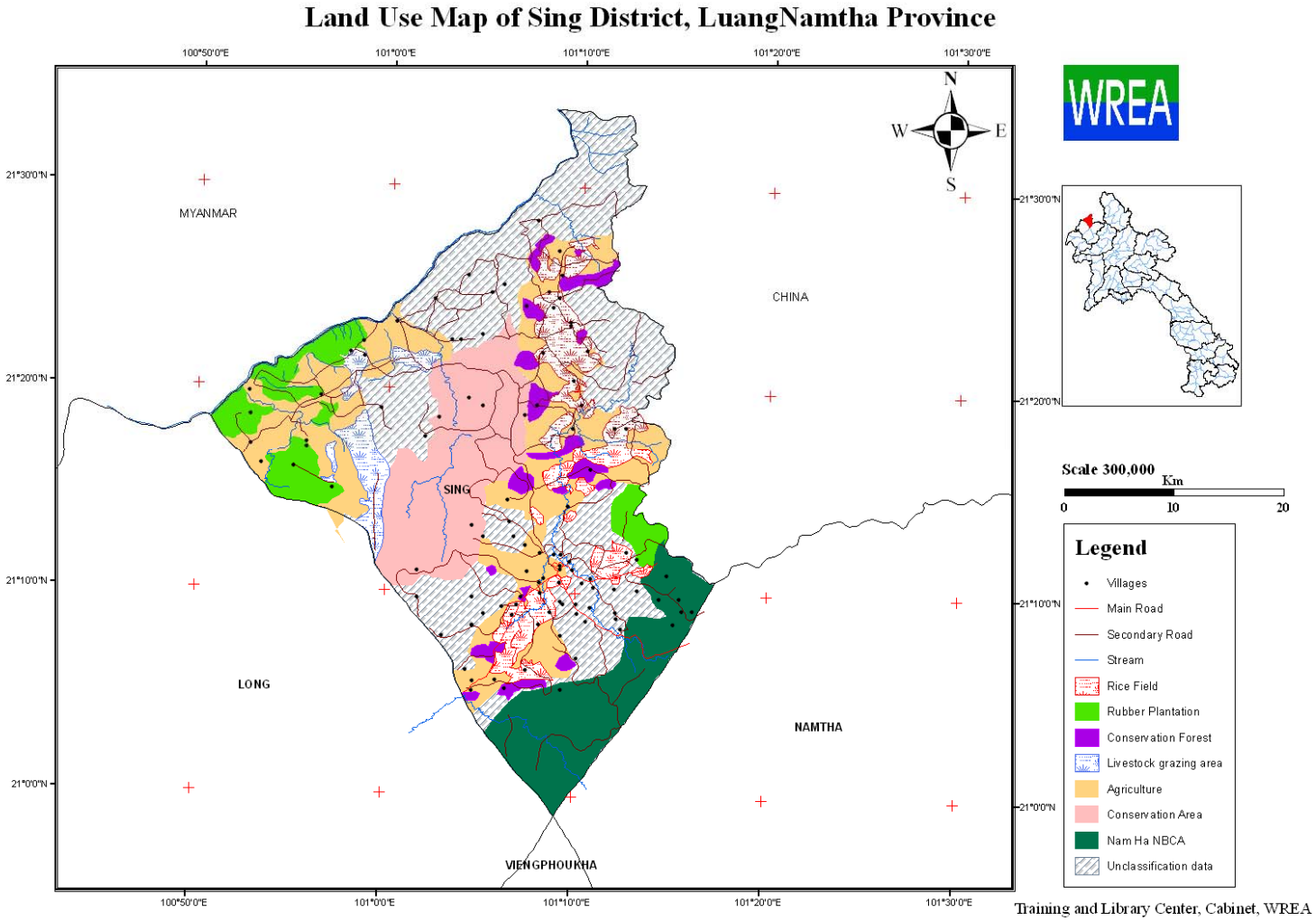
- *Sing District*

Sing District or Muang Sing is located in the north with 60 km from the capital Luang Namtha. It is linked to Xieng Kok District, a Mekong River port, situated at 70 km from the west of Yunnan Province of China. The District is known for its cultural and historical sites. Its main income is from tourism and trade with China.



Map 4: Land Use Map of Sing District Compared to Hat Nhao, Erlar Mai Village only comprised of 75 households. Their main cash crop is sugar cane plantation. Since the success of Hat Nhao village, they have been initiated to rubber tree plantation. (Head of Erlar Mai Village Village, 2008)

Table7: Rubber Plantation by year in Erlar Mai Village

Year	No.household	Area/ha	No.Tree
2004	7	8.89	4000
2005	13	9.00	4050
2006	29	17.11	7700
2007	18	5.57	2505

Houay Longkhao Village is smaller than Erlar Mai Village, with a number of 64 households. They mainly practice swidden cultivation and sugar cane farming. (Head of Houay Longkhao Village, 2008)

Table 8: Rubber Plantation by year in Houay Longkhao Village

Year	No.household	Area/ha	No.Tree
2003	2	3.60	1,620
2004	2	1.90	855
2005	20	26.50	11,925
2006	46	65.40	29,430
2007	46	76.40	34,380

3.2.2 Oudomxay Profiles

Oudomxay Province shares its borders with China and Phongsaly Province in the north, Luang Namtha and Bokeo Provinces in the west, Xayabouly Province in the south and Luang Prabang in the east. It is the crossroads of the five northern provinces, namely Bokeo, Luang Namtha, Phongsaly, Luang Prabang and Xayabouly.

Oudomxay Province is comprised of seven districts, namely Xay, La, Namor, Nga, Beng, Hun, Pakbeng. With total population about 275,300, and area of 15,370 Km^2, with density about 18 people/Km^2, in 2002, 38% total population have access to clean water and 18.1% and about 5,820 ha are Shifting cultivation areas. The main cash crops are maize and job's tears and NTFPs. Some earn their living as traders and small merchants. It has trade relations with several neighboring countries, namely China (79.8 percent), Thailand (18.6 percent) and Vietnam (1.6 percent).

Oudomxay Province is one of the target area especially Xay and Hun Districts

Hun District:

Hun District is one of the target areas with total population 55,539, and 22,748 people were female, with this numbers, about 5,227 families or 59% household are poor and 3,230 families still have not enough rice, 1,114 families limited of cloths and 4,000 families still lack of housing, the percentage of people that can access to clean water and toilet were 35,32% and 6,22% respectively. .

Nong Bouadeng Village:

There are 142 houses in Nong Bouadeng Village, the total population is 1032 inhabitants, and 421 were female. The total household is 186, Lao sung 976 people, Lao lum 21 (11 were female), and Lao Therng 33 people (18 were female). Occupation grouping by household of the villagers, 10 households work as official, 3 households be a trader, 68 households practice as upland rice, 55 household also do rice field and upland rice, 2 households as service sector, and 4 households have no job. The head of village ranged 6 households as the poor household and 124 at mid level. In the village, there are 74 households which have a latrine, 1 household with a modern toilet, 50 households with a normal toilet, 23

household with a dry toilet[18]. Children' age lower than 5 years with the number 285, (Head of Nong Bouadeng Village, 2008)

Xay District

Somxay Village:
The total number of household is 208, which 195 household plant rubber tree. Villagers mainly practice corn, upland rice, and rice field for the income generation. There 38 households without land to cultivate rice field. In the village, 3 households have been invested to plant rubber tree by themselves. Most of the villager have cooperated with Chieng Fong Company to carry out rubber plantation with investment pattern as 40% for local people and 60 % for company when reaching years tapping latex.

Hom Xay Village:
Hom xay Village have 147 houses, 159 household with the total population 930 (463 were female). The villager plant rubber tree in 9 ha on which 76 households carry out together and dividing the benefit (50:50) (Head of Hom Xay Village, 2008)

3.2.3 Champassak Province Profiles

Champasak province is located in the southern part of Laos, share borders with Thailand, Combodia, Saravanh, Attapue and Sekong province, with total area about 15,415 Km^2, with population of 575,600 (2004) and a population density of about 24 people/Km^2.

Champasak Province comprised of two regions, 26% upland and 74% lowland. The Mekong River devises the Province into east and west. The east bank has 6 districts and the west bank has 4 districts. Namely: Bachiangchaleunsook District, Champassack District, Khong District, Moonlapamok District , Paksé District , Paksong District, Pathoomphone District , Phonthong District, Sanasomboon District, Sukhuma District.

In 2002, the percentage of the population with access to clean water and sanitation are 77.7% and 32.3% respectively. In Champasack Province there are 3 national protected areas such as Xe Pain National Protected Areas with areas 2400 Km2, Dong Huasao National Protected Areas with 1,100 Km2 and Phouxiangthong National Protected Area 1,200 Km2 (Sources: Ecotourism Laos,2007)

Bachiang Chaleurnsouk District:
Bachiang Chaleurnsouk district have total population of 39,308 or 7,393 households, with 19,783 were female. The number of poor household is 924 cover 12.5% and household poor by criteria was 924 households. The number of household still limited of rice, clothing and housing are 942, 744 and 924

[18] A modern toilet "cistern flush", normal toilet "bucket flush"

households respectively (NGPES), in 2002 the percentage of people access to clean water service and toilet covered 98.24% and 95.08% respectively *(Sources: Factors influencing the non sustainability of the Improved Water Supply and Sanitation in Rural area in Poor Provinces in Lao PDR).*

Patumepound District:
Patumephoun District have total population with 49,241 or 8,693 households, recently there are 690 households were poor or about 7.9%. The number of household poor by criteria was 690 households and the household with still limited of rice and housing are 690 and 382 households respectively. In 2002, percentage of people access to clean water service and toilet covered of 56.13% and 28.92% respectively *(Sources: Factors influencing the non sustainability of the Improved Water Supply and Sanitation in Rural area in Poor Provinces in Lao PDR).*-.

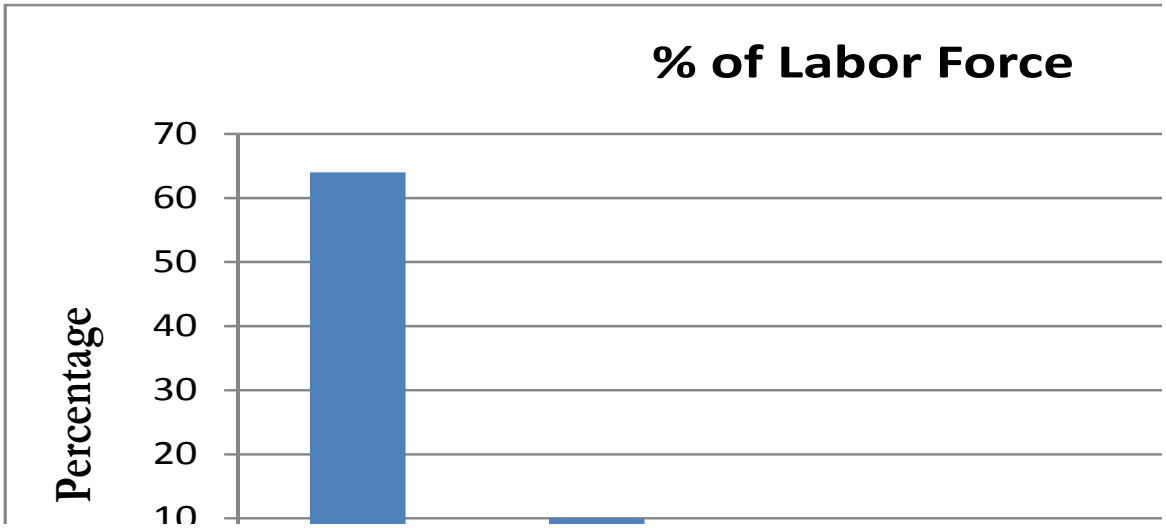
Champasak Province is comprised of two regions, 26% upland and 74% lowland. The Mekong River devises the Province into east and west. The east bank has 6 districts and the west bank has 4 districts.
In the lowland area of 1.135.000 hectares (75-120 metres above sea level), support such crops as rice and beans. Temperature in the lowland area average 27 degree Celsius and rainfall is around 2.279 millimetres per year

The upland area of 406.500 hectares (400-1.284 meters above sea level) the average temperature is 20-21 degree Celsius. Rainfall is 3.500 millimetres per year humidity of this suitable for growing vegetables, coffee, tea, NTFP (mak naeng) and timber.

