ISSN 0563-8682

Southeast Asian Studies

東南アジア研究

Vol.47 No.4

ISSN 0563–8682

東 南 ア ジ ア 研 究

47 巻 4 号　　2010 年 3 月

目　　次

SOUTHEAST ASIAN STUDIES

Vol. 47, No. 4 March 2010

CONTENTS

Southeast Asian Studies, Vol. 47, No. 4, March 2010

Agency, Opportunity and Risk: Commercialization and Human-nature Relationships in Laos

Introduction

Kono Yasuyuki*, Nathan Badenoch**, Tomita Shinsuke***
Linkham Douangsavanth** and Nonaka Kenichi****

From Land-locked to Land-linked

Laos, previously known as an isolated and land-locked country, has undergone rapid changes bringing it into the dynamic regional economy of Southeast Asia. Located strategically at the center of the region, and home to many of the region's remaining natural resources, the country is better understood now as "land-linked" [Kono *et al*. 2008]. Regional integration is proceeding at a rapid pace, driven by national policies, regional cooperation and the private sector. Each of Laos' 16 provinces has an international border. With the opening of the Lao national economy starting with the 1986 *Chinthana-kaan mai* policy, local Lao economies have begun to orient themselves towards markets in neighboring countries and beyond. Thailand, China and Vietnam are now not simply sources of commodities for the Lao population, but have become partners in trade and investment.

The larger context for these local market-based linkages is the driver to create a common economic arena on the mainland of Southeast Asia, including the provinces of Southwestern China. The Greater Mekong Subregion, a regional mechanism funded by the Asian Development Bank with significant financial backing from the Japanese government, is working to integrate communications and energy networks to promote the movement of capital, goods and people across the region [ADB 2004]. With improved road links, Chinese, Thai and Vietnamese companies are increasingly attracted to Laos as a destination for investment. This in turn has stimulated the growth of a modest domestic private sector providing basic services.

* 河野泰之, Center for Southeast Asian Studies, Kyoto University
e-mail: kono@cseas.kyoto-u.ac.jp
** National Agriculture and Forestry Research Institute, Lao PDR
*** 富田晋介, Graduate School of Agricultural and Life Sciences, The University of Tokyo
**** 野中健一, College of Arts, Rikkyo University

By most macro-economic standards, Laos' development in the past years has been impressive. Annual growth rates of between 7–8% and increases in foreign direct investment to 4.3 billion dollars in the first nine months of 2009, suggest that policies opening the country to regional trade under the framework of the ASEAN Free Trade Area have produced results [EarthTimes, 27 October 2009]. Much of this development, however, is based on extraction of the country's natural assets. Laos, itself a hotspot of biodiversity, has seen a continuous reduction in forest cover, from 49.2% in 1982 to 41.1% in 2002 − the product of multiple pressures stemming from logging and agriculture [DoF 2003]. Ambitious hydropower development plans aim to turn Laos into the battery of Southeast Asia, drawing upon the abundant water resources that rise in and flow through the country [GoL 2006].

At the micro-level, there are indicators that the gap between the rich and the poor is widening at a worrying rate. The benefits of economic development have been concentrated in the Mekong valley region, while the upland regions lag behind. The Participatory Poverty Assessment 2006 [Chamberlain 2007] showed that the major source of poverty in the country is insecure access to land. Behind the inadequate land situation is the government's effort to stabilize shifting cultivation and create permanent village settlements in areas where access to services is better. In terms of human development, every second child still suffers from chronic malnutrition, a situation that has not changed in ten years [World Food Programme 2008]. Running across these worrying indicators is the gross imbalance in poverty, with the ethnic minority groups that compose approximately half of the national population at a distinct disadvantage. Vulnerability of local livelihoods to shocks has emerged as one of the key threats to human development in the new economy across the region [Cornford and Matthews 2007].

Opportunity and Risk: Rural Livelihoods in Transition

The situation of development in Laos is a complex mosaic of government and market, seemingly contradictory macro- and micro-dynamics, and widening variation across sectors of society. That said, both upland and lowland areas are clearly on the way towards a market-driven, regionally oriented economy. Natural resources are to be the mainstay of local economies, just as in the national economy. Trade in natural resources has long been an important part of local economies, and has been a central element of Laos' relationships with its neighbors [Stuart-Fox 1998]. What is different today is the rate of change, and ways of adaptation to these changes that challenge rural people's resilience.

The papers in this volume show how local people are adapting their livelihood to the rapidly deepening market economy through case studies in various parts of Lao PDR.

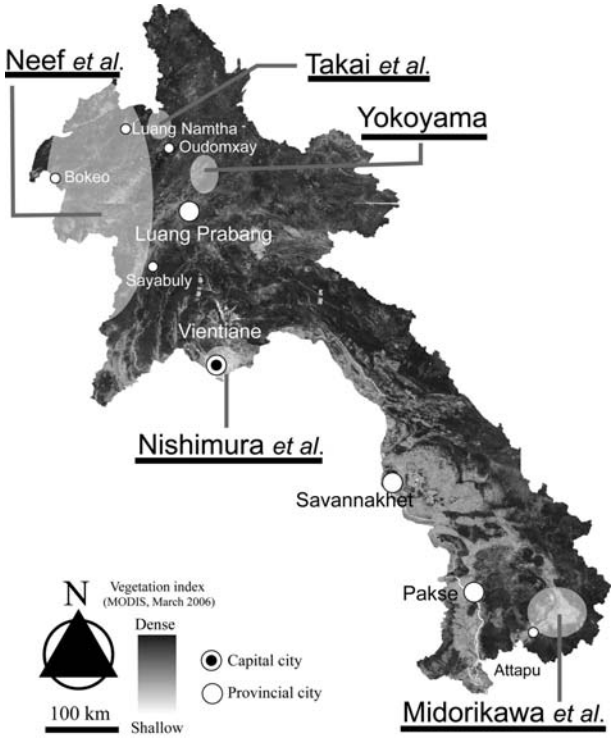


Fig. 1 Locations of the Study Sites

(Fig. 1). Two main sets of dynamics are explored in the following analysis. First, some communities are devising new ways to engage with the market, commercializing resources they have traditionally managed as part of their livelihoods. Here, local people engage with rapidly expanding domestic markets to supply natural products that are collected or cultivated within the village landscape. These products are linked ecologically and economically with other livelihood activities; for example, a wide range of wild foods are collected from rice fields and village forests. As Nishimura *et al*. describe, responding to signals from markets in nearby urban marketplaces and more distant regional markets, rural people devise strategies for securing income based on the resources available on hand.

In a large part, these strategies are based on consideration of how to maintain simultaneously a flow of economic benefits and productive natural systems. In places located farther from markets, for example in the northern mountainous regions, local people search for ways to respond to the changes in demand for forest products. Non-timber forest products (NTFPs), long-time components of local and regional trading networks, undergo another phase of commercialization. One of the key changes in the upland economy has been the re-emergence of private traders who provide access to more distant markets, such as China. The trade in NTFPs was nationalized through

state-run trading firms until the end of the 1980s, when restrictions on private involvement in trading were released. After this, marketing chains — often linking ethnic groups and crossing boundaries — for forest products such as *Boehmeria malabarica*, called *peuak meuak* in Lao, were revived and new products available locally become commercially viable. Traders form nodes in these networks, building upon social relations in upland areas, as described in Yokoyama's article. Neef *et al.'s* analysis shows how local dependency on these products has grown with increased international trading outlets.

These case studies illustrate how economic sustainability at household-level is intricately linked to ecological sustainability at the farm level, even as markets take producers and products into larger scales of economic activity. Simultaneously, rural lifestyle, or more concretely speaking, people's time allocation, is deeply linked to the ecological seasons and daily rhythms of the rural landscape, as Nishimura *et al*. describe (Fig. 2). Small-scale, incremental changes are born out of the daily decision-making

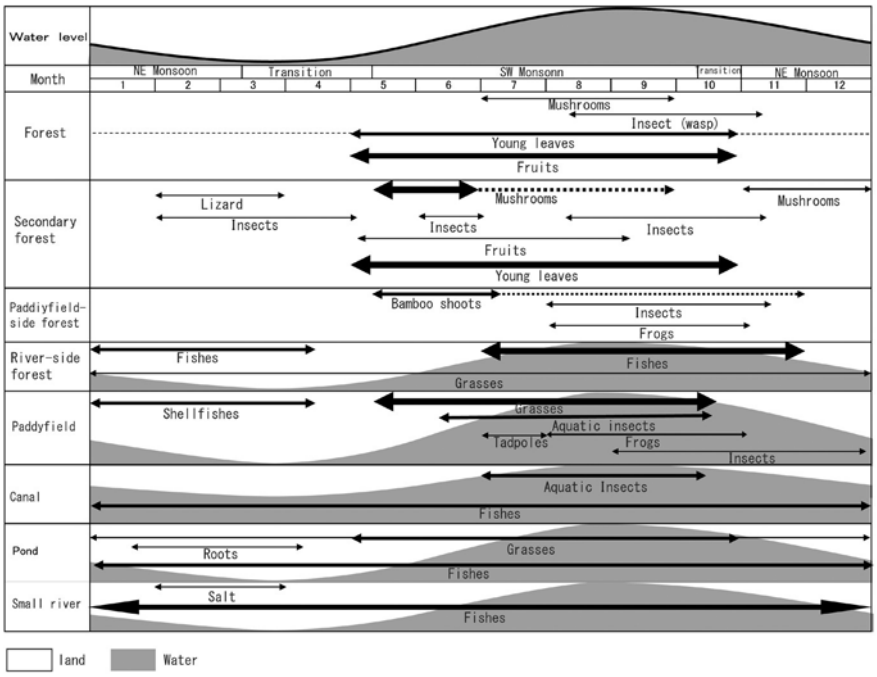


Fig. 2 Non-rice Products of Paddy Landscape and Their Seasonality at a Village in the Vientiane Plain

Note: A wide range of non-rice products including fishes, insects, weeds and tree products are caught/collected at mosaic landscape of paddy fields, forests and water body for home consumption and commercial purposes. Availability clearly depends on seasonal hydrological patterns.

strategies of local people.