Local Government and Population

Champasack Province (capital: Pakse) consists of 10 districts with 924 villages of 104,857 households, with a total population of 603,880 of which women make up 51 percent. The density is 39 persons / km2. The labour force includes 73.3 percent of the population. Champasack Province consists of Pakse, Sanasomboun, Bachaingchaleunsouk, Paksong, Pathoumphone, Phonthong, Champassack, Sukhuma and Mounlapamok Districts.

Figure 5: Labor Force in Champasack province



Source: Planning and Investment Department, 2006

Natural resources:

The province is abundant in natural resources. Agricultural land constitutes 37 percent of Champasak Province. Forest areas cover 895.500 ha, representing 58, 09 percent of the province. There are three national forest conservation areas with 425.600 ha, equal 47.53 percent as well as 11 provincial forest conservation areas.

Rice and cash crop plantation Promotion Area:

The rice and cash crop plantation promotion area includes a total area of 175,000 ha, of which 87,663 are being used. The fruit tree plantation promotion area includes a total area of 41,225 ha of which 10,225 ha are now in use. The coffee and forest plantation area includes a total area of 142,773 ha, of which 29,142 ha are now in use. Opportunity exists for the remaining 113,631 ha. The agar wood promotion area includes a total area of 3,800 ha and the rubber tree promotion area includes a total area of 14,500 ha. The livestock promotion area includes a total area of 33,800 ha in 6 promotion areas.

Pak Houay Village (Pathoumphone District):

There are 69 houses, the total population of the village is 336 (176 female). All most of people generate income from selling lemon, water potato, and rice field. The villagers utilize land of village with number 950.01 ha to cooperate with Dak Lak Rubber Company to plant rubber and then villagers will divide into 3 ha/household. However, when reaching years tapping latex, the company will get the sharing of 20% throughout the age of rubber and household will get 80%, those households have to pay back money to the company of amount approximately 2,700-3,000 USD/ha (within 13 years) with 210,000 Kip for official fee documents.

Lak 29 Village (Pathoumphone Pathoumphone District):

Lak 29 Village, has a total population of about 1569 (778 female), 249 houses, with 287 households. The main income generation activities in the village, is from handicraft such as the ability to work creatively with rattan, Mark chong (kind of NTFPs), workers. The price of rattan is about 2,000 Kip/line and Mark chong

approximately 50,000 Kip/Kg. The company compensate for the amount 5,000,000-6,000,000 Kip/ha for rice field. In 2007, compensate in the price 1000 Kip for one teak, which ages less than four years. In 2008, the price of compensation was increased at the price 4000 Kip for one teak which have an age from 4 to 15 years, about 20 households lose teak garden, a household plant teak between 100-2000 per household, for example, a villager gets compensation of around 6,800,000 kip/1000 teak, one household show that their teak ages about 10 years with amount 600, but the compensation by company is only 2,000/teak. In 2007, compensate for bamboo around 100,000 Kip/bush. Furthermore, impacts of the rubber project limit the field for feeding animals like cow. The village has loosened Mark chong forest more than 1,000 trees, this forest have been preserved for disabled people for income generation as well villagers have spent more time to find NTFPs as rattan. According to the villager reported that trees have radian around 70-80 cm, which burn on site. Moreover, the company have occupied the land for 50-60 ha which is not include in the land concession of Dak Lak Rubber Company.

Oudomsouk (Bachiang District)

Oudomsouk Village is a big village which accumulate a small village as one unit, there are 437 houses, the number of household is 457 with total population 2666 (1333 female). People in the village have a varied source of income such as selling coffee, cutch, durian, rambutan, Cardamom. The villagers also lose their land to Dak Lak Rubber Company, Lao-Viet Rubber Company, and Yao Tien Rubber Company and then become as the workers in the company. Land encroachment by the company is usually done in the night time without the participation of local people with capacity about 200-300ha/day. In the past, there are 4 sectors of government carry out a field survey in the village. In the north of Oudomsouk Village, 6 cows died in Kang Lai Village. Similarity, while Lao workers utilize the chemicals in rubber garden, they don't know the direction of the wind and were without a basic protective uniform. Also the company range the age of Lao workers between 15 and 40 years, a person who age is more than 40 years cannot work with the company or work at the lower income. Recently, the company has declared a person who completed the high school level to get training for tapping latex course in Vietnam. However, the lower educational of villagers are the main problem to become as the skill workers when the company built up a latex processing factory. (Head of Oudomsouk Village, 2008)

3.3 Field Survey Preparation

A comprehensive desk study or data gap analysis was undertaken in parallel to meetings with all concerned persons at the central level and discussing over the phone with relevant provincial authorities and persons, specifically the provincial departments of planning and investment, agriculture and forestry, water resources and environment offices. The main purpose of data gap analysis are to: (i) list out existing relevant policies, legislation, projects in place as well as status of their implementation at the national level; (ii) identify the missed data and information,

the main reasons behind; and (iii) prepare a good foundation of the field work for ensuring accuracy and quality of field data collection.

Training course on Costs Benefits Analysis had been done in June 2008, with the gracious assistance from the Economy and Environment Program in South East Asia (EEPSEA), and accordingly to the Research Work Plan objectives. The course had helped our Study Team to understand better the appropriate way to design the field questionnaire forms, relevant data to be taken into consideration in assessing the Net Present Value, such as the costs of environment damages from rubber tree plantation, harvest and production, as well as concerned spatial data collection and analysis; and the effective interview.

Questionnaire forms had been formulated accordingly to its targets groups: (i) local authorities; (ii) private sectors; and (iii) households or farmers. These questionnaires forms are attached at Appendix 1. Pretest had been done in Sang Thong District of Vientiane Capital City. 30 households who are planting rubber had been interviewed. Appropriate revision of the questionnaire forms had been done right after the pretest, such as rearranging the questions to be simply understood and responded, adjust unclear questions.

Two weeks before going to the field, the Team had informed the Provincial Water Resources and Environment Office about the field dates, main objectives, targeted villages and households, as well as needed information to gather in addition to interviewing concerned households. Moreover, there was explanation on the questionnaire forms to the Team Members to ensure the same understanding vis a vis their use and the way of interviewing in order to ensure accuracy of field data gathered.

GPS had been used to capture the location point and area of the rubber tree plantation, village's location in the field, the distance of rubber tree plantation from the villages and district. In addition, data related to rubber tree plantation surface had been also collected from available data: land use map, profiles of each village and district, and consultation with the local administration for getting accurate and updated data. The application of GIS by using program Arc GIS 9.1 had been applied to edit and analyze field data. During the mapping creation, the team survey have closely communicated concerned local administration and staff for confirming data accuracy and ensuring its readiness to be represented into the map, which will be further incorporated in the study report, illustrating the size of rubber tree plantation as well its distance from the protected areas and forest areas.

3.4. Field Survey

The Team had started its field work in the North from the first week of August 2008. The Provincial Department of Planning and Investment provided them the five Years Provincial Socio-Economic Development Plan, including data related to foreign and local investment in concerned provinces and districts. The provincial

Department of Agriculture and Forestry informed them about the status and trend of rubber plantation in provinces, and districts. The Water Resources and Environment Office had arranged all the field work, such as meetings with all relevant provincial districts and villages' authorities, and also participated in the field work, interviewing households.

Moreover, the Team had explained the use of the questionnaire forms to our provincial colleagues before going to interview targeted households. The Head of the Districts provided the district profile, list of targeted villages and advised which villages to be more appropriate. Decision on the targeted villages had been made in close consultation with concerned local authorities. The Head of villages informed the Team about the village profile, gave the list of targeted households and accompanied the team during the interview as needed.

The Team had some difficulty in obtaining information related to the total size of rubber tree plantations at the provincial and district level, as data has not been updated. Only the Head of village was able to provide adequate data in this area due to his record. In addition, the Team faced to some unforeseen flooding in the district during the survey, which stopped them from interviewing the target village in Sing District and had to opt for another one, as well as shorten their field collection survey. Thus the number of households interviewed in the North is less than planned, as shown in Table 9. Details related to field work findings are be described in Section 4: Results and Discussion. The target households collaborated and worked effectively with the Team.

Table 9: Breakdown of the households interviewed

Targeted Provinces	No. of households	Targeted Districts	No	Targeted Villages	No
Luang NamTha	57	Sing	39	Erlar Mai	12
				Huay Longkao	27
		Luang NamTha	18	Had Nhao	18
Oudom Xay	66	Xay	48	Hom Xay	48
		Houn	18	SomXay	7
				Nong Bouadeng	11
Champassak	73	Phathoumphone	44	Pakhouay	33
				Lak 29	11
		Bachiang	29	Oudomsouk	29

Source: survey, August 2008.

3.5 Data compilation and analysis

After the completion of the field survey in the North, the Team revised questionnaire forms as a result of lessons learnt in this first field mission. The questionnaire forms were revised, to make it simpler and easily to be understood by interviewed villagers or farmers. One week later, the Team went to Champassak Province for the final phase of field work.

Following the completion of the field survey in the South, the Team compiled the data and entered the data into databases. This was a time consuming process and

took three months longer than anticipated. SPSS, excel programs were used for the analysis of data and Cost-Benefits Analysis was also used.

3.6 Cost-Benefits Analysis (CBA)

Steps in conducting Cost Benefit Analysis

Step 1: Defining the reference groups
At the start of an analysis, it should be state for whom the study is being done and whose costs and benefits will be included. In addressing these issues and calculating benefits or costs to different people or groups it is important to be clear and consistent (Richard O. Zerbe Jr. 2006, A Primer for Benefit-Cost Analysis). In Lao PDR, there is no field study that has used cost benefit analysis (CBA) for assessing the economics of rubber plantations.

The referent group refers to the group(s) of individual households and companies whose welfare will be taken into account and the resources being re-allocated when measuring the costs and benefits of the project (Orapan,). In this study, there are five main referent groups, namely: (1) A self-financed rubber tree plantation, (2) contract farming systems, and (3) basic cash crops (mostly corn, sugar cane, and upland rice). These scenarios are available in Oudomxay and Luang Namtha Provinces, in northern Laos. (4) Large scale rubber concessions and (5) basic cash crops (mostly garden durian, rambutan, coffee) these two scenarios are found in Champasak Province, southern part of Laos.

Step 2: Selecting the portfolio of the project

In this study, the assumption of basic cash crops are that, local farmers who usually earn income from sales of corn, sugar cane, and upland rice which predominates in the Oudomxay and Luang Namtha Provinces. In Champsak Province, before the development of large scale rubber concessions, local farmers generated incomes from the sale of rambutan and durian fruit. Sharing in each group of rubber plantation is the method to do in this case study to make it clear on cost and benefit as self finance, contract farming and large scale of rubber concession

With respect to self-financed rubber plantations, it was observed that in some cases the government provided soft loans with an interest rate of about 5% which farmers used to procure land, labour, and capital. Local farmers will receive all profits from sale of latex, timber, seedling, intercrop rice and other crops in the rubber garden. However, farmers are left to find markets for their production on their own.

Contract faming systems that are promoted in the northern part of Laos, investors support capital inputs and are responsible for finding markets. Local

farmers/smallholders provide the land and labour to plant rubber. In term of profits, local farmer will profit from the sale of latex (not timber), with the profits being shared amongst the farmer and investor. In this study, farmers receive 40% of sales and the investor 60%.

Large scale rubber concessions are promoted in the southern provinces, namely Champsak, Saravan, Sekong, and Attapue Provinces. Farmers may have the opportunity of employment by the company. If farmers are able to be employed by the company, daily or monthly wages of approximately 25,000 Kip/day and 700,000 Kip/month can be earned. Land clearing by the company has been undertaken without prior consultation with villagers, that results in the acquisition of villager gardens, orchards, and industrial trees (such as teak) without appropriate compensation. It would appear that these lands that subsumed by the company with be returned to the individual villagers after 50 years.

Step 3: Identifying the project impacts

Indentifying all the impacts that result from the project's implementation. This stage involves the listing of all resources used, two concepts are important at this stage; additionality and displacement. Additionality, refers to the net impacts of the project and displacement is often important when applied by development authorities at regional level (M.John, Economic Valuation and Environmental Asssessment).

The cost and benefits in the five scenarios mentioned above will vary. Listing the outputs, impacts and potential impacts derived from result of field survey and consultation with key stakeholders was undertaken. Other information was also reviewed from documents, literature, and articles. In the field survey, interviews with key stakeholders that included the Provincial Investment and Planning Office, Water Resources and Environment Provincial Office, Provincial Forestry Office, Governor of the district, head of village, and individual household that planted and not planted rubber.

Step 4: Indentifying impacts that are of economic relevance

This step involves identification of all impacts including the non-priced impacts (those not traded in the market). The positive impacts are classified as benefits and negative impacts are counted as costs

All impacts must be valued in common units. The common unit in CBA is financial, within this study kip and dollars currency are used. The other function of CBA at this stage includes; predicting value of cash flow into the future, correcting for market prices where necessary and generating prices where none exist. For most projects it is necessary to discount costs and benefits occurring at different times. This is usually done using exponential discounting to calculate present values of all

future costs and benefits (M. John, Economic Valuation and Environmental Assessment).

Step 5: Calculation of NPV

Costs Benefits Analysis is normally used to identify whether the project is socially, economically and environmentally viable by weighing up benefits and costs throughout the project's life. The purpose of this Study CBA is to also estimate and compare the Net Present Value (NPV) and Benefit/Cost Ratio of before and after rubber plantation in the North (Luang Nam Tha and Oudomxay Provinces) and in the South (Champassak Province). Before rubber trees plantation, villagers mainly rely on cash crops farming, NTFPs collection, and swidden rice cultivation (in the North) or wet rice plantation (in the South).

The NPV of each option is estimated by applying formula:

NPV = PV (B)-PV(C) or $$NPV = \sum_{t=0}^{n} \frac{B_t}{(1+i)^t} - \sum_{t=0}^{n} \frac{C_t}{(1+i)^t}$$

Where B_t denotes the benefits received in period t;

C_t denotes the costs incurred in t;

t is year, t = 0, 1…, n; and i is discount rate.

The formula shows that the NPV is the difference between the present value of the benefits, PV(B), and the present value of the costs PV(C) of a project. When there is comparison of NPV between at least two cases or projects, the one with higher NPV would be most preferable. A positive NPV and Benefit/Costs Ratio (B/C) will illustrate viability of the project, while a negative NPV and B/C ratio would indicate the opposite (Boarddman, Greenberg, Vining and Weimer)[19]

4. RESULTS AND DISCUSSIONS

4.1 Findings from Study Visit in China

The main objectives of this study were: (i) to learn concrete experiences from concerned Chinese institutions, authorities, private sectors and farmers on rubber tree plantation and development in China, including the implementation of relevant policies, legislation; (ii) to investigate on-the-ground experiences, modes of operation and market trends in the Chinese rubber sector; and (iii) to build linkages between Lao and Chinese researchers working on rubber and other plantation issues in the Mekong Region.

[19] Chapter1: page 7;14. Chapter6

This study visit was conducted by ERI, NAFRI, and IUCN Study Teams, with the facilitation of Yunan University, and Science and Technology Bureau. The Teams initially met with the Agriculture Bureau representatives, followed by a field visit to a Dai (Dai ethnic group) rubber smallholder village and processing facilities. The Team was divided into three groups to deeply discuss that specifically addressed three issues: (i) Trade and Investment; (ii) Policy; and (iii) Planting and technical aspects.

A synopsis of the Teams activities are as follows:

i. The role of government is to regulate the rubber industry in order to minimize environmental impacts, ensure financial and technical assistance to smallholders during rubber price fluctuations to effect optimum rubber productivity and effective protection of forests areas.

ii. Clear guidelines for rubber tree cultivation, including techniques, altitude, maximum slope, a 100m buffer zone to be maintained near watersheds, soil and water quality protection have been promulgated and implemented in a relatively effective manner. If serious soil erosion occurs, rubber plantation is not allowed to continue. Moreover, if there is encroachment into protected areas, the concerned persons will be severely fined and the rubber plantation destroyed. In addition to that, there is a requirement for the private sectors to install waste water treatment facilities in their rubber processing.

iii. The functions of the Environmental Protection Bureau have been clearly defined, such as being responsible for the overall monitoring of rubber plantations impacts on environment quality, such as air and water pollution, etc.

iv. Pineapple, tea, corn, peanuts, and soya bean or yellow bean (huangdou, local language) are often planted during the first four-five years, as intercrops in order to ensure continuous income to small-scale farmers and minimize impacts to soil quality. It was reported that the overall costs of rubber plantation is about RMB 300 per ha/per year (land costs being not included).

v. There is a clear contrast of management between a state farm and smallholders' plots. Farmers have the tendency to plant their rubbers in a more haphazardly manner and the lack of pruning at a young age give the trees an obvious lean. While the state-owned farms, being larger, have are planted symmetrically and have a high level of maintenance; all trees are at the same size and in good alignment. The productivity of the state farms is higher than those of local farmers due to the introduction of new technology and better resources in terms of human and finance.

vi. The Chinese private sector had previously focused on the contract farming, such as the “2+3” system for rubber cultivation in the 1990’s. However now, they prefer to invest in the processing of rubber, due to the effective management of rubber smallholders, strong support from Government in rubber investment, local market demand, the failure of the contract farming, and high costs of the land concessions.

vii. The Yunnan Xishuangbanna Weisheng Rubber Co, a private company, producing rubber for tires for a buyer company in Shandong. This processing plant employs about 120 people, with salaries reaching RMB 2,300 per month. Rubber stock comes from around Jinghong, as well as some grades from Vietnam. The company has four more plants, including one in Myanmar. Waste water treatment facility uses sedimentation, purifiers and series of ponds with plants to recycle water used in the plant (washing rubber). The company has been fined, and is planning to invest in a new treatment facility.

viii. The Yunnan State Farm Jingbong No.8 was set up in 1998, employing around 100 people and produces rubber for tires. The plant is using the Cleaner Production (CP) Audit to be completed by the end of 2008. (China’s Cleaner Production Promotion Law requires certain companies to develop a CP plan and submit to an audit to improve their triple bottom line). An improved water treatment facility, running water through plant terraces, as well as recycling, was instituted under its CP plan.

The above mentioned experiences could be a good lesson to relevant Lao authorities, villagers and the private sector. Same issues could be avoided and the successes that have been demonstrated in China could be replicated in Laos.

4.2 Field Study Finding

4.2.1. Profile of Respondents

The initial number of households indentified for interviews was 210 however due to flooding and difficulty in communications only 196 interviews were undertaken. Table 10 summarizes the socio-economic characteristics of the respondents. More than 70% of respondents planted rubber and 80% of interviewees were head of household. There were about 69% male interviewees with an average age of 41 years old, and about 90% of the total of interviewees are married. Respondents were relatively poorly educated, with approximately 25% are not able to read and write. More than 40% had incomes and expenses level that were less than 500,000 Kip or 58.5USD per month. Mean income and expenses was estimated to be more than 1,000,000 Kip or 117 USD per month.

Table 10: Respondents' Socio-Economic Characteristics

Variables		Number	%
Number of respondents who planted rubber		140	71.43
Number of respondents who were Head of Household		158	80.61
Gender	male	137	69.90
Mean Age (year)	41		
Status of Respondents	married	177	90.31
Educational Level	Illiteracy	49	25.00
Income Level/month	<500,000	83	42.35
Expenses Level/month	<500,000	133	57.65
Mean Income/month	1,267,800/Kip		
Mean Expenses/month	1,027,000/Kip		

Source: WREA Team Study analysis, August 2008

Table 11 indicates the involvement of women in daily routines and their age. There are five main daily activities that they contribute to household income generation and family care: (i) firewood collection (14.12%); (ii) cooking (12.51%); (iii) gardening (12.06%); (iv) grass cutting in rubber plantation areas (10.45%); and (v) child care (10.10%). It was observed that female labour used in rubber tree plantation was predominantly for grass cutting. However, they are also consulted in the rubber tree plantation decision: size and location, buying seeds, latex price and market[20]. Females younger than 20 years old are more involved in fire wood collection (50%); and those lesser than 51 years old are engaged in cooking, gardening, cutting grass in rubber plantation and taking care of children.

Table 11: Daily routine' Women Involvement

	<20	20-30	31-40	41-50	51-60	>60	Total	%
Fire wood collection	**63**	**14**	**20**	**20**	**4**	**2**	**123**	**14.12**
Weaving	28	3	10	7	2	-	50	5.74
Cultivate Rice	17	8	13	19	3	-	60	6.89
NTFPs collecting	21	3	9	12	1	-	46	5.28
Fishing	12	-	1	7	-	-	20	2.30
Feeding Animals	8	3	10	16	2	-	39	4.48
Gardening	**22**	**22**	**28**	**26**	**6**	**1**	**105**	**12.06**
Cooking	**35**	**20**	**24**	**26**	**3**	**1**	**109**	**12.51**
Children care	**25**	**15**	**21**	**21**	**4**	**2**	**88**	**10.10**
Grass Cutting in Rubber Garden	**27**	**15**	**23**	**21**	**5**	**-**	**91**	**10.45**
Grass Cutting in Shifting cultivate	37	7	15	19	2	-	80	9.18
Shifting cultivate	19	7	8	16	1	-	51	5.86
Officer	6	2	-	1	-	-	9	1.03

Note: Multiple answers (including members in household)

Table 12 shows that men are mostly involved in three main activities: (i) gardening (29.05%); (ii) taking care of rubber trees (25.90%); and (iii) fire wood collection

[20] According to the qualitative data survey, July-August 2008

(16.85%). This suggests that men spend more time in gardening and rubber tree plantation care; and men also participate in fire wood collection. It is noticed that male is only employed in work outside the house, especially rubber plantation work.

Table 12: Daily routine' Men Involvement

Activities	<20 years old	20-30 years old	31-40 years old	41-50	51-60 years old	>60 years old	Total	%
Fire wood collection	**14**	**18**	**17**	**17**	**9**	**-**	**75**	**16.89**
NTFPs collecting	4	2	5	4	1	-	16	3.60
Fishing	5	5	1	3	1	-	15	3.38
Feeding Animals	7	4	5	7	6	-	29	6.53
Gardening	**31**	**24**	**30**	**30**	**12**	**2**	**129**	**29.05**
Hunting wildlife	2	1	1	1	1	-	6	1.35
Planting Rubber	**26**	**24**	**25**	**28**	**10**	**2**	**115**	**25.90**
General engage	2	8	10	7	1	-	28	6.31
Construction workers	-	3	4	2	-	-	9	2.03
Factory workers	1	1	-	1	1	-	4	0.90
Officer	2	5	7	2	2	-	18	4.05

Note: Multiple answers (including members in household)

4.2.2 Findings at Luang Nam Tha and Oudomxay Provinces

i) Socio-Economic and Costs/Benefits Analysis Findings

- *Cash Crop Smallholders*

Before rubber tree plantation, villagers relied mainly on cash crops (corn) and swidden cultivation. Their annual income was approximately 9,152,000 kip or US$ 1,070.41 per year. This income was generated predominantly from the production of corn and upland rice.

According to the Costs and Benefits Analysis formula:

$$PV(C) = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t}$$

Where Ct denotes the costs incurred in t for t = 0, 1, 2…,n, is the discount rate. The major costs of the rubber plantation are the direct costs that will be disbursed over the whole project life, from years zero to 30.

Corn:

Costs of corn production: The area of corn yield was estimated to be approximately 2.2 ha, that required 45 kg of seed equivalent to 741,310 Kip/year, labour cost around 144,000 Kip/year, cost of herbicide 329,500 Kip/year; others 169,000 Kip/year.

Cost of Corn = (Seed (kg) X seed price) +labour + herbicide + other …..(year1)

(45kg x 17,000kip) +100,000kip+329,500kip+169,000kip=1,194,500kip (year1)

.
.
.