Second, other communities are experiencing rapid transformation of livelihoods and lifestyles. Takai *et al*. show how a conflict between agriculture and livestock has arisen in response to market opportunities. Farmers, anxious to take advantage of demand for cash crops, have expanded agricultural production areas. This means that fallow fields, where livestock had previously been kept under customary management institutions, come under multiple demands. The result has been a tightening of land use restrictions not only from government agencies but also from inside the community. In the end, previously diverse production systems have been transformed into more simplified ones. Buffalo, traditionally a popular strategy for livelihood security, have been sold off, even as consumer demand may be growing in urban areas.

With these changes, some of the basic assumptions of life have been challenged, such as the allocation of time and labor to agriculture-based livelihood activities. Nishimura *et al*. show how the peri-urban people take advantage of opportunities to engage in wage labor in Vientiane municipality. Where the rhythm of daily life was centered previously on agriculture and collection of natural products, people are now faced with a range of options for off-farm income generation. Foreign investment in Vientiane municipality creates a pull-force, which comes just as prices for traditional agriculture and other natural products experienced drops. The advent of wage labor brings about a drastic change of the rhythm of daily life, from ecological to artificially predetermined rhythm, reflecting the changing idea on the productivity of their time. This diversifies the lifestyle even within a family, particularly between on-farm workers and wage labors.

Thus, the agency of local people is expanding with the opening of new opportunities ushered in by the market. However, opportunity is accompanied by risk in the process of transition. The risk stems from uncertainty in both the market and policy, in addition to environmental degradation.

The government hopes to concentrate more dispersed communities near roads where it is hoped they will have better access to markets and social services. While access may be improved through basic infrastructure, communities are often not equipped for the changes that can result from being resettled along roads and with other communities from unfamiliar ethnic groups, often in areas where productive land is in severe shortage [URDP 2007]. Another key concern is health, as is shown by Midorikawa *et al*.'s findings about the interrelationship between water, livelihoods and health. In the relocated community studied, high levels of malaria and parasites were observed, despite the potential access to improve health care services. The research shows that information gaps are still substantial, raising the risk of infection among relocated people.

Many ethnic minority groups rely on NTFPs for cash income. These commercialized forest products are, however, largely bought and sold as raw products. The hopes for success, in terms of raising local incomes, are pinned on the creation of sustainable production, processing and marketing mechanisms. Potentially high-value products,

such as paper mulberry, are constrained by the difficulty in developing ways to add value and thereby increase the benefit to harvesters, as shown in the article by Neef *et al*. Here as well, the unsure land tenure situation adds a layer of uncertainty and risk to these communities.

Agency and Balance: Negotiating the Human-environment Relationship

The changes described in these papers represent a significant shift in the role of local people in determining their livelihood and economic activities. This new form of "agency" means that rural people have more options at hand, when it comes to improving their well-being. After two decades of state-directed development, markets are providing the signals upon which people act. With the market come other actors, domestic and foreign. By any standard of governance, one must welcome the increased role for local decision making.

Yet, the flip-side of this new range of opportunity is uncertainty and risk, and there are signals that the market as it currently operates is far from producing efficient outcomes. Farmers lack negotiation skills to engage with agribusiness, price information is slow to reach producers and the government still struggles to provide the necessary support mechanisms. Contracts are very difficult to enforce, and have very little meaning in terms of ensuring that a farmer's product will be purchased. Informal networking among farmers and local traders is yet immature. Furthermore, competition between traders may mean higher farm-gate prices, but at the same time communities may find themselves in competition with other communities. Market demands dictate quality, quantity and timing of supply, which mean that the conditions for production are fixed outside of the producers' livelihood.

Farmers who are empowered by the changes going on around them are faced with a range of dilemmas. The short-term prospect of increased cash income is a main concern for rural people who are faced with an ever-longer list of expenditures, from agricultural inputs to school uniforms and modern medicines. Farmers have learned that market prices for cash crops are unstable. The drop in maize prices in 2008–09 was a particularly strong shock for many areas, for example. There is a strong incentive to capitalize on opportunities when they present themselves, which can lead to over-exploitation of resources. Farmers are also learning that over-supply drives prices down. On the other hand, many of the products being sold have been a component of traditional livelihood strategies for generations. Knowledge of management, harvesting and use of natural products may exist in communities. If the need for short-term cash overrides the benefit of a longer-term management regime, not only will the resource be depleted, but indigenous ecological knowledge is also eroded.

This dilemma is also reflected at the national level. Short-term benefits from a

resource-extraction economy become more tentative when considered in a longer-term perspective of sustainability. In the market economy, the main strategy for providing support is to identify one product that draws on the local ecological and economic situation, and focus on this as the main route to development. As seen in the paper by Takai *et al*., the homogenization of production systems may bring some immediate economic benefits, but the overall sustainability of the system is likely to be reduced and the vulnerability of the producers enhanced.

Clearly Laos is undergoing remarkable changes with integration into the regional economy. The interface between local and regional markets is complex and dynamic. Farmers find themselves with more power to make their own decisions, but the dilemmas they face are increasingly difficult and their bargaining position remains weak. Economic reforms promoting market-oriented production have stimulated new strategies to production which reflect a greater range of options than have been available in the past. More locally appropriate and sustained government support is needed to help bridge gaps in information and experience, reduce risk by encouraging diversification and providing an institutional and regulatory framework that mediates the interactions between diverse stakeholders.

Micro-analysis and Policy Feedback Loops

As these papers demonstrate, micro-level analysis is indispensable in maintaining the feedback loops to inform policy. In "policy," the volume editors refer to the full spectrum of actors making decisions that impact local livelihoods and landscapes. This includes government policy makers, who are in need of information regarding the outcomes of development interventions. Furthermore, the donor community, which usually works in close concert with government agencies to implement programmes and projects, is important not only because of the direct impacts of its activities on the local level, but also because it maintains dialogue with government and other actors. Finally, international organizations, which work at both policy and implementation levels, are well positioned to make use of research findings.

Biodiversity is one of Laos' greatest resources. More broadly speaking natural resources will continue to be the backbone of development in Laos. There is now no question about whether Laos will be integrated into the regional economy, assuming a fully developed central position as a land-linked country. How this process of integration proceeds depends on a mixture of both policy-level development interventions and local-level, individualized decisions about how to engage with market opportunities. This collection of papers shows that at the local level, there remain steep challenges to maintaining a balance between the aspiration of improving one's economic wellbeing in the short-run and the imperative of sustaining the productive natural systems upon

which livelihoods depend. Furthermore, while farmers are making more decisions about their economic activities, they are at considerable risk when they venture down the path of commercial cropping.

Research, such as presented in the papers included in this volume, should be of use to decision-makers at all levels. Additionally, this analysis should contribute to the constant re-creation of a research agenda that addresses the key challenges faced by Laos. Domestic Lao researchers and foreign researchers alike have a key role to play in providing policy-relevant analysis to a broad range of actors. Empirical data based in the daily dilemmas of decision making faced by local people should form the foundations of policy debate on pathways towards economically viable, ecologically sustainable and socially acceptable development outcomes.

Acknowledgements

On the way from field survey, data analyses and workshops to the completion of this volume, we have owed a number of persons, institutions and projects. We began a collaborative research program in Laos in 1999. This is exactly the year when the National Agriculture and Forestry Research Institute (NAFRI), our counterpart, was established as the umbrella institute of the various research centers under the Ministry of Agriculture and Forestry, Lao PDR. As a partner of our research activities, the first Director General, Dr. Ty Phommasak, the second Director General, Dr. Bounthong Bouahom, and their staff helped us to carry out field surveys, co-organized a series of workshops, and translated some publications into Lao [Bouahom *et al*. 2007]. A part of our work has also been coordinated by the Department of Geography, the National University of Laos, and the National Institute of Public Health. Most of the articles of this volume are the outcome of a research project of the Research Institute for Humanity and Nature (RIHN) titled "A Trans-Disciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005." The discussions among this research group, particularly with its leader, Prof. Akimichi Tomoya, have been indispensable for the success of our research work. In addition, a various research projects including the Grant-in-Aids for Scientific Research of the Japanese Society of for the Promotion of Science, including "Transnational Comparison of Ecological Resource Management by Constructing Integrated Database on Livelihood and Environment in Mainland Southeast Asia" (No. 15310166) and "Land Use Dynamics of Mainland Southeast Asia: Combining Field Works with RS" (No. 18310160), supported our field studies and data analyses. We would like to express our sincere thanks for their academic and financial supports.

References

Asian Development Bank (ADB). 2004. *Regional Cooperation Strategy and Programme*. Manila: Asian Development Bank.

Bouahom, B.; Kono, Y.; and Nonaka, K., eds. 2007. *Thammasat, Manut lae Saphapweadlom* [Nature, Human and Environment]. Vientiane: National Agriculture and Forestry Research Institute.

Chamberlain, J. 2007. *Participatory Poverty Assessment*. Vientiane: Asian Development Bank and National Statistics Center.

Cornford, J.; and Matthews, N. 2007. *Hidden Costs: The Underside of Economic Transformation in the Mekong Region*. Vientiane: Oxfam Australia Report.

Department of Forestry (DoF). 2003. *Comparison of Different Land Use and Vegetation Types in Laos*

in 1982–1992–2002. Vientiane: National Office for Forest Inventory and Planning.

EarthTimes, "Foreign Investment in Laos Jumps Nearly Fourfold this Year," 27 October 2009, accessed 12 November 2009. http: //www.earthtimes.org/articles/show/ 291909, foreign-investment-in-laos-jumps-nearly-fourfold-this-year.html

Government of Lao PDR (GoL). 2006. *National Socio-Economic Development Plan (2006–10)*. Vientiane: Committee for Planning and Investment.

Kono, Y.; Ochiai. Y.; and Yokoyama, S. 2008. Development Path of Laos (in Japanese). In *Lao Rural Area Studies*, edited by S. Yokoyama and Y. Ochiai, pp. 13–44. Tokyo: Mekong.

Stuart-Fox, M. 1998. *The Lao Kingdom of Lān Xāng: Rise and Decline*. Bangkok: White Lotus.

Upland Research and Develoment Programme (URDP). 2007. "Report on the Effects of Village Re-location on Previous Land Allocation in Phonexay, Luang Prabang and Namo, Oudomxay," *URDP Research Management Component*. Vientiane: National Agriculture and Forestry Research Institute.

World Food Programme. 2008. *Lao PDR: Comprehensive Food Security and Vulnerability Analysis*, Vientiane: WFP.

Southeast Asian Studies, Vol. 47, No. 4, March 2010

The Trading of Agro-forest Products and Commodities in the Northern Mountainous Region of Laos

YOKOYAMA Satoshi*

Abstract

The purpose of this study is to clarify the trade flow of agro-forest products and commodities by analyzing commercial activities and private traders in a mountainous region. This study focused on Ngoi district of Luang Phabang province in northern Laos where there is a long history of non-timber forest product (NTFP) trading in the study area.

In the Lān Xāng Kingdom era, political coordinators called *Lām* collected agro-forest products from mountain people as tax, and private traders purchased NTFPs, mainly benzoin and cardamom. Then, under the communist regime in the period between 1960 and 1986, private traders were replaced by government-managed stores and the role of the *Lām* disappeared. After the Lao version of Perestroika or *Chintanakan Mai* in 1986, private agro-forest product trading was re-established in the study area and in addition, general stores and periodic markets appeared along the riverside. The re-establishment of agro-forest product trading resulted from the stimulation of commodity flows due to the local general stores and periodic markets, and vice versa.

During the *Chintanakan Mai* period, the NTFPs being traded in the study area were not traditional foods or medicines but rather new products being exported to foreign countries, especially China. The borders with Thailand, China, and Vietnam in northern Laos were re-opened in the early 1990s, after which Chinese traders came directly to northern Laos to purchase NTFPs. This paper shows how the stimulation of human mobility, commodity distribution, and information flow observed after *Chintanakan Mai* has strongly affected the livelihood of the mountain people.

Keywords: northern Laos, NTFP, commercial activity, agro-forest product trading, periodic market

I Introduction

Economic networks on a continental or global scale have developed, not only in urban areas but also in rural areas since the late 20th century. The mountainous region of Laos has also been incorporated into a novel market system, and this has brought about various social, economic, and cultural changes. An understanding of these changes may provide an insight into some of the effects of globalization. However, a basic understanding of the historic relationship between the mountainous and lowland regions in northern Laos is first required.

* 横山　智, Department of Geography, Nagoya University, Nagoya 464–8601, Japan
e-mail: s-yokoyama@nagoya-u.jp

In Laos, the products that were supplied by the mountainous regions to the lowlands were typically special kinds of forest products. Stuart-Fox [1998: 49] describes forest product gathering in the northern mountainous region in the Lān Xāng Kingdom era of the 14th century: "Valuable forest products such as benzoin and other resins, sticklac for making lacquerware, cardamom, and beeswax were collected mainly by *Lao Thoeng*."[1] In terms of forest product trading, ethnic Lao[2] traders, known as *Lām*, played an important role in the Lān Xāng Kingdom era of the 15th century [*ibid*.: 48–49]. According to Halpern [1958: 69], the relationship between the *Lām* and mountain people continued until the late 1950s.

Moreover, by the early 20th century, Yunnanese caravans, known locally as *Cin Ho* caravans, had constructed cross-border trade networks, and were trading between China, Burma, Thailand, and Laos. This history has been shown to date back to the Tang age (A. D. 618–907) or more [Forbes 1987]. There were three main caravan routes between Yunnan and northern Thailand through northern Laos during the late 19th century: The first was Muang Sing – Xiangkok route to Chiang Mai and Uttaradit; The second was Luang Namtha – the Houayxay route to Nan and Uttaradit; The third was Oudomxay – the Pakbeng route to Nan[3] [Walker 1999: 29–36]. At that time, raw cotton cultivated by Lao farmers was sold to Yunnanese caravans as a principal product.

Although trading history in mainland southeast Asia has been an object of study for a long time, there is little information so far concerning agro-forest product trading by *Lām* and the trade between Yunnanese caravans and mountain people in Laos. As a topic of research, it remains to be discussed further.

The trading system in northern Laos was greatly changed by political upheavals. In 1945, Laos became independent from France and established the Kingdom of Laos; however, at the same time, a communist-led political association called *Lao Issara* (Free Lao) was increasing its influence in the country and established a provisional government in Vientiane [LeBar and Suddard 1960: 19]. The *Lao Issara* had fought against French colonialism and American imperialism for the liberation of Laos with a coalition with the communist Vietminh. It subsequently formed a communist government called the *Pathet Lao*,[4] and the headquarters were established in Xamneua in 1951 [*ibid*.: 22]. The *Pathet Lao* controlled the area of Phongsaly and Huaphan provinces in northern Laos, designated as a liberated zone under the terms of the Geneva Agreements of 1954

1) The term *Lao Thoeng* represents the Khmu.
2) The official ethnic name for this group is "Lao," but it is often confused with an identical word which stands for the Lao nation, that does not refer to any ethnic group. In this paper, the term "ethnic Lao" is used to avoid confusion.
3) With regard to a route to Nan, Forbes [1987: 13] suggest that caravan might visit Luang Phabang, because a large daily market was held there.
4) This means "Lao Country." The *Pathet Lao* was reorganized into the *Neo Lao Hak Xat* (Lao Patriotic Front) in 1955 [Stuart-Fox 1998: 94].

[Stuart-Fox 2001: 190]. The *Pathet Lao* controlled the northern part of Laos from the late 1950s to the early 1960s, and had established government-managed stores called *Han Kha Khong Lat* in order to sell commodities and purchase agro-forest products.

The system of government-controlled trading continued even after the establishment of Lao People's Democratic Republic (Lao PDR) in 1975. However, it began to collapse in the mid-1980s. The government adopted the Lao version of Perestroika or *Chintanakan Mai* in 1986, and then private-managed general stores and periodic markets began to appear in rural areas that had previously specialized in subsistence farming. In addition, private agro-forest product trading was re-established.

Recent studies of trading in Laos have focused on border trade [Mya Than 2006; Khontaphane *et al*. 2006], associated distribution routes [Walker 1999], smuggled timber trading on border areas [Pholsena and Banomyong 2006: 147–154], and an overview of major agricultural crops [GoL, Department of Agriculture 2002]. There have been no studies on how commodities have been supplied from the lowlands to the mountains, on how agro-forest products have been supplied from the mountains to the lowlands, or on historical changes in these processes. In addition, it remains unclear whether globalization has had an effect on agro-forest product trading.

In the northern mountainous region, the *Lām* have supplied many kinds of products to lowland areas, and furthermore Yunnanese caravans may have directly trade a wide variety of goods with mountain people. In this respect, the northern mountainous region of Laos has been productive for a long time. However, the mountain people were merely gatherers in this context, that is, there was a clear distinction between lowland people and mountain people before *Chintanakan Mai*.

In fact, at present, the mountain people are in charge of a part of the global economy, and they are not merely gatherers. Thus, it is hasty to reach the conclusion that the mountain people of northern Laos were affected by globalization after *Chintanakan Mai*, because the trading between the mountains and lowlands has been established, and agro-forest products have been exported from the mountains to foreign countries via the lowlands since the Lān Xāng Kingdom era. To be precise, some mountainous areas have had a grounding in exporting natural resources on demand, and being embedded into the markets of foreign countries [Pholsena and Banomyong 2006: 131–134]. However, trading in the region has constructed a different system after *Chintanakan Mai* than the one it previously had.

Over the past years, studies have focused on an economic shift, from subsistence-based agriculture and livestock to more commercialized agriculture and wage-earnings, induced by government development policies.[5] Foreign investment from the neighboring countries such as Thailand, Vietnam, and China, have increased under the develop-

5) The Government of Laos has made it a top priority to break away from Least Developed Countries (LDCs) by 2020 [GoL 2004].

ment project of the Greater Mekong Subregion (GMS) led by Asian Development Bank (ADB) [ADB 2007]. Furthermore, China has an especially large influence on peoples' livelihood in the northern Laos [Stuart-Fox 2009], and the mountain people comply with Chinese demand for cash crops such as maize and sugar cane [Thongmanivong and Fujita 2006], and rubber production [Cohen 2009; Shi 2008; Rattanavong 2008; Ziegler *et al*. 2009], in addition to forest products. These changes are strongly accelerated by improving transport infrastructure with aid from international donors such as ADB. In particular, Asian Highway No. 3 linking Yunnan and northern Thailand through northern Laos plays a central role in the regional integration. Many researchers have described this circumstance as seeing Laos transition "from a land-locked country to a land linked country" [Jönsson 2009] or becoming a "crossroads" [Pholsena and Banomyong 2006; Lintner 2008].