Cost of Corn = (Seed (kg) X seed price) +labour + herbicide + other …..(year30)

(45kg x 17,000kip) +100,000kip+329,500kip+169,000kip=1,194,500kip (year30)

Benefit of Corn= (Price x Quantity) . . . . . (year1)

(1100kip x 7,000kg) = 7,700,000 kip. . . (year1)

.
.
.

Benefit of Corn= (Price x Quantity) . . . . . (year30)

(1100kip x 7,000kg) = 7,700,000 kip . . . . . (year30)

Upland Rice: Cost of upland rice seed and labour with land of 0.44 ha and seed price of 2200 kip/ kg estimated seed 30kg and labour 500 000 per time

Cost of rice = (Seed (kg) x seed price) +labour . . . . . (year1)

(2,200kip x 30kg)+500,000 =566,000 kip . . . . . (year1)

Cost of rice = (Seed (kg) x seed price) +labour . . . . . (year30)

(2,200kip x 30kg)+500,000 =566,000 kip . . . . . (year30)

Benefit of rice = (Price x Quality21) . . . . . (year1)

2,200kip x 660kg = 1,452,000kip . . . . . (year1)

.
.
.

Benefit of rice = (Price x Quality) . . . . . (year30)

2,200kip x 660kg = 1,452,000kip . . . (year30)

$$PV(C) = \sum_{t-0}^{30} \frac{(Corn\cos t + Rice\cos t)}{(1+i)^t}$$

$$PV(C) = \frac{1{,}194{,}500+566{,}000}{(1+12\%)^0} + \frac{1{,}194{,}500+566{,}000}{(1+12\%)^1} + \cdots + \frac{1{,}194{,}500+566{,}000}{(1+12\%)^{29}} = 16{,}125{,}826 kip$$

[21] One hectare of land got 1.5 ha of rice; 0.44ha got 0.66 tons of rice or 660kg

Benefit from upland rice will be:

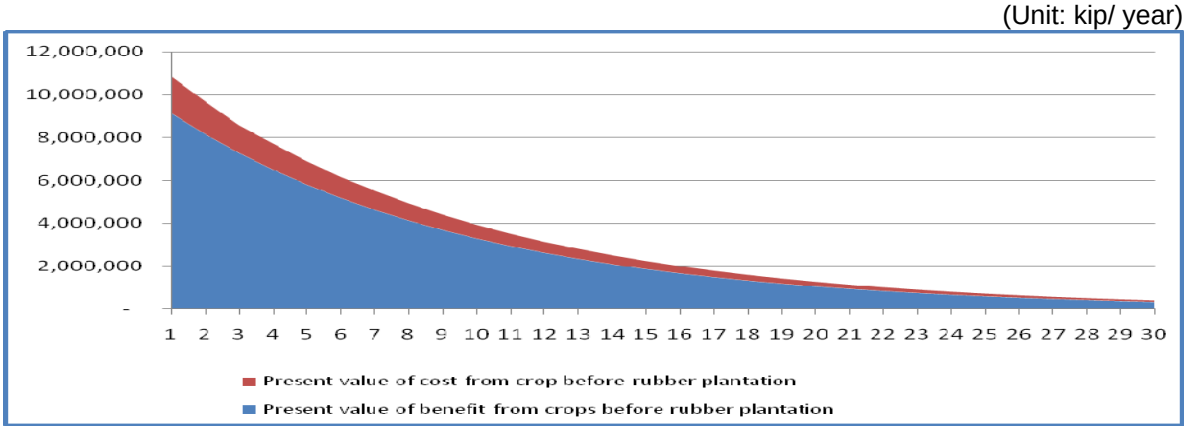
$$PV(B) = \sum_{t-0}^{30} \frac{(corn + rice)}{(1+i)^t}$$

$$PV(B) = \frac{(7{,}700{,}000 + 1{,}452{,}000)}{(1+i)^0} + \frac{(7{,}700{,}000 + 1{,}452{,}000)}{(1+i)^1} + \cdots + \frac{(7{,}700{,}000 + 1{,}452{,}000)}{(1+i)^{29}} = 82{,}567{,}569 kip$$

NPV (crops before rubber) = 82,567,569 - 16,125,826 = 66,441,743 kip or $7,771
The Net Present Value (NPV) and Benefits/Costs (B/C) ratio of basic cash crops (corn and upland rice) before rubber plantation, have a respective value of 66,872,946 Kip or US$ 7,821 and 5.26, which is higher than that of the Rubber Farming Contract but less than the rubber smallholders self investment, as illustrated in below Figures 6-9.

Figure 6: NPV of Corn and Upland Rice before Rubber Plantation

(Unit: kip/ year)



Source: WREA Study Team, August 2008

Rubber Smallholders Self Investment

Costs: Rubber area, rubber price, material, herbicide, herbicide, chemical

- $$PV(C) = \sum_{t-0}^{30} \frac{(seedling + labor + herbicide + pesticide + fertilizer + equipment + landtax)}{(1+i)^t}$$

$$PV(B) = \sum_{t-0}^{30} \frac{rubberlatex}{(1+i)^t}$$

$$PV\ (C) = \frac{3{,}835\ ,481\ .20}{(1+12\ \%)^{\ 0}} + \frac{4{,}407\ ,881\ .20}{(1+12\ \%)^{\ 1}} + \cdots + \frac{3{,}885\ ,481\ .20}{(1+12\ \%)^{\ 29}} = 38\ ,004\ ,667\ kip$$

$$PV\ (B) = \frac{4{,}181\ ,760}{(1+12\ \%)^{\ 0}} + \frac{4{,}181\ ,760}{(1+12\ \%)^{\ 1}} + \cdots + \frac{35\ ,438\ ,040}{(1+12\ \%)^{\ 29}} = 449\ ,513\ ,914\ kip$$

NPV (of rubber by smallholder) = 449,513,914 - 38,004,667 = 411,509,247 kip or $48,130

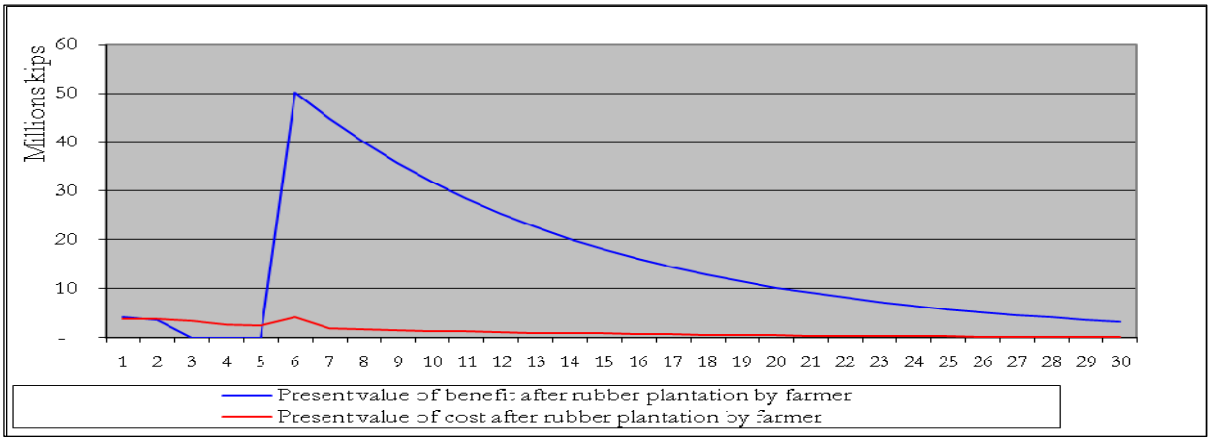
Rubber Smallholders Self Investment NPV value is 411,509,246 Kip or 48,130 USD[22] and B/C ratio is 11.83. This high value could be explained by the financial and technical support from relatives living in China: investment budget, rubber seeds, technique in rubber planting, tapping and processing latex. Moreover, there is no labour fee as it is family labour force, and organic fertilizers are used, which is free. For those who are planting rubber trees in the same scale and do not receive

[22] Rubber price is based on the August, 2008 year price. This might go down due to the decrease world fuel price

the same support, the Benefit Cost Ratio would be lower, because of all of the above mentioned costs to be assumed (see Figure 7)

Figure 7: NPV of Rubber plantation by self investment

(Unit: kip/ year)



Source: WREA Team Survey, August 2008

- *Smallholders Contract Farming*

According to the field findings in the North, the contract farming of rubber plantations is mainly of the type 2+3 (farmers will get 40% of benefit from latex selling, while investor will get 60%). Farmers possess land and offer labour, while investors provide the technical support, fertilizers and other equipment, as well as being charged with finding markets. Throughout the first and second years, farmers can plant rice as intercrop in rubber plantation and continue to ensure family rice consumption. After six years, rubber trees become mature and start to provide latex. During the first six years, farmers have to take care of rubber trees planted and Rubber Company still provide fertilizer and technical advices on the appropriate way of taking care of rubber trees and latex tapping.

$$PV\ (C) = \sum_{t-0}^{30} \frac{(sharing \quad 60\ \%\ to investor \quad)}{(1+i)^t}$$

$$PV\ (C) = \frac{522\ ,400}{(1+12\ \%)^{\ 0}} + \frac{522\ ,400}{(1+12\ \%)^{\ 1}} + \cdots + \frac{53\ ,157\ ,060}{(1+12\ \%)^{\ 29}} = 265\ ,947\ ,892\ \ kip$$

Benefits: Based on 2+3 policy (local farmers receive 40% and investors get 60%) from selling rubber latex

$$PV(B) = \sum_{t-0}^{30} \frac{(40\%rubberlatex + uplandrice)}{(1+i)^t}$$

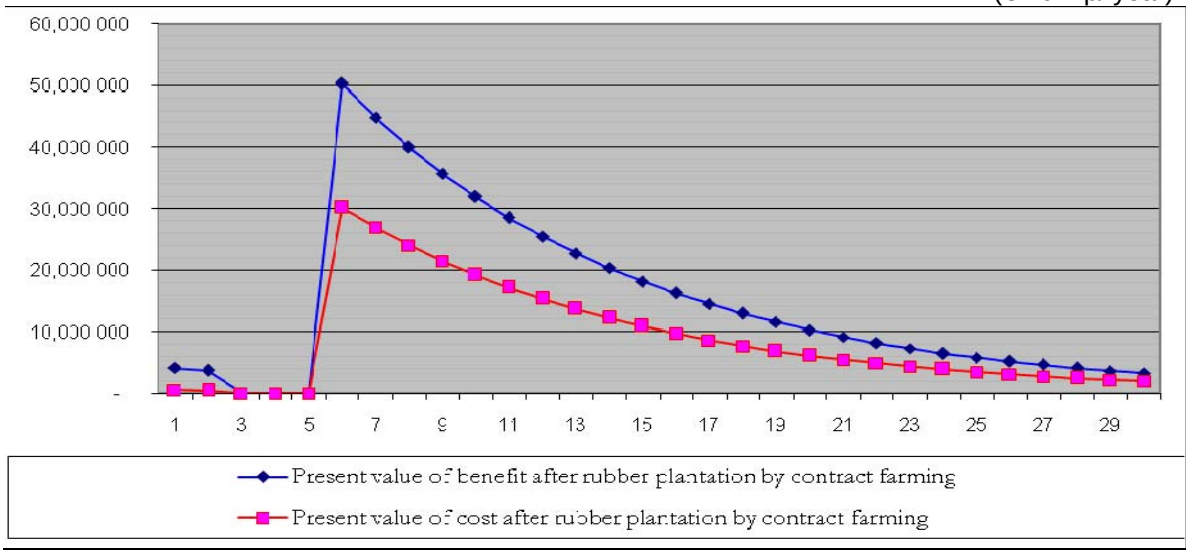
$$PV\ (B) = \frac{4{,}181\ ,760}{(1+12\ \%)^{\ 0}} + \frac{4{,}181\ ,760}{(1+12\ \%)^{\ 1}} + \cdots + \frac{35\ ,438\ ,040}{(1+12\ \%)^{\ 29}} = 449\ ,513\ ,914\ \ kip$$

NPV (rubber by contract farming) = 449,513,914 - 265,947,892 = 183,566,021 kip or $ 21,470

It is found that the NPV and B/C ratio of the Rubber Plantation by Contract Farming respectively were: 183,566,021 Kip or 21,469 USD and 1.69, which was less than those of cash crops (before rubber plantation) and rubber smallholders self investment. This is explained by the fact that benefit gained from latex selling between local people and foreign rubber companies is 40:60 (local people receive 40%, while the company gets 60%; and the costs of rubber tree plantation are higher than those of cash crops, which do not require crop seed buying and others (see Figure 8).