It is obvious that the penetration of the global market has progressed at a rapid speed and covered a wide spatial range in Laos. Improvements in transportation and logistics platforms must be considered as one of the triggers underpinning this change, but that is not all. There is still little known about what kind of changes occur in parallel with infrastructure development in northern Laos. In order to deal with these issues, it is essential to understand agro-forest product trading and commercial activities at multiple levels, from small mountain villages to urban areas. Consequently, the purpose of this study is to clarify the trade flow of agro-forest products and commodities by analyzing the commercial activities and private traders in the mountains from spatial and historical viewpoints.

In order to achieve this purpose, this study focused on Pak Luang area,[6] Ngoi district in Luang Phabang province as a representative example of the northern mountainous region (Fig. 1). Here, three ethnic groups, ethnic Lao, Khmu, and Hmong, live in the same area. Only Pak Luang village, which was an ethnic Lao village until 15 Khmu families moved there from a nearby village in 1999, is mixed. The other villages are ethnically homogeneous. There are no land vehicles in the study area because only hill footpaths are present; hence, access is only possible on foot or by boat using the Ou River. The major economic activities in the study area are swidden agriculture and gathering NTFPs (non-timber forest products).[7] Moreover, there are several kinds of commercial activities such as a general store management and agro-forest product trading, which were introduced after *Chintanakan Mai*.

---

6) The Ngoi district office carried out the merging of villages in the mid-1990s. As a result, several small villages in the study area merged into larger neighboring villages for administrative purposes, as shown in Fig. 1. Although the administrative unit changed from village to settlement, the dwelling area did not change. Hence, to avoid confusion, the term village but not "settlement" is used to denote an administrative unit.

7) The author previously discussed NTFP gathering in the study area [Yokoyama 2004].

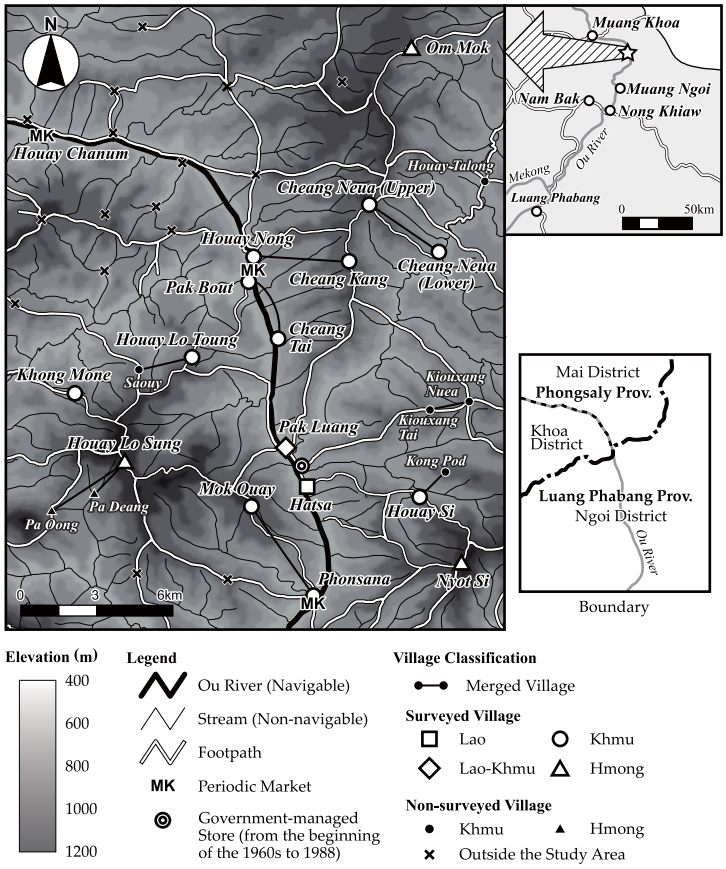


Fig. 1　Village Locations in the Study Area
Source: Surveyed by the author using GPS, and 1/100,000 Topographical maps issued by the National Geography Department, in 1983

II　Commercial Activities in the Mountainous Region

II–1　*Trading History in the Study Area*

In the study area, the commercial activities date back about 60 years, as determined from interviews with elderly people in 2005. According to interviewees, they have never traded their products with Yunnanese caravans, but there were several *Lām* in the study area. The *Lām* were appointed by a district office, and had been present in ethnic Lao villages until the 1950s. A major role of the *Lām* was not to trade but rather to collect tax from mountain people in Khmu and Hmong villages. The purchasing of agro-forest products from mountain people was undertaken by traders called *Poka*, separately from

the *Lām*. The *Lām* usually levied rice, opium, and valuable NTFPs from mountain people as tax, and then paid tax to the district office as cash in French Indochina piaster.[8] The *Lām* received the difference between the total value of products collected from mountain people and the total tax paid to the district office. The other role of the *Lām* was to arrange for Khmu people to engage in farm work in ethnic Lao villages. The ethnic Lao people did not pay the Khmu people but sometimes provided them with a meal after work. The *Lām* had arranged a fixed partnership with at least one Khmu village. It can be said that a patron-client relationship between ethnic Lao and Khmu had been established in Ngoi district of Luang Phabang province. The *Lām* should be considered more like middlemen between mountainous villages and lowland ethnic Lao villages rather than be seen as traders.

At present, it is unclear whether *Lām* existed across the whole of northern Laos. For example, in an ethnography of the Lamet, who belong to the same linguistic family as the khmu, written by Izikowitz [1951], the existence of the *Lām* mediating between a Lamet mountainous village and an ethnic Lao lowland village was not mentioned. The Lamet transported surplus harvested rice by boat to ethnic Lao merchants in the lowlands, which was exchanged for iron products such as farming implements and sharp tools [*ibid*.: 308–315]. The function of the *Lām* as determined by the author's survey differs from the descriptions by Stuart-Fox [1998] and Halpern [1958], and the existence of the *Lām* remains unclear given the conflicting accounts provided by Izikowitz's ethnography of the Lamet. However, there is little doubt that there were *Lām* in certain ethnic Lao villages of northern Laos, and that the mountain people have had a strong relationship with lowland people for a number of centuries.

In Pak Luang village, which was established about 300 years ago, the elderly people stated that there were two *Lām* and a trader of agro-forest products in the village. The two *Lām* dealt with four Khmu villages: Khong Mone, Cheang Tai, Cheang Neua, and Cheang Kang, and collected taxes from them for the French Indochina government and then, for the Royal Lao government. A trader in the village had purchased benzoin, cardamom, and opium from neighboring villages and sold these to the Chamber of Commerce of the French Indochina government in Luang Phabang via Nam Bak until the mid-1950s. Nam Bak was then the largest town along the Ou River, because Nong Khiaw, the current commercial center and seat of Ngoi district, had not been established.[9]

In the case of Hatsa village, an ethnic Lao village with a similarly long history as Pak Luang, there was only one *Lām*. He alone dealt with seven Khmu villages: Xam Noun,[10]

---

8) The piaster was the official currency of French Indochina from the late 1880s to the mid-1950s, and was subdivided into 100 cents. It was called *hman* in northern Laos.

9) In 1976, the seat of Ngoi district was moved from Ngoi village to a new town named Nong Khiaw, where the Ou River crosses the road to Xamneua.

10) Xam Noun village is outside of the area shown in Fig. 1.

Kiouxang, Houay Si, Kong Pod, Houay Talong, Mok Ouay, and Taban Lam,[11] and two Hmong villages: Houay Lo Sung and Nyot Si. He had held the *Phia*, a title of the nobility, which was the highest ranking official in the *Taseang*[12] in the era of the Kingdom of Laos. Moreover, Hatsa village had five traders until 1960 who purchased the same kinds of forest products as were bought in Pak Luang. The products were transported to Luang Phabang by boat to be sold to French traders.

Under the *Pathet Lao* regime, a government-managed store located at the Ou riverside between Hatsa village and Pak Luang village was established in the early 1960s (Fig. 1). The store replaced the local traders and purchased agro-forest products from local residents besides selling daily necessities. Mountain people sold agro-forest products such as benzoin, cardamom, opium, and sticklac to the government-managed store, then these products were sent to Xamneua. The local traders, therefore, could not continue trading with merchants in Luang Phabang.

However, the *Chintanakan Mai* period began in 1986, and the government-managed store was closed in 1988. Just before the closure of the government-managed store, privately managed general stores began to appear in Hatsa village. Then, two periodic markets on the Ou riverside were established in 1990 (Photo 1). Private agro-forest product traders also re-emerged in Hatsa village around the same time that the general stores began to open in 1985. When agro-forest product trading recommenced, the traders sold the products they purchased to the government-managed store. After the government-managed store closed in 1988, the traders started selling to other traders in the Nong Khiaw or Luang Phabang areas.

(a) Pak Bout Market, November 2001　(b) Phonsama Market, April 2001　(c) General Store at Hatsa Village, September 2002

Photo 1　Periodic Markets and General Store in the Study Area

11) Taban Lam village is located near Nyot Si. However, its inhabitants moved to another village and it is now deserted.

12) This was a sub-district within the district, and contained 10 to 20 villages. This administrative unit was abolished during the *Chintanakan Mai* period [Stuart-Fox 2001: 315]. In Thailand, however, *Tasaeng* acts as an official administrative district.

II–2 *Characteristics of Commercial Activities in the Study Area*

In 2001, the general stores and agro-forest product traders were unevenly distributed in the study area (Fig. 2). The general stores are only located in Pak Luang village and Hatsa village. Many general store managers have an additional role as agro-forest product traders. There are two types of general store: permanent stores found in Hatsa village and non-permanent stores, which are only open during the periodic market, found in Pak Luang village. The first general stores in the area were opened in 1985 in Hatsa village by seven households. Two households in Pak Luang village started the first non-permanent stores in 1992. By 2002, Hatsa village and Pak Luang village had 15 and five stores, respectively. All general store managers are ethnic Lao, but not former traders or *Lām*.

A periodic market is held on the riverbank at two places, Phonsana village and Pak Bout village. In addition to these, Houay Chanum periodic market in Phongsaly province, which is outside the study area, is included in this study because the general store managers and agro-forest product traders in the study area use this market.

Agro-forest product trading differs greatly in the nature of the activity according to the spatial range of trading. Thus, in this study, agro-forest product traders are classified into three levels (Table 1). While only Level-1 traders

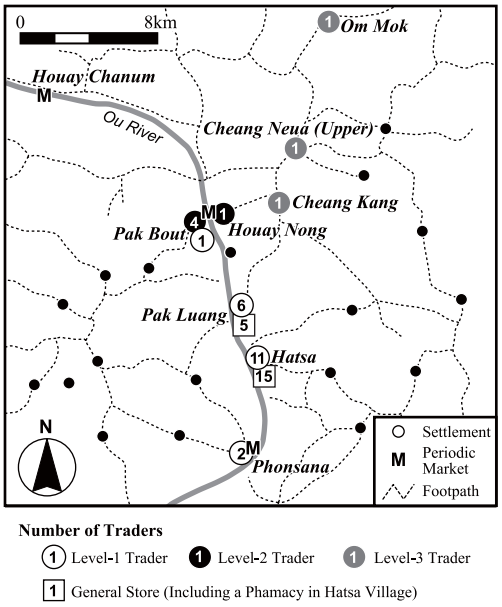


Fig. 2 Distribution of Agro-forest Product Traders and General Stores in the Study Area, 2001

Source: Surveyed by the author

Table 1 Classification of Agro-forest Traders According to Spatial Range of Trading

Trader Type	Range of Product Purchasing	Selling Destination	Trading Permit
Level-1	Forest product gatherers, agricultural product growers, Level-2 traders and Level-3 traders in the market and the village	Traders or exporters living outside study area	District permit
Level-2	Forest product gatherers and agricultural product growers in the market and the village	Level-1 traders	Village permit
Level-3	Forest product gatherers and agricultural product growers in the same village	Markets and Level-1 traders	Village permit

Source: Surveyed by author

who have a motorized boat trade outside the study area, the range of activity of Level-2 and Level-3 traders is limited to the study area. Additionally, traders must pay a fee for an annual trading permit to Ngoi district office. Annual trading permits are of four types: domestic permits, provincial permits, district permits, and village permits. The domestic permit allows unlimited transportation of goods within Laos, and also allows the export of products. The cost in 2001 was 1,500,000 Kip/year (about 166.7 US$/year). The provincial permit, district permit, and village permit cost 700,000, 500,000, and 200,000 Kip/year (about 77.8, 55.6, and 22.2 US$/year), respectively. Traders with a village permit can sell products purchased in the village at the periodic market. In the study area in 2001, no trader had a domestic permit or a provincial permit. Level-1 traders have a district permit, and Level-2 and Level-3 traders have a village permit. All traders shown in Fig. 2 have an official permit of Ngoi district.

Agro-forest product trading has extended beyond ethnic Lao villages appearing in Pak Bout village in 1994 and Phonsana village in 1997. These are both Khmu villages located along the Ou riverside. Afterwards, traders appeared in Cheang Neua (Upper) and Cheang Kang villages, which are Khmu villages in the mountains, and Om Mok village, which is a Hmong village, also in the mountains. In terms of geographical location, although Level-1 and Level-2 traders are only in the Ou riverside villages, Level-3 traders are limited to the mountain villages.

Commercial activities in the study area after the start of the *Chintanakan Mai* period were initiated by ethnic Lao households located along the river where accessibility to urban areas has been comparatively good since the mid-1980s. Later, these activities spread to the Khmu households located along the river, then, finally to the Khmu and Hmong households located in the mountains. However, Level-1 traders and general stores are found only in riverside households. In the study area, geographic village location, influenced by traffic networks such as the river, greatly contributed to the initiation of commercial activities.[13)]

III　Trading System of Agro-forest Products and Commodities

III–1　*Periodic Markets and Commodity Supply*

In the study area, two periodic markets were started in 1990 whereby many stalls were opened by general store managers in both Hatsa village and Pak Luang village. All merchants of Hatsa village had both a store open in the village and a stall in the periodic markets. The periodic markets and general stores at Hatsa village are, therefore, the only commercial outlets available for mountain people.

13) Yokoyama [2001] discusses the way in which the economic activities were newly introduced to the villages are related to the village location, as the major effect of new information is obtained from surrounding villages through the road link.

Commodities sold comprise daily necessities, clothes, and food, all of which are made in Thailand, Vietnam, or China. The general store managers travel to Luang Phabang and Muang Khoa areas at least once a month to purchase commodities to sell in their stores and stalls.[14] Moreover, they ask friends or relatives resident in those areas to send commodities whenever possible. From 1997, the five general store managers of Hatsa village sometimes traveled to Mengla, Xishuangbanna in China to purchase Chinese commodities at a low price by sharing a truck hired in the Muang Khoa area.[15] However, they stopped these journeys in January 2000 because Chinese merchants started to sell a large amount of cheap Chinese commodities in the periodic markets from that time.

Periodic markets have been seen in many places through out the ages. There are many similarities between periodic markets throughout the world, for example, they are held at regular intervals based on the local calendar and act as a place for social interaction [Ishihara 1987: 16–34; Skinner 1964]. The periodic markets in the study area follow this pattern. A market is held once every 10 days in accordance with the Khmu calendar.[16] Phonsana periodic market and Pak Bout periodic market are held on the third day (*Kat*) and the tenth day (*Huay*) of this ten day "week," respectively.

The number of stalls and their patterns of flow to the periodic market are shown in Fig. 3. In Pak Bout periodic market on 29 November 2001, 47 stalls originated from four villages. From the study area, Hatsa village and Pak Luang village contributed 19 stalls and 3 stalls, respectively, and from outside the study area, Muang Khoa area (Khoa district, Phongsaly province) and Hatpon village (Mai district, Phongsaly province) contributed 24 stalls and 1 stall, respectively. Stalls originating from the Muang Khoa area are more numerous than those from inside the study area.

Because many people come to Pak Bout periodic market, it is held on both banks of the Ou River at different times. The Pak Bout side on the west bank of the river holds the market from around 6 a.m. to 8 a.m. It then moves to the Houay Nong side on the east bank of the river and lasts from around 8 a.m. to 10 a.m. The Phonsana periodic market on 25 April 2001 was relatively small, with 18 stalls from three villages. From the study area, Hatsa village and Pak Luang village contributed 14 stalls and 3 stalls, respectively; from outside the study area, Sop Khing village (Ngoi district) contributed one stall. In Houay Chanum periodic market, which is held every ninth day (*Hap*), on 8 March 2001,

14) The general store managers buy Thai and Chinese products from the Luang Phabang area, and Chinese and Vietnamese products from the Muang Khoa area. Chinese products can be bought in both areas, so managers can choose to buy where the price is lower.

15) Regarding long-distance trade in northern Laos, Walker [1999: 138–162] illustrates that women traders known as *Mee Kha* play a central role in trading commodities. In the study area, women traders also traveled to buy commodities in China.

16) The calendar of Khmu that has one cycle every 10 days is as follows; First day: *Mung*, second day: *Puk*, third day: *Kat*, fourth day: *Kot*, fifth day: *Huang*, sixth day: *Tao*, seventh day: *Ka*, eighth day: *Kap*, ninth day: *Hap*, and tenth day: *Huay* [Chazée 1999: 64].

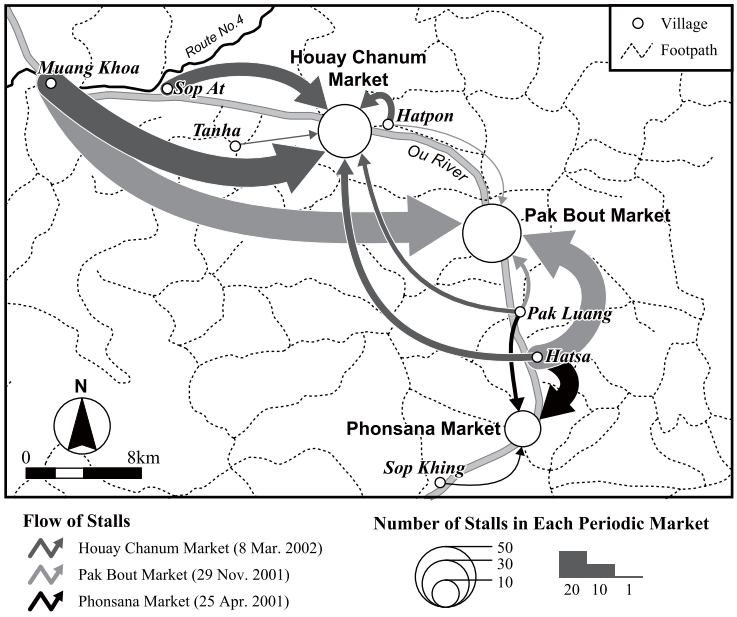


Fig. 3　Stall Flows of Periodic Markets
Source: Surveyed by the author

Table 2　Characteristics of Stalls in Periodic Markets　(Unit: Stalls)

Commodity Category	Commodity Sub-category	Phonsana Market 25 April 2001	Pak Bout Market 29 November 2001	Houay Chanum Market 8 March 2002
Sundries	Daily Necessities	6	11	12
	Clothes and Bedclothes	8	20	11
	Lamp Oil and Gasoline	0	1	2
	Medicine	1	2	4
Appliances	Electrical Products	0	2*	1*
	Tools	0	2*	1*
	Watch Repairer	1	1	1
Foods	Noodles	1	4	4
	Confectionary	1	4	3
	Total	18	47	39

Source: Surveyed by the author
Note: * Chinese merchants

four stalls originated from Hatsa village and three stalls originated from Pak Luang village. The number of stalls in Houay Chanum periodic market was 39, which makes it the second largest periodic market along the Ou riverside, after that at Pak Bout.