Figure 8: Rubber plantation by contract farming

(Unit: kip/ year)



Source: WREA Study Team, 2008

In addition to the above mentioned Costs Benefits Analysis, the Study Team also compared the Net Present Value and Benefit/Costs Ratio of rubber plantation (smallholders self investment and contract farming) with those of cash crops and corn in the same land size of 2.6 ha, and the result is as follows:

Table 13: Comparison of NPV of cash crops and those of rubber tree plantation (self investment, contract farming)

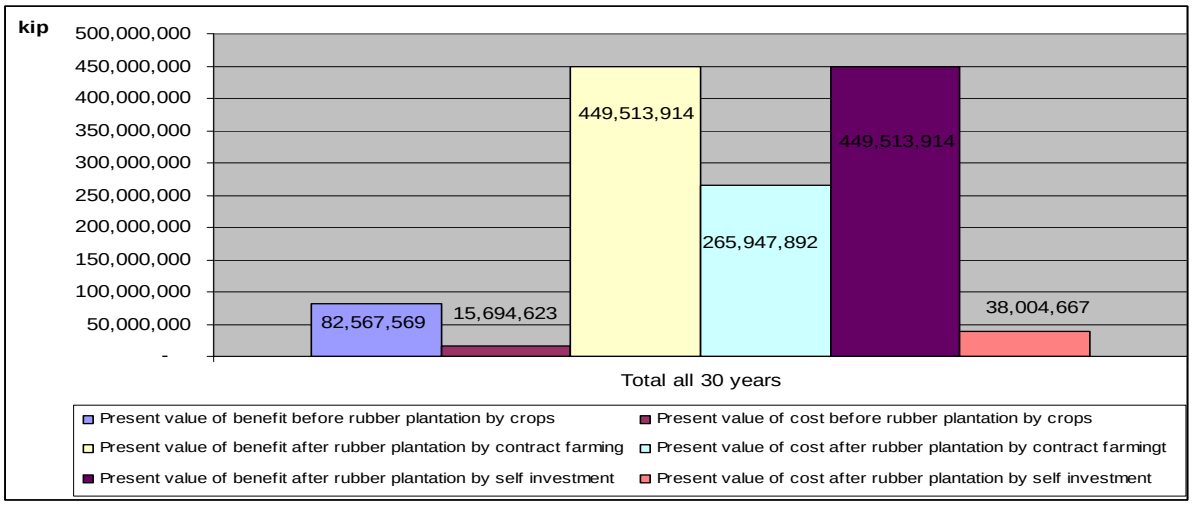
No.	NPV	NPV(Kip)	NPV(USD)	B/C ratio
1	**Self investment for rubber**	411,509,246	**$48,130**	**11.83**
2	Rubber by contract farming	183,566,021	$21,469	1.69
3	**Basic crop (corn and upland rice) without rubber**	66,872,946	**$7,771**	**5.12**

These findings reveal that NPV of these three cases have a positive value (NPV>0) as well as Benefit Cost Ratio. Thus, production in these three cases is viable. But, the rubber smallholders self investment case is the most beneficial, followed by the cash crops before rubber tree plantation, while the least financially viable is the

rubber contract farming. It may therefore be preferable to promote rubber smallholder self investment enterprises rather than contract farming, and to also take into account the benefits earned from cash crops without rubber tree plantations. The cash crop case needs to be effectively promoted and further studies must be undertaken to optimise benefits and decrease costs.

We could not systematically conclude from this first finding, that small rubber self investment enterprises are more practicable than the cash crops plantation and that this approach to rubber production could be expanded throughout the entire country. There would be a need to undertake more consistent and integrated studies on these issues, such as to identify the real reasons behind differences of these benefits and costs. According to the field findings, the difference might mainly be from the global price of latex, which is currently higher than those for cash crops during the study period. Over the past several months the price of latex has declined dramatically whilst cash crop prices still remain at the same the same level and in some countries are increasing.

Figure 9: Present value of benefit- cost – before and after rubber plantation in the north of Lao PDR



i) Environment Impact Findings

It was reported that after rubber tree plantation: (i) some weather changes, such as the climate is warmer than usual and the rainy season comes later or earlier. In addition to that, there was unforeseen flooding occurring during intensive rainfall events, blocking traffic and access to many remote villages[23]; (ii) there is also some external pressure on villagers land use and forest resources. For example, some local businessmen have attempted to get concessions on the agricultural and forested land for rubber tree plantation purposes. Some areas of the buffer zone of Protected Areas were occupied by rubber tree plantation, which might have cumulative social and environment impacts if this issue is not vigorously addressed at the start, specifically those plantations which are near to the Nam Ha National Protected Area, being declared as the ASEAN Heritage, and rewarded by

[23] Field survey, August 2008

UNESCO as a model Ecotourism Project which could be appropriately replicated in the entire country; and (iii) misuse of pesticides have impacted water quality of the streams and villagers' health[24].

4.2.3 Findings Champassak Province

i) Socio-Economic Impacts

Before the of large scale rubber tree plantations, villagers earn around 35 million kip or US$4,100 per year from selling their garden products (mostly durian and rambutan fruits) and NTFPs harvested from their lands and village forests[25]. The Net Present Value and Benefit Cost Ratio from Cash Crops and NTFPs are consecutively US$26,653 and 26, which are quite high.

- *Income of Villagers before Rubber Concession*

PV (C), Calculation of the major costs of the rubber plantation are the direct costs that will be incurred throughout the life of project, from years 0 to 30: costs derived from local farmers' income from selling durain, rambutan, cardamom, mark chong, and NTFPs; other costs are from land clearing, rubber plantation. According to the Viet-Lao Joint Stock Rubber Co, Ltd and Daklak Rubber Company, the cost for the preparation and rubber plantation is approximately 2,864 USD/ha (exclude latex processing) and 2,700 – 3,000 USD/ha, respectively.

$$PV(C) = \sum_{t-0}^{30} \frac{(Durain + Rambu\ \tan + Cardamon + NTFPs)}{(1+i)^t}$$

PV (B) can be derived from the salaries of workers. Rubber Company pay salaries to workers of approximately 700,000 Kip/month, and land Tax is about 5 USD/ha/year. Revenue from selling Latex, in Had Yao village, Luang Namtha Province, rubber could produce 1,360 Kg/ha/year of latex equivalent to 8,840,000 Kip or nearly USD 880.

$$PV(B) = \sum_{t-0}^{30} \frac{Salary}{(1+i)^t}$$

Cash Crops

Coffee in Laos is cultivated almost exclusively in Bolaven Plateau, Champasak Province. This Plateau is a volcanic origin and covers approximately 1.000 km^2 at a height of between 300 and 1.500 meters above the sea level. Coffee is grown by about 20,000 families who live in 250 villages. Each family cultivates between 0,5 and 3 hectares of coffee, thus making it as an important source of income for many villagers in the area.

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[24] Houy long kao and Eurlamai villages, Sing District Luang Namtha Province.
[25] Villagers from Oudomsouk village, Bachiang District

Nowadays about 15,000 tons of coffee is produced in Laos, 95% of which is Robusta. In 1993, a new variety of Arabica, resistant to the rust, was introduced into the Bolaven Plateau and more specifically into Champasak's province (kingfish erecolodge).

Ban Itou, Lak 35, Paksong District, Chamapsak Province

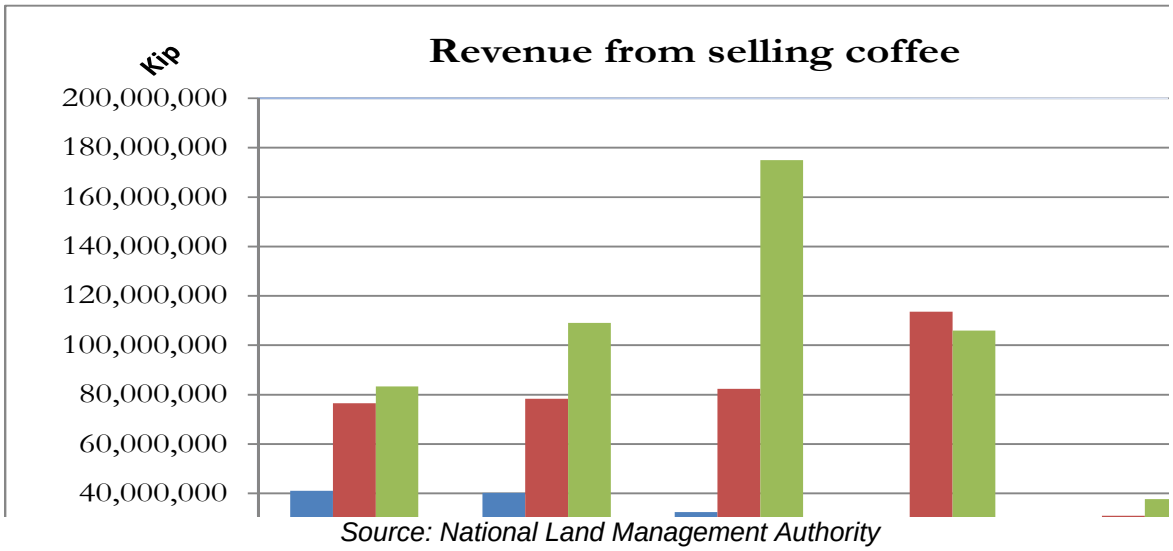
The Itou Village consist of two ethnic groups: Lao Lum and La Ven ethnic, is accounted for 97.68%. Local farmers mainly practice coffee and tea cultivation. Moreover, they also feed animals and planting coffee seedlings as the main income generating activities.

Ban Itou is far from Pakse District about 35 Km and Paksong District around 15 Km, there are 144 households, 158 houses with total population 826 and 376 was female. Total area of village is approximately 269 ha (all households cultivate production in the village), the capacity of production is about 800 Kg/ha. Tea fields are approximately 54 ha, about 28 households have been planted with production 300 Kg/ha. Annual production is approximately 384 ton/year. In addition, 105 households also plant coffee seedlings in order to sell in Paksong District. The local farmers can grow coffee seedlings around 1.5 million tree/year, which can generate income more than 3,159 million Kip, GDP per capital of local farmers is 1,000 USD/year. In the village, there are fix costs estimated about 95,496,826 Kip and variable costs 38,620,000 Kip.

Source: kplnet

In 1980, coffee field production was 6,451 ha, this area has increased to be 36,642 ha in 2002. The coffee products estimated around 2.5-3 Kg/tree or 1-1.5 ton/ha. Due to a continuous increase in coffee price and world demand, in Ban Lak 19, there have been 30 households who garden coffee with an average income 5,147,000 Kip/household/year. However, in Oudomsouk Village, one of the target villages, in 2003, the villagers could earn incomes of approximately 41,100,000 Kip. In 2005, income has steady decreased to be 32,480,000 Kip, 29,505,000 Kip in 2006 and 3,600,000 Kip in 2007 respectively.