Stalls deal mainly in small commodities such as sundries, appliances, and foods (Table 2). Although the commodities are difficult to accurately categorize because of the

large variety present, many stalls primarily sell daily necessities and clothes. Additionally, there are noodle stalls and confectioners. Note that the general stores at Hatsa village are not considered in Table 2, where many kinds of commodity, though not electrical products, can be bought.

Among the general store managers, a number of Chinese merchants have opened stalls dealing in electrical products and tools at Pak Bout and Houay Chanum markets since 2000. They run general stores in the Muang Khoa area. By the time that the general store managers of Hatsa village had stopped traveling to China as mentioned above, Chinese merchants had already reached the northern mountainous region of Laos.

III–2 *Purchasing of Agro-forest Products in the Mountainous Region*

The function of these markets is not only to facilitate the selling of commodities, but also to facilitate the purchasing of agro-forest products from individual people. Moreover, some people barter their products for commodities. The products traded in the study area are mainly NTFPs: cardamom, benzoin, *Puack Muack*, paper mulberry, rattan fruits, galangal fruits, and tiger grass (Table 3). In terms of agricultural products, cash crops are limited to sesame and the opium poppy, while other crops including upland rice, maize, and cassava are grown for consumption, not for sale. Opium is sold directly to foreign traders and its distribution flows are difficult to follow: therefore, it is excluded from the category of agro-forest product trading in this study.

Table 3 Characteristics of Non-timber Forest Products in the Study Area, 2002

Name (Scientific)	Type	Season	Destination for Export	Buying Price (Kip/kg)	Selling Price (Kip/kg)	Use
Cardamom (*Amomum villosum*)	Fruit	Aug.–Sep.	China, Vietnam, Korea	15,000	20,000	Medicine
Benzoin (*Styrax tonkinensis*)	Resin	Apr.–May	France, Germany	45,000	55,000	Flavor, Fragrance, Medicine
*Puack Muack** (*Boehmeria* sp.)	Bark	Year-round	China	2,000	2,500	Glue for Incense Stick
Paper Mulberry (*Broussonetia papyrifera*)	Bark	Year-round	Thailand	2,000	2,500	Paper
Rattan (*Daemonorops* sp.)	Fruit	Aug.–Sep.	China	4,000	5,000	Medicine
Galangal (*Alpinia galanga*)	Fruit	Jul.–Sep.	China	4,000	5,000	Medicine
Tiger Grass (*Thysanolaena latifolia*)	Flower	Mar.–Apr.	Thailand	2,500	5,000	Broom

Source: [Yokoyama 2004]
Note: * In some regions, "*Puack Muack*" is called "*Nan Nyao*" or "*Sapan*."

Agro-forest product trading is carried out at both the periodic markets and the traders' houses. As shown in Fig. 4, three trading territories have been formed: there is an overlap between parts of trading territory B and C. This means that people sell products to both areas. In trading territory A, there are nine traders in five villages. Only one Level-1 trader exists at Pak Bout village, and the others are Level-2 and Level-3 traders. Level-2 traders living in Pak Bout and Houay Nong villages sell almost all their products to the Level-1 trader. However, Level-3 traders living at Om Mok, Cheang Neua (Upper), and Cheang Kang villages on the east side of the Ou River sell their products at Pak Bout periodic market. Level-3 traders living in the mountain villages cannot transport their agro-forest products to Pak Bout village on the opposite bank because they have no boat.

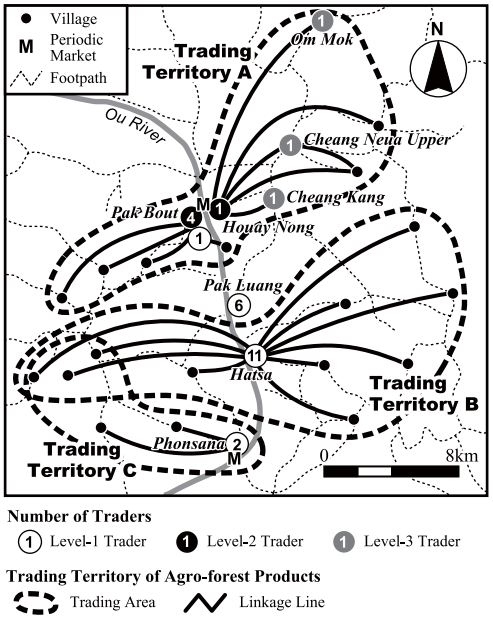


Fig. 4 Trading Territory of Agro-forest Products in the Study Area, 2002
Source: Surveyed by the author

On the day of the Pak Bout periodic market centering on trading territory A, and Phonsana periodic market centering on trading territory C, many agro-forest product traders with abundant funds living in other villages, such as Hatsa village and Pak Luang villages, come to purchase products, and a competition for products occurs between the traders. To facilitate this, Level-1 and Level-2 traders living in Pak Bout and Houay Nong villages offer free accommodation to mountain people on the day before the periodic market,[17] the traders then purchase products from the mountain people who have stayed at their home. This method of purchasing was introduced in 1998. Mountain people have no obligation to sell the agro-forest products to the trader who offers the accommodation. However, in most cases, a relationship of regular trading has been built between the traders and the gatherers. Consequently, although traders offer their houses at no charge, this method is advantageous because of the easier access to agro-forest products.

17) People in Om Mock, Houay Lo Sung, and Khong Mone villages take about four hours to reach the Ou River on foot. In order to be on time for the periodic market, which is only held in the morning, they have to leave the village at midnight and walk along a pitch black road.

Moreover, a Level-2 Khmu trader at Pak Bout village visited three Khmu villages, Houay Lo Toung, Saouy, and Khong Mone, ten times in 2001 in order to purchase NTFPs. He employs mountain people as porters to carry the NTFPs that he acquires. The advantage in purchasing in the mountains is that products can be obtained at a cheaper price than if bought at the Pak Bout periodic market, even with the extra porter charge.[18] There are few traders who employ this method, but there are many who make contracts with gatherers and pay cash in advance in order to ensure a reliable supply of NTFPs. This method is particularly common for purchasing benzoin and cardamom because these products generate larger profits for traders than the other products, as shown in Table 3.

Hatsa village, which functions as a center of trading territory B, is an important center for the purchase of agro-forest products in the study area, even though a periodic market is not held. The main reason for this is that Hatsa village meets the daily demands for both the purchasing of agro-forest products and the selling of commodities. Hatsa village is very convenient in comparison to the periodic markets which are held only once every 10 days. Meanwhile, Pak Luang village is not located in any trading territory despite there being six Level-1 traders and five general store managers in the village. All Pak Luang merchants carry out most of their business at the periodic markets, so no store is open in the village. Accordingly, mountain people do not trade in Pak Luang village, but instead choose Hatsa village as the best location for agro-forest product trading.

It has been clarified that both commodity sales and agro-forest product trading are centered on Pak Bout periodic market, Phonsana periodic market, and Hatsa village. These activities are closely associated (Fig. 5). The trader purchases agro-forest products from mountain people, and pays them cash. Mountain people buy commodities from the general store using this money. Thus, a circulation of cash as money is passed from the trader to the mountain people, and finally to the general store manager. The agricultural products, cash, and commodities end up in the hands of the trader, general store manager, and mountain people, respectively.

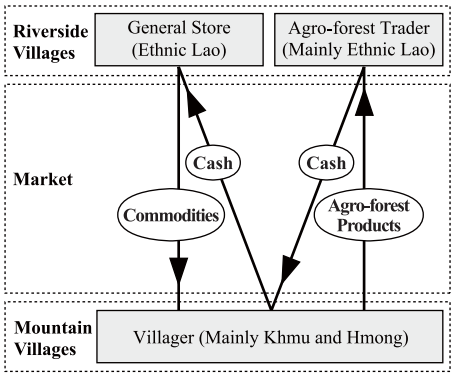


Fig. 5 Circulation of Agro-forest Products, Commodities and Cash

18) Hmong people in the study area dislike reducing the price of their products so they do not sell forest products in the village. The Khmu trader could not buy any forest products in the Hmong villages, although he went on buying trips in 1999.

The spread of the agro-forest product trading resulted from the stimulation of commodity flows through local general stores and periodic markets, and vice versa. One of the noteworthy features of trade in the mountainous area is that buying and selling transactions occur concurrently. Selling commodities is the role of the ethnic Lao, and buying them is chiefly carried out by the Khmu and Hmong people. A close relationship between commodity sales and agro-forest product trading has been built up in market places. Although it appears relatively simple, commodity dealing and agro-forest product trading in the mountains are part of a complex system influenced by transport conditions and ethnic relations based on regional history.

III–3　*Spatial Characteristics of Income from Non-agricultural Activities*

In order to determine household income[19] from non-agricultural activities including trading and general store management, the author conducted interviews with 160 households in 12 villages in the study area. To avoid gathering biased income data, the household income was broadly classified into three levels based on the information of the village administration committee and randomly sampled households from each level.

The calculated results of income from non-agricultural activities are shown in Fig. 6.

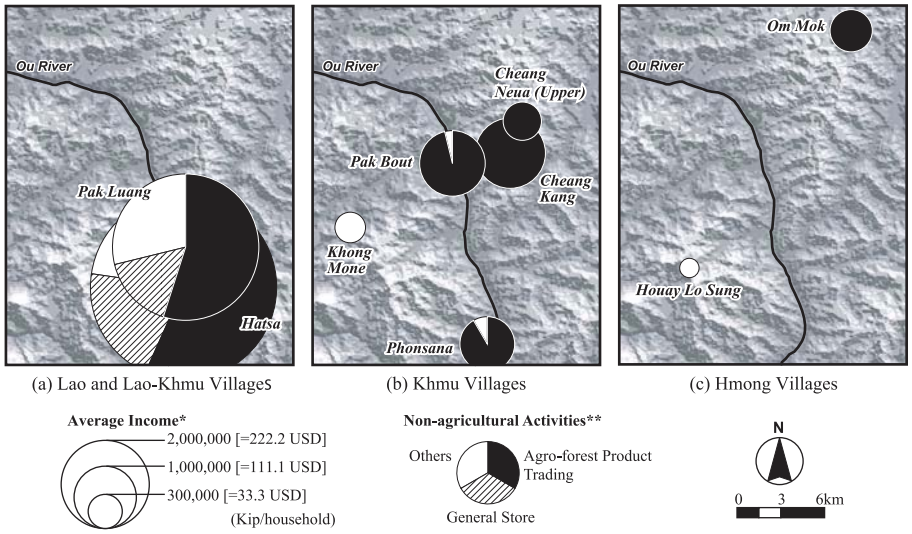


Fig. 6　Income from Non-agricultural Activities, 2001

Source: Suveyed by the author

Note: * 1 U. S. dollar (US$) was equivalent to 9,000 Kip as of December 2001.

**Number of sampled households was 160 settlements, 12 villages.

19) The incomes listed in this paper refer to gross revenue, for which wholesale cost is deducted from commodities sales.

Since four mountain villages, Cheang Neua (Lower), Mok Ouay, Houay Si, and Nyot Si, were not involved in any non-agricultural activities, their income was zero. In addition, in other villages, income varies among households in the same village. In the case of Hatsa village, six out of 19 interviewees were not involved in non-agricultural activities. The difference between minimum and maximum income of non-agricultural activities among those engaged in such activities in the village was about 28,592,000 Kip (about 3176.9 US$). This variation is not evident in Fig. 6, which only shows the village average. However, differences between various geographical locations and ethnic characteristics can be observed in the map.

It was found that residents of ethnic Lao and Lao-Khmu villages, Hatsa village and Pak Luang village, obtained a large income and that the inhabitants of both villages initiated non-agricultural activities at an early stage compared with the others in the study area, and gradually expanded the scale of trading. The average household income from non-agricultural activities was as follows: Hatsa village, 8,912,211 Kip (about 990.2 US$); Pak Luang village, 5,506,941 Kip (about 611.9 US$). The income included in the Others component shown in the figure refers to public servants' salary, drugstore sales, and technical workers' earnings.

Among the Khmu villages, the average household income of Cheang Kang village, where only one Level-3 trader resided, was larger than those of Pak Bout village and Phonsana village where Level-1 traders resided.[20] The income of the trader in Cheang Kang village came from three tons of benzoin trade even though the trader was only classified as Level-3. Furthermore, benzoin is the most profitable NTFP of the study area, as shown in Table 3.

The income included in the *Others* component in the Khmu villages was as follows: a public servant's salary in Khong Mone village and a Video CD show[21] in Pak Bout and Phonsana villages. The Video CD show was given by a trader who had a TV and a Video CD set. It was provided for mountain people who stayed with the trader on evenings before the day of the periodic market. In 2001, the owner of the device earned a show fee of 500 Kip/person (about 0.06 US$) from the audience. Children were charged half-rate. The Video CD show is a special activity which is found only in villages with a private electric generator, as in the study area.

---

20) There is a Khmu trader in Houay Nong village, but data on his cash income could not be obtained because he was absent when the survey was carried out. Therefore, data relevant to this could not be included in the data of Fig. 8.

21) Although Yokoyama [2001] reports on income from a VCR show in the rural village of Oudomxay province, this show was not found in the survey of the study area as of 2002. It is thought that the VCR show changed to a Video CD show. Video CDs have become commonplace in Southeast Asia because of the ease with which people can burn Video CDs on CD-Rs using their PCs. Video CDs, such as movies, are often bought in the Nong Khiaw and Muang Khoa areas. The generator for a thresher is used as a power supply.

In the village of Hmong, income from non-agricultural activities comprised income from the agro-forest product trade in Om Mok village and a pension in Houay Lo Sung village.

According to the second Lao Expenditure and Consumption Survey (LECS 2) carried out for the 1997–1998 fiscal year, the average household commercial income of seven northern provinces was 1,860,000 Kip [GoL, National Statistics Centre 1999]. For comparison, the commercial income in 1998 was converted to the price level for 2001 using the consumer price index.[22] As a result, the commercial income in 2001 was determined to be equivalent to 5,730,043 Kip (about 636.7 US$).[23] The commercial income of Hatsa village was 6,888,948 Kip (about 765.4 US$). Clearly, Hatsa village had a commercial income higher than the average for northern Laos. This is surprising for a remote area with no roads.

III–4　*Ethnic Contrast and Trading System*

It is generally ethnic Lao living in the Ou riverside who purchase agro-forest products, and Khmu and Hmong people living in the mountains who sell them. This, in addition to commodity dealing, may exhibit a clear ethnic contrast.

However, it is a mistake to believe that ethnic Lao are born as traders or merchants. Ethnic traits must be created through a history of relations with other ethnic groups. In northern Laos, the Khmu, a Mon-Khmer-speaking group, are regarded as one of the native peoples that preceded the Lao [LeBar *et al*. 1964: 113]. Hmong emigrated from southern China to the Luang Phabang area around 1847–50 [Culas 2000: 36]. Although the Khmu have a long history of living in northern Laos, their political position has been very low. Ethnic Lao referred to the Khmu as *Kha*, meaning "slave," until the *Pathet Lao* era. It is not difficult to imagine that the ethnic Lao that ruled the country maintained control over the Khmu in the northern region. Halpern also refers to the fact that "often the Khmu lack sufficient goods to trade, and they are forced to work for the Lao settlements as coolies or servants" [1959: 123]. This can explain the existence of the *Lām* who made arrangements to force Khmu people to engage in farm work in ethnic Lao villages without pay.

In this historical context, it is understandable that ethnic Lao engaged in trading in order to control valuable NTFPs gathered by Khmu people. Few other options were available for ethnic Lao, who arrived in the region more recently and were unfamiliar with the natural environment in the study area. The ethnic contrast regarding commercial activities seen in the study area may have been inevitable given the history that

22）When the consumer price index in 1995 was set as 100, the consumer price indexes in 1998 and 2001 were 275.2 and 847.1, respectively [IMF, Statistics Department 2002].

23）The LECS 2 survey includes the urban area. If it had included only rural villages as the object of study, the average income might have been lower.

Laos, a complex multiethnic country, has experienced.

IV The Trading Flows of Agro-forest Products and Commodities

IV–1 *Changes in Agro-forest Product Exports and Political Situation*

Let us now attempt to examine the agro-forest product distribution channels between the mountainous region of northern Laos and foreign countries. Export points of NTFPs were greatly affected by the prevailing political regime. We have only limited information on trading of agro-forest products during the Lān Xāng Kingdom era. However, it may safely be assumed that products were sent to the former capital Luang Phabang and then shipped to Thailand or Vietnam, namely, to ports from which the products could be exported to European countries. In the days of French Indochina from the late 19th century, the products were initially exported to Saigon via Vientiane, but this shifted from Saigon to Bangkok in the 1950s because of the warehousing facilities constructed with American aid at both Thadeua in Vientiane and Bangkok [LeBar and Suddard 1960: 220; Vercouttre 1959].

During the French Indochina period, the rivers played a central role in the transportation of people. LeBar and Suddard describe the transportation conditions at the time: "Throughout the centuries the natural waterways of Laos — the Mekong and its tributaries — have been supplemented only by the most primitive trails and tracks, but communication by boat is well developed and Lao villages are for this reason usually located near water courses" [1960: 215]. Areas with only river access are considered to be isolated from the outside world by present day standards. In fact, the opposite is true. Areas with river access were geographically most convenient for communication with the outside world. Roads were not involved in the transportation of products for traders in northern Laos, as noted in more detail below: "Laos has about 3,500 miles of roads and tracks of which only about 1,200 were surfaced in 1957, mostly in the south. The remaining mileage which was unsurfaced could not be used in the rainy season" [*ibid.*: 217]. In order to engage in trading in northern Laos, it was necessary for ethnic Lao traders to be located in villages on the river.