Figure 10: Yearly income from selling coffee products in Oudomsouk, Nongkea, and Lak 19 Villages

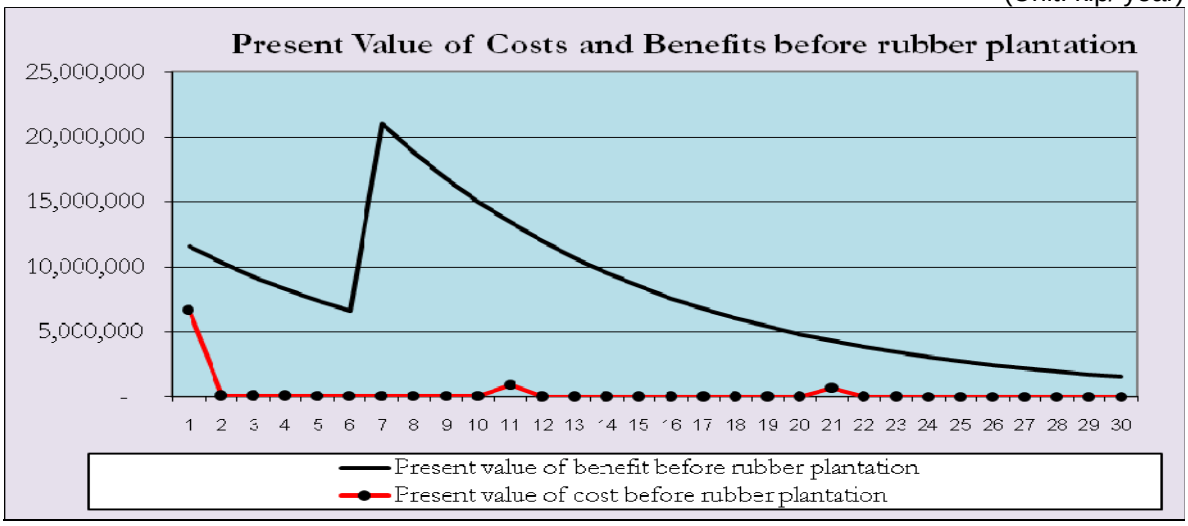


Source: National Land Management Authority

Before the large scale rubber tree plantation, villagers earn around 35 million kip or US$4,100 per year from selling their garden products (mostly durian and rambutan fruits) and NTFPs harvested from their lands and village forests[26]. The Net Present Value and Benefit Cost Ratio from Cash Crops and NTFPs are consecutively US$26,653 and 26, which are quite high.

Figure 11: Present Value of Costs and Benefits of Crops and NTFPs earning (before rubber plantation) in Champassack Province

(Unit: kip/ year)



Source: WREA Team Study, August 2008

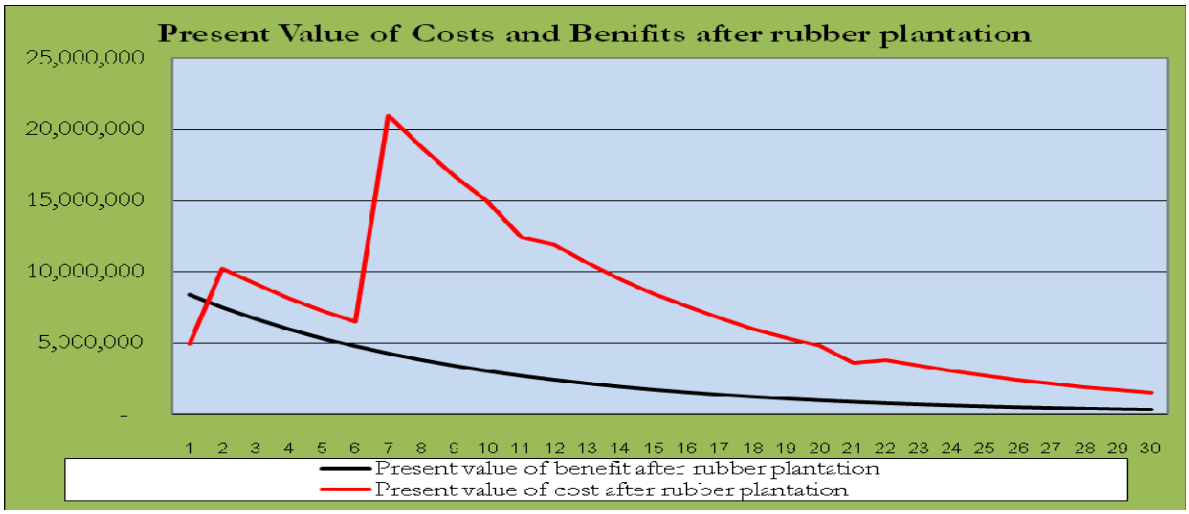
But after large scale rubber concessions, their lands and village forests had been cleared and converted to rubber tree plantation, thus NTFPs as well as durian and rambutan fruits are no longer produced. Consequently, the livelihoods of villagers has been drastically changed: they have to almost rely entirely on their monthly wages (around US$50-120), which makes them more and more dependent on the investors. If this issue is not addressed, it could have notable cumulative impacts.

Only people around 15-40 years old are recruited for labour by rubber plantations, as it is the case at Oudomsouk village, Bachiang District. The Net Present Value and Benefit Cost Ratio of household respondents from large scale rubber plantation account respectively -US$25,914 and 0.01. This cost-benefit analysis demonstrates that the costs have exceeded the benefits of the project. This shows that the project is not viable; the development should not proceed because the large forest area yet to be cleared would incur more costs than benefits. Limiting the plantation to its current size and protecting the remaining forests would be the only option to prevent negative impacts on the local people and the environment. This case is quite similar to the Cambodia case study, as discussed previously in the literature review section.

[26] Villagers from Oudomsouk village, Bachiang District

Figure 12: Present Value of Cost and Benefit from Rubber Plantation in Champassack Province

(Unit: kip/ year)



Source: WREA Team Survey, August 2008

Table 14: Comparison of NPV between before and after rubber tree plantation

No.	NPV	NPV(Kip)	NPV(USD)	B/C ratio
1	Net benefit of villagers after rubber plantation	-152,099,852	-$177,90	0.07
2	Net benefit of villagers before rubber plantation (from Cash Crops and NTFP Harvest)	227,883,023	$26,653	26

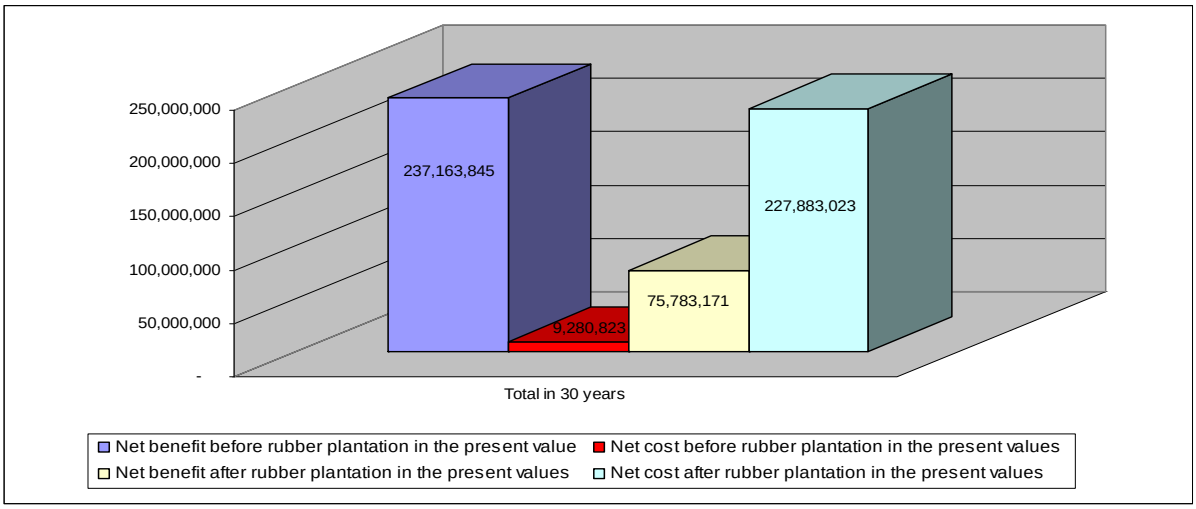
Source: WREA Team Study, August 2008

It could be concluded that the large scale rubber tree plantation would be beneficial to developers but not at all to villagers, as the NPV is negative and the B/C ratio is 0.07, as illustrated in the above Table and Figures 10-11. These large sizes rubber tree plantation only provide salaries to villagers in addition to destroying their usual income from their garden and NTFPs harvests.

It might be more rational, in Laos, to promote the smallholders rubber self investment, enforce relevant laws, avoid any large scale rubber tree plantation which encroach on forest areas or villager lands, and let the private sector investing in rubber processing, as China has done and is doing.

Large scale plantation could contribute to poverty alleviation of the villagers if it does not destroy forest areas and villagers lands, are implement according to national legislations, and that it provide complementary income to villagers in addition to what they are earning before rubber tree plantation and not destroying their existing income.

Figure 13: Present value of benefit- cost – before and after rubber plantation in the South of Lao PDR



Source: WREA Team Study analysis, August 2008

i) Environment Impacts

Large rubber concession plantations result in rapid land clearance and conversion, which has a negative impact on soil quality, ecosystem equilibrium and biodiversity resources sustainability, if these plants are in the forest area. Villagers have noticed the loss of local NTPS species, and weather change. The use of pesticides and fertilizers are starting to have health and environment impacts, as has happened in Luang Nam Tha Province. This issue should be effectively addressed by clear explanation on the management and use of pesticide in a wise way. Moreover, rubber plantation plants are invading the protected areas[27].

5. CONCLUSION AND SUGGESTIONS

5.1 Conclusion

Coping with rapid expansion of rubber tree plantation in the country, institutions and authorities have not been able to keep up with the issuing of relevant policies, strategies, regulations and development programs that would promote sustainable rubber tree development. The recent promulgation of the Tourism, revised Forestry and Land Laws and the coming submission of the National Land Use Inventory Report to the National Assembly, as well as the Investment, Mining and other Laws during November 24 – December 8th, 2008 illustrates the importance of a strong governance framework that Lao Government is developing in managing and using its natural resources in a sustainable manner.

[27] The Daklak Rubber Company is in the National Protected Area Dong Hua Sao, Bachiang District, Champassak Province

However, research on appropriate rubber development technology is still in its infancy; relevant legislation ensuring protection of small rubber holders' rights and benefits has not been promulgated yet. There is still a lack of coherent studies on: (i) the appropriate technology or techniques to select and develop relevant rubber species or varieties, planting and tapping the rubber trees in different regions of the country due to differences of ecosystems, and on rubber latex processing; (ii) the identification of appropriate foreign markets and traders that could provide attractive and fair prices to local smallholders; (iii) the suitable contract farming options ensuring optimum benefits to local farmers or smallholders; (iv) access to attractive loan or financial mechanism; and (v) the effective information system to provide on time information for smallholders, private sectors, local communities and policy makers.

The northern part of the country is mostly mountainous with high slopes and rubber plantation areas would be predisposed to mud slides during heavy rainfall events, as has occurred in some neighboring countries. Moreover, too rapid expansion of rubber at a large scale could affect the forested areas, their biodiversity resources, and poor villagers' livelihood as being affected as observed in Champassak Province.

According to the Study findings, it seems that smallholders farming are more suitable to the Lao situation and needs. The self investment option could provide optimum revenue to smallholders if there are guarantee markets and technical advice from relevant local government institutions. Concerned local government institutions need to closely assist smallholders in managing effectively their plantation and in selling their products at a fair and optimum price. Chinese experiences could be used as an appropriate reference for the northern part of Laos due to its close similarities of weather, ecosystems and physical land conditions: local farmers are planting rubber trees, while the private sector are only investing in rubber processing; State Farms, together with the Agriculture Bureau are doing research on the optimum productivity of rubber plantation and processing to be further disseminated to local communities and investors; and the Environment Sector is conducting the environment monitoring.

Traditionally, Lao women are playing a valuable role in all households' activities and decision making process. Even though the husband is officially the head of the household, final decisions are mostly made by the wife. In the case of rubber tree plantations, in addition to participating in family daily work, women also contribute to the decisions on rubber or cash crop plantation, the size of these enterprises, related expenses as well as the price of rubber that is to be sold.

Villagers are directly exposed to economic abuse from foreign and local rubber investors or traders due to their lack of experience in selecting good rubber species, planting rubber tree, processing rubber latex and negotiating their labour fees and rubber latex price. Furthermore, they have difficulty in getting access to attractive loans for developing their rubber tree plantation.

Rubber tree plantations could be developed in a sustainable manner by learning from the experiences of other countries in the region, which practice inter-cropping during the first four to five years of rubber tree plantation, and processing of rubber latex as well as optimum practices for rubber tree production. But these experiences would have to be studied and tested before being introduced to Lao smallholders and private sectors.

5.2 Suggestions

The risks of rubber monoculture, specifically its cumulative impacts on the daily life of small rubber holders living in the remote areas should be addressed. Farming concessions shall be undertaken only on state land or degraded lands, they should not encroach into forest areas and invade villagers' lands as in Champassak Province. This is difficult to achieve due to the attractive benefits from forest land clearance and investors focus on fast and short term benefits. In the case that villagers are willing to sell or rent their lands to rubber developers, the costs of the land should be based on market prices. By doing so, rubber tree plantation could contribute to poverty alleviation of surrounding villages, districts and provinces.

The roles of local banks, such as the Agriculture Promotion Bank should be encouraged to assist smallholders obtaining soft loans.

Rubber tree plantations should be appropriately managed and issues addressed at the start of the venture. It this is not undertaken then Lao PDR could face significant cumulative social, economic and environment impacts in the near future, due to limited financial means and human resources capacity, as well as the small size of its population to respond to the future huge labour requirements for rubber tree pruning, tapping and processing at the national level.

Moreover, there should be firm implementation and enforcement of relevant legislation and Government decisions, such as on the national land use and allocation: size to be preserved for forest and protected areas, rubber surface to be developed in the country, sufficient dimension for other appropriate crops and trees cultivation, tourism and other development activities areas, which would provide optimum revenues to local communities and the country, as well as having less social and environment impacts.

Promotion and expansion of rubber tree plantation in Lao PDR would have to be studied in a consistent manner. Urgency and priority is to be given to national land use before allocating any concession to any development investment project (not only related to rubber tree plantation, including hydro power and mining development) and comparative studies on CBA within rubber, jatropha, eucalyptus, teak, eagle wood, ecotourism, hydropower and mining, etc.

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APPENDICES

Appendix1.

Questionnaire Form

Questionnaire. No:

Rubber in the GMS: An Integrated Research Exercise on Rubber Development in Lao PDR, complementary group:

Rubber: Costs or Benefits to the Lao PDR?

Case Study: In Luangnamtha, Oudomxay and Champasack Province.

Interviewee's Name: House Number: Village: District:
Date: /2008
Start Time: Finish Time: Total:

Introduction

My name is , working at the Environment research Institute. We are conducting the research on cost or benefit from rubber tree planting. We are interested in the real situation, problems and advantages concerning the rubber. This research will provide good information and suggestion to the Lao Government about social-economic and environment. Your information given will be kept as secret and will not be revealed; it will only be used in this research.

I. Social-Economic Information.

1. Are you the head of your family?

1.1 Yes 1.2 No

2. How many people in your family?

Total: , Male: ,Female:

3.1 Age: 3.2 Gender: 3.2.1 Male 3.2.2 Female

4. Status: 4.1 Single 4.2 Married 4.3 Divorce 4.4 Widow

5. What is your income and expenditure for one month?

No.	Level of Income	Actual Amount	No.	Level of Expenditure	Actual Amount
1	Below 500,000 kip		1	Below 500,000 kip	
2	500,001-1,000,000 kip		2	500,001-1,000,000 kip	
3	1,000,001-1,500,000 kip		3	1,000,001-1,500,000 kip	
4	1,500,001-2,000,000 kip		4	1,500,001-2,000,000 kip	
5	2,000,001-2,500,000 kip		5	2,000,001-2,500,000 kip	
6	2,500,001-3,000,000 kip		6	2,500,001-3,000,000 kip	
7	3,000,001-3,500,000 kip		7	3,000,001-3,500,000 kip	
8	3,500,001-4,000,000 kip		8	3,500,001-4,000,000 kip	
9	Above 4,000,000 kip		9	Above 4,000,000 kip	

6. Education

No.	Education Level	Actual Level (Class or Certificate)
1	Illiteracy	
2	Literacy	
3	Out of Primary School	
4	Primary School	
5	Out of High School	
6	High School	
7	Out of Vocational School	
8	Vocational School	
9	Out of University	
10	University or Above	

7. Information of the interviewee

7.1 Are you a local villager of this area?	7.2 When did you come to live here?	7.3 Why did you come to live here?	7.4 Where did you live before?	7.5 What did you do before?
1. Yes (Move to the next Question) 2. No (Continue to 7.2-7.5)				

8. What are your main activities?

8.1 Farmer 8.2 Rubber tree farmer 8.3 Growing rice 8.4 Other (please give detail):_____

9. What is your income per year before paying taxes and others expenditures?_____ Kip

10. Do you think your income now is enough for your family living? 9.1 Yes 9.2 No

If not, how much will be enough?_____ Kip

11. How much of your family saving per year?_____ Kip

12. What are the agricultural activities that raise income for your family?

A. Rice	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Pull/ Kip	Cultivate/Kip	Harvest/Kip	Others
1.Irrigate R														
2. Season R														
3. Upland R														

B. Crops	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Labor/Kip	Cultivate/Kip	Harvest/Kip	Others
1.														
2.														
3.														

C. Economic Wood	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Labor/Kip	Cultivate/Kip	Harvest/Kip	Others
1.														
2.														
3.														

13. Do you have the other activities besides mention above?

13.1 Yes 13.2 No

14. If yes,

14.1 What is it? _____

14.2 How much do you earn per month? _____ Kip/Month

II. Female participation in Rubber Tree Planting.

15. Female's income contribution to the family. Use ✓ in the box

No.	Name	a. Age	b. Collect Wood	c. Handicraft	d. Cultivate Rice	e. Collect NTFP	f. Fishing	g. Raise Animal	h.Gardening	i. Cooking	j. Look Children	k. Cutting grass	l. Plant Rubber	m. Upland rice	n. Income /Month
1															
2															
3															
4															
5															

16. Male's income contribution to the family.

No.	Name	a. Age	b. Collect Wood	c. Collect NTFP	d. Fishing	e. Raise Animal	f.Gardening	i. Hunting	j. Plant Rubber	k. Worker	l. General engage	m. Factory Worker	n. Officer	n. Income /Month
1														
2														
3														
4														
5														

III. NTFP Gathering

17. NTFP Gathering (Before Planting Rubber 10 years)

NTFP	A. Times per Month	B. Volume of Collecting (kg)	C. Collect for		D. Price Per Kg	E. Income earned per year	F. Place to sell
			c.1. Sell	c.2. Eat			
1.							
2.							
3.							
4.							

18. NTFP Gathering in Present.

NTFP	A. Times per Month	B. Volume of Collecting (kg)	C. Collect for		D. Price Per Kg	E. Income earned per year	F. Place to sell
			c.1. Sell	c.2. Eat			
1.							
2.							
3.							
4.							

IV. General Information of Rubber Tree Planting

19. What type of rubber tree planting?

19.1 Own Investment 19.2 Be labor of the rubber company 19.3 Sharing Contract

20. If have sharing contract, what is the proportion? Villager _____% Company _____%

21. What are the contributions between villagers and investor? (Labor, Land, Tools, Fertilizer, Chemical and so on)

Villager Cost	a. Amount	b. Price/Kip	Unit	Company Cost	a. Amount	b. Price/Kip	Unit
1. Land			Hectare	1. Land			Hectare
2. Labor			Head	2. Labor			Head
3. Seedling			Seed	3. Seedling			Seed
4. Tapping Equipments				4. Tapping Equipments			
5. Latex Collecting Equipments				5. Latex Collecting Equipments			
6. Others _____				6. Others _____			

22. If you were the labor of company, when did you start working? Year _____

23. Company's name: _____

24. The average income for one month: _____ Kip

25. Can you calculate the amount of rubber tapped in one hectare for one time? _____ Kg per time

26. Where was your seedling from? (Thai, Vietnam, China, or other) _____

27. From your opinion, what kind of seedling that will be suitable for the weather and land in your village? And why?

_____

V. Initiated Cost of Rubber Tree Planting

28. The overview of rubber planting in your family year by year.

No.	a. Year	b. Area (Hectares)	c. Tax	d. Number of Tree	e. Price of Seedling	f. Distance	g. Remaining trees	h. Dead tree	i. Replants	j. Remarks
Year 1										
Year 2										
Year 3										
Year 4										
Year 5										

29. Equipments and labor used in the planting

Items	Equipments			Labor			
	Unit	Price	Total	Hire Labor	Wage per day	Self Labor (family)	Total
1. Land Clearance							
2. Logging Tree							
3. Grass Cutting Machine							
4. Hole Digging							
5. Plant/tree							
6. Fertilizer							
7. Branch Cutting							
8. Chemical (Pesticide, Herbicide)							
9. Others _____							

30. Amount, Unit, Value and/or Price of Tapping Equipments

Items	a. Amount	b. Price	c. Total	d. Duration Use	e. Used Items
1. Battery					
2. Knife					
3. Limestone					
4. Drop Bowl					
5. Bowl wire					
6. Collecting Bucket					
7. Store Bucket					
9. Filter					
10. Stick to stir					
11. Storing House					
12. Chemical					
13. Water					
14. Gas					
15.Others					

31. Equipments and Labors in the Maintenance

Equipments	Price Per Unit	Times Per Year	Total Amount	Total Kip
1. Fertilizer (kg) Formula _____				
2. Pesticide				
3. Herbicide				
4. Latex Accelerated Chemical				
Labor	**Wage**	**Labors (Head)**	**Hours Per Time**	**Total Kip**
1. Put Fertilizer				
2. Grass Cutting				
3. Use Chemical				
4. Other _____				

32. Volume of rubber yield year by year

No.	Year	Number of Tree (Tapped)	Amount of Latex per Times Kg	Sell (kg) per Time	Times of Sell Per Month	Price per kg	Place to Sell
Year 6							
Year 7							
Year 8							
Year 9							
Year 10							

VI. Rubber Market Condition

33. Do you know the market to sell your production? Where? And what form?

_____

34. Is the price of rubber guaranteed?

34.1 Yes 34.2 No

35. Do you think that planting rubber will increase your income?

35.1 Yes 35.2 No

36. Do you know the market price of rubber?

36.1 Yes 36.2 No

36.3 If yes, what is the source? _____

37. Are you a member of Rubber Tree Planting Group?

36.1 Yes 36.2 No

38. What are the benefits offered as being a member?

_____

39. What is your rubber grade? _____

40. How do you sell your rubber? (At home, using truck, merchants come to buy in the village and so on)

_____

41. Do you have any problems in planting rubber?

41.1 Yes 41.2 No

42. What are the impacts to your family and the company? Write 1 For Most Important, 2 For Very Important, and 3 For Not Important in the box below.

Positive Impacts	Write the Number	Negative Impacts	Write the Number
1. Major Income Source		1. Do not have land for planting crops	
2. Working Opportunity		2. Unfair Labor Price	
3. Create Solidarity in the Family		3. Cattle Destroy the Rubber Tree	
4. Have Potential to Buy Things		4. Have less money for living due to the investment	
5. Support Children Education		5. The Unstable Rubber Price	
6. Huge Investment with High Revenue		6. Health Impact from Planting Rubber	
7. Be able to save money in case of emergency.		7. Out of School Due To Labor Need	
8. Other _____		8. Other _____	

43. The house size and condition before and after planting

Before _____ After _____

44. Do your cattle eat or damage the others rubber tree? If yes, how much of the fine?

_____

45. Can you compare your living before planting rubber ten years ago and present? Is it better or worse?

_____

46. Do you plan for the future of your family? Please provide the detail

_____

47. Do you notice the forest and biodiversity near your community before planting rubber 10 years and at present?

1=high or good; 2=fair; 3= not good or low

Before	ranges	After	ranges
1. High Scale Forest cover 2. High Volume of NTFP 3. Raining properly 4. The weather is getting hotter 5. Good Soil condition 6. A lot of wild animal 7. Other _____		1. Low Scale Forest cover 2. Low Volume of NTFP 3. Raining properly 4. The weather is getting hotter 5. Bad Soil condition 6. Less wild animal 7. Other _____	

Questionnaire Form

Questionnaire. No:

Rubber in the GMS: An Integrated Research Exercise on Rubber Development in Lao PDR, complementary group:

Rubber: Costs or Benefits to the Lao PDR?

Case Study: In Luangnamtha, Oudomxay and Champasack Province.

(For those who do not plant rubber tree)

Interviewee's Name: House Number: Village: District:
Date: /2008
Start Time: Finish Time: Total:

Introduction

My name is , working at the Environment research Institute. We are conducting the research on cost or benefit from rubber tree planting. We are interested in the real situation, problems and advantages concerning the rubber. This research will provide good information and suggestion to the Lao Government about social-economic and environment. Your information given will be kept as secret and will not be revealed; it will only be used in this research.

I. Social-Economic Information.

1. Are you the head of your family?

1.1 Yes 1.2 No

2. How many people in your family?

Total: , Male: ,Female:

3.1 Age: 3.2 Gender: 3.2.1 Male 3.2.2 Female

4. Status: 4.1 Single 4.2 Married 4.3 Divorce 4.4 Widow

5. What is your income and expenditure for one month?

No.	Level of Income	Actual Amount	No.	Level of Expenditure	Actual Amount
1	Below 500,000 kip		1	Below 500,000 kip	
2	500,001-1,000,000 kip		2	500,001-1,000,000 kip	
3	1,000,001-1,500,000 kip		3	1,000,001-1,500,000 kip	
4	1,500,001-2,000,000 kip		4	1,500,001-2,000,000 kip	
5	2,000,001-2,500,000 kip		5	2,000,001-2,500,000 kip	
6	2,500,001-3,000,000 kip		6	2,500,001-3,000,000 kip	
7	3,000,001-3,500,000 kip		7	3,000,001-3,500,000 kip	
8	3,500,001-4,000,000 kip		8	3,500,001-4,000,000 kip	
9	Above 4,000,000 kip		9	Above 4,000,000 kip	

6. Education

No.	Education Level	Actual Level (Class or Certificate)
1	Illiteracy	
2	Literacy	
3	Out of Primary School	
4	Primary School	
5	Out of High School	
6	High School	
7	Out of Vocational School	
8	Vocational School	
9	Out of University	
10	University or Above	

7. Information of the interviewee

7.1 Are you a local villager of this area?	7.2 When did you come to live here?	7.3 Why did you come to live here?	7.4 Where did you live before?	7.5 What did you do before?
1. Yes (Move to the next Question) 2. No (Continue to 7.2-7.5)				

8. What are your main activities?

8.1 Farmer 8.2 Rubber tree farmer 8.3 Growing rice 8.4 Other (please give detail):_____

9. What is your income per year before paying taxes and others expenditures?_____ Kip

10. Do you think your income now is enough for your family living? 9.1 Yes 9.2 No

If not, how much will be enough?_____ Kip

11. How much of your family saving per year?_____ Kip

12. What are the agricultural activities that raise income for your family?

A. Rice	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Pull/Kip	Cultivate/Kip	Harvest/Kip	Others
1.Irrigate R														
2. Season R														
3. Upland R														

B. Crops	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Labor /Kip	Cultivate/Kip	Harvest/Kip	Others
1.														
2.														
3.														

C. Economic Wood	a. Area/ Hectare	b. Type of soil	c. Product Volume (kg)	d. Period (Month)	e. Plateau or Plain	f. Times per year	g. Sell (Kg)	h. Price per kg	Seedling /Kip	Fertilizer/Kip	Labor /Kip	Cultivate/Kip	Harvest/Kip	Others
1.														
2.														
3.														

13. Do you have the other activities besides mention above?

13.1 Yes 13.2 No

14. If yes,

14.1 What is it?_____

14.2 How much do you earn per month?_____ Kip/Month

II. Female participation in Rubber Tree Planting.

15. Female's income contribution to the family. Use ✓ in the box

No.	Name	a. Age	b. Collect Wood	c. Handicraft	d. Cultivate Rice	e. Collect NTFP	f. Fishing	g. Raise Animal	h.Gardening	i. Cooking	j. Look Children	k. Cutting grass	l. Plant Rubber	m. Upland rice	n. Income /Month
1															
2															
3															
4															
5															

16. Male's income contribution to the family.

No.	Name	a. Age	b. Collect Wood	c. Collect NTFP	d. Fishing	e. Raise Animal	f.Gardening	i. Hunting	j. Plant Rubber	k. Worker	l. General engage	m. Factory Worker	n. Officer	n. Income /Month
1														
2														
3														
4														
5														

III. NTFP Gathering

17. NTFP Gathering (Before Planting Rubber 10 years)

NTFP	A. Times per Month	B. Volume of Collecting (kg)	C. Collect for		D. Price Per Kg	E. Income earned per year	F. Place to sell
			c.1. Sell	c.2. Eat			
1.							
2.							
3.							
4.							

18. NTFP Gathering in Present.

NTFP	A. Times per Month	B. Volume of Collecting (kg)	C. Collect for		D. Price Per Kg	E. Income earned per year	F. Place to sell
			c.1. Sell	c.2. Eat			
1.							
2.							
3.							
4.							

Questionnaire From For Rubber Tree Investment and Concession Company

Company's Name: From:

1. Which form of your company's Rubber Tree Plantation?
1.1 Sharing Investment 1.2 Land Concession
2. How do you share the investment?
Investor % Villagers %
Other (Please give detail)
3. What are the company contributions in the investment?

Detail	Volume and Unit	Price
1. Seeding		
2. Tool		
3. Fertilizer and Chemical		
4. Others		

4. When did your company start the concession of the land?
_____
5. How long does the concession?
_____
6. How many hectares?
_____
7. Who process the land?
_____
8. What is the number of workers?
_____

9. Labor Information

Source of Labor	Unit of Labor	Wage Per Day	From (China, Vietnam or Thai)
1. Villagers			
2. From Oversea			
3. From other City			
4. Other			

10. Does your company provide the training Rubber Tree Planting for the workers?
10.1 Have 10.2 None
11. How do you set the wage for the worker?
_____ Hour/Day/Month
12. After tapping, what will be the wage per hour/day/month?
_____
13. Do you plant other crops in the rubber tree plantation?
13.1 Plant 13.2 None
13.3. If Plant, what kind of crop? And what is the area you plant?
_____
14. What are the costs of the rubber tree planting year by year before tapping and after tapping?
15. Do you buy the rubber from villagers?
15.1 Yes 15.2 No
15.3 If yes, what is the price per kilogram?
_____
16. Which countries do you export the rubber to?
_____
17. What is your plan to enlarge the plantation in hectare and where will be your next concession target?
_____
18. Did your company have the concession in the other places? If yes, how many hectare? When was the beginning? Have you tap the rubber yet?
_____

_____

_____

Appendix 2

Household questions

1. Head of household's name, age and sex?

2. How many members in your family? How long have you plant rubber?

3. How long have you lived here? Where did you live before?

4. What is your most important activity now? Next and next?

5. Now what kind of land do you have? Fill in the table.

Kind of land	**Size**	**Land quality**	**Land title document**
Paddies rice			
Soybean			
Rubber plantation			
House plot			
Others			
Total			

6. What are your important livelihood activities in the present? Fill in the table.

Crop	**Size**	**Amount harvested**	**Place (in/outside the land 3ha)**	**Short of rice period**		**Low/ upland**	**Period can plant further**
Rice							
Crop	**Size**	**Amount harvested**	**Place (in/outside the land 3ha)**	**Amount sold**	**Price**	**Planting cost**	**Period can plant further**
Soy beans							
Mung beans							
Sesame							
Corn							
Peanuts							
Others							

7. What is your income from? (Rubber; Crops…)

8. How much your income from rubber per month? And how many kg?

9. What other sources of incomes did you have?

10. What kind of land did you own (before rubber plantation)?

Kind of land	**Size of land**	**Land quality**	**Land title document**
Paddies rice			
House plot			
Others			
Total			

11. Do you think rubber will be good source of income? Do you know the price of rubber? Has anyone ever told you the price? How much do you think you will get off 1 hectare of rubber? Are they guaranteeing to buy it? At what price?

12. Does company guarantee to buy? How much per kg in the present?

13. What assistance does the company give you? Do they train you how to grow rubber? Do they visit you and give you advice? Can you go and ask them for advice? Have you ever done this?

14. Do you have cows or buffalos? Is there a problem with your cows or buffalos eating the rubber? What company reaction? Or neighborhood reaction?

15. Do you think it is harder or easier for you to make a living now compared with before rubber plantation?

16. How will you make your living in the future?

17. Was there plenty of wildlife in the forest around your village before rubber plantation? 10years ago, 5 years ago? Now has this changed? Why?

Village Chief Interview Guide

1. How many families in the village?

2. How many families plant rubber by:

Type of rubber plantation	Number of households
Self investment	
Labor of company	
Household joint with company	

3. Are these families' lands? If yes, how many families have their owner land? And how many families rent land?

4. How much money for renting land for 1 ha/year?

5. Are there any documents that show the company compensated people and the price they paid? Do you or the villagers have them?

6. Does the commune chief have them? Does the company have them? Did you of the villagers ever sign or thumbprint any documents?

7. Does the company provide training to villagers on rubber plantation? If yes, how many times? What do they train, for how long?

8. Have the villagers ever requested training? What did the company say?

9. What other assistance does the company give?

10. Can you tell me what the main activities are that make up the livelihoods of the people in this village? Were any of these different 5 or 10 years ago?

11. Is there problem with villagers' cows or buffalos eating the rubber? What company reaction?

12. What is your assessment of the family scale rubber plantation in promoting rubber plantation to reduce poverty in your village?

13. Do you think rubber will be good source of income? Do you know the price of rubber? Has anyone ever told you the price? Has the company told the villagers?

14. You have any comments on the family scale rubber plantation? What should have been done? Do you think it could be a good thing if change to other cash crops

15. What ideas do you have to improve things now so that the rubber development will be better for people and better for reducing poverty in the future?

Communities Questions

1. What are your organization's roles and responsibilities in land and forest issues in this area?

2. What is your organization plan to development community forestry?

3. What have been changes/results of your organization so far?

4. What is your organization planning in future?

5. What is your assessment of the family scale rubber plantation in promoting rubber plantation to reduce poverty in JingHong?

6. What are your opinions or recommendations on the family scale rubber plantation

Company Interview Guide

1. How many people are here as full-time employees?

2. Where do workers mostly come from? What do the workers get paid? Do you have a training scheme for your workers so they can improve their skills and their pay? Are there any villagers on this training scheme?

3. What assistance are you providing to villagers so they can grow rubber? Do they receive training, if so how often?

4. How many workers per hectare do you require while the trees are small and when the trees are full grown?

5. What problems have you encountered in land clearing and in planting rubber trees?

6. What is the cost per hectare of clearing, planting and looking after the trees until they reach production? Can you say what you spend per hectare on fertilizer, labor? What are your biggest costs?

7. Does the company plant any cash crops themselves to offset the costs of production before the trees start producing? Or is it villagers or workers? Who gains income from its harvest? What do you or they plant and how much do you or they earn per hectare per year? Have the cash crops grown well and produced returns as expected?

8. How many tons of latex do you expect to get when the plantation reaches full production?

9. What is the present price of latex? What is the long term outlook for latex? Do you think the price will increase or decrease, why?

Appendix 3

Field Survey Picture in Champasack Province

Rambutan Fruit in Oudomsouk Village

Meeting Head of Oudomsouk Village

Interview the local people in Oudomsouk Village

Grass clearing in rubber garden in Daklak Rubber Company, Phathomphone District, Champasak Province

Daklak Rubber Company located near the HouayNamsay

A young rubber seeding preparation to Phonsouvanh Construction Company

Meeting a head of Phathomphone District, Champasak Province

Interview the local people in Pakhuoay

Village Interview with local people in Lak 29 Village

Luangnamtha Province

Meeting Head of Homxay Village

Meeting Head of Erlar Mai

Village Rubber Garden in the near Erlarmai village

Interview in Erlar Mai Village

Flooding during the field survey in Oudomxay Province Upland Rice Field

Retailers collecting NTFPs

Road flooding during field survey

Questionnaire Pretest in Songthong District

Meeting with Vice Governer of Sangthong District

Equipments for tapping latex

Equipments for synthetic rubber processing in Songthong District

China Study Tour

Xishuangbanna Dai Autonomous Region, Yunnan Province, Jinghong District

Group Discussion