Under the communist regime of the *Pathet Lao*, government-managed stores sent all products they purchased in the mountains to Vietnam via Xamneua. After the establishment of Lao PDR. in 1975, the products began to be exported to foreign countries from Vientiane, namely, a shift from Vietnam to Thailand occurred again.

During the *Chintanakan Mai* period, several borders with Thailand, Vietnam, and China were opened in order to improve relations with neighboring countries in preparation for a decrease in foreign assistance from the former Soviet Union and the Eastern bloc. In addition to this, the transport infrastructure was being improved by foreign assistance, as mentioned in Chapter Ⅰ. As a result, cross-border trade was re-established.

The question we have to ask here is how this cross-border trade made the mountains change. In addition to the trade flows of agro-forest products, brokerages of private traders and changes of natural resource gathering needs to be examined in detail. These are questions to be considered in this chapter.

IV–2 *The Export of Agro-forest Products from the Mountains*

Agro-forest products from the study area are exported from four export points: Boten[24] on the Chinese border, Houay Xay and Vientiane on the border with Thailand, and Tai Chang on the border with Vietnam (Fig. 7). Among these, Tai Chang is a local border

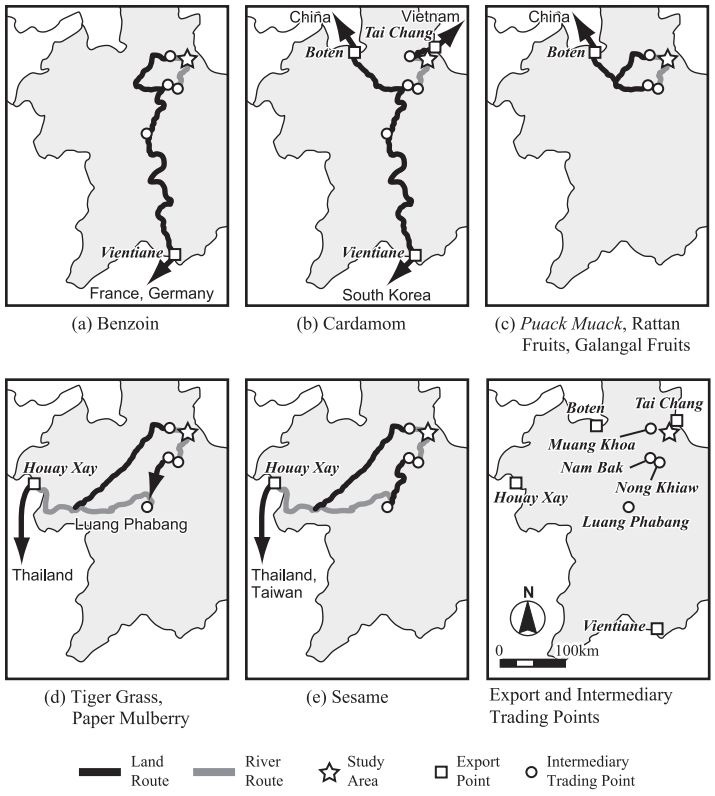


Fig. 7 Distribution Channels of Agro-forest Products
Source: Surveyed by the author

24) After the mid-2000s, two local border checkpoints, Meo Chai (Namo district in Oudomxay province) and Phang Hai (Muang Sing district in Luang Namtha province), were mainly used for cross-border trading between northern Laos and southern Yunnan, instead of Boten, which is an international border checkpoint.

which is used only by Lao and Vietnamese nationals. These borders were opened one after another between the late 1980s and the early 1990s. The stimulation of human mobility and information flow that occurred through the opening of the borders greatly contributed to the formation of various agro-forest product trade flows.

Benzoin (a) is transported to the exporter in Vientiane over land, and then by plane to France or Germany. Cardamom (b) is exported to China, Vietnam, and South Korea. Cardamom is the agro-forest product with the greatest variety of channels in the study area. All cardamom exported to Vietnam over land passes through a trader/exporter in the Nam Bak area, and other products exported to China over land pass through a trader/exporter in the Muang Khoa area. The trader/exporter in the Nam Bak area exports the cardamom to South Korea in addition to China. This trader/exporter separates the cardamom into two groups according to the fruit size; large fruits are sent to China and small fruits are sent to South Korea via Vientiane.

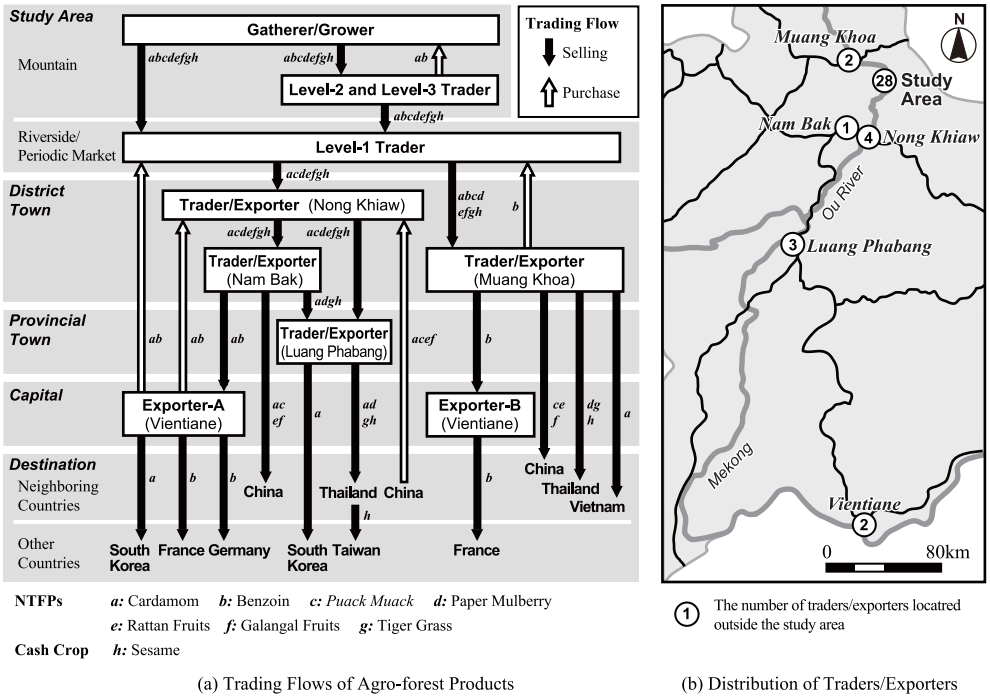
All *Puack Muack*, rattan fruits, and galangal fruits (c) are exported to China from Boten over land. As for tiger grass and paper mulberry (d), the trader/exporter in the Muang Khoa area directly exports them to Thailand using a combination of land and river routes. On the other hand, the shipments dealt with by the traders/exporters in the Nong Khiaw and Nam Bak areas are transported to an exporter in the Luang Phabang area, who then transports them to a paper mill in Thailand by boat. Much of the tiger grass is transported to Thailand without being processed, but some of it is processed by the company in the Luang Phabang area. The company started operating a small-scale paper mill in 1999 after obtaining paper-making machines from Chiang Mai, Thailand. Although the company purchased about 300 tons of paper mulberry bark, about 200 tons was exported to Thailand without processing because the processing capacity of the paper mill is only 100 tons a year.

Sesame (e) is exported without processing by the same route as tiger grass and paper mulberry bark via the Luang Phabang area. Some sesame sent to Thailand is transported to a sesame oil factory in Thailand, and the remainder is exported to Taiwan.

So far, the author has described the distribution channels and methods of trade of agro-forest products from the study area to foreign countries. As for the actual routes used for the distribution of the agro-forest products, the land transportation route was used only by the exporter from Vientiane who transports benzoin and cardamom between Luang Phabang and Vientiane where the road is paved, and over a short-distance to China or Vietnam. All the other agro-forest products exported to Thailand or by way of Thailand were sent on the Mekong river. In northern Laos where the roads are underdeveloped, the river played an important role as a distribution channel of the agro-forest products, as described above.

IV–3 *Interconnection between the Mountainous Region and Urban Areas*

The trading flows of agro-forest products from the study area to various destinations are



(a) Trading Flows of Agro-forest Products　　(b) Distribution of Traders/Exporters

Fig. 8　Trading Flows of Agro-forest Products and Distribution of Traders/Exporters

very complex, as illustrated in Fig. 8 (a). On the one hand, we can see complex flows that reach destinations via five brokerages; on the other hand, there are simple flows in which a trader living in an urban area purchases products directly from traders on site in the mountains. We will take the example of benzoin (*b*) to illustrate the flows. It is possible to classify these flows into three types. First, there is "Direct Trading," in which Exporter-A in Vientiane makes a trading contract with a Level-1 trader in the study area and goes to purchase directly from that trader. Second, there is "Consignment Trading," in which Exporter-B in Vientiane entrusts the purchase of benzoin to a trader/exporter in the Muang Khoa area. Here Exporter-B does not go to the study area. Finally, there is general "Phased Trading," in which benzoin is transferred in stages from a Level-2/Level-3 trader to Exporter-A in Vientiane via the Nong Khiaw and Nam Bak areas. In the case of traders/exporters in district and provincial towns, the purchased NTFPs are exported to China using self-owned trucks. This trading system, which involves several traders, is recognized as "Phased Trading."

A method of trading similar to "Direct Trading" was observed for cardamom, *Puack Muack*, galangal fruits, and rattan fruits. As shown in Fig. 8 (b), there are four traders/exporters in the Nong Khiaw area, and three of them trade directly with China. According to traders/exporters in the Nong Khiaw area, Chinese traders come to purchase

NTFPs at regular intervals of two to three weeks from August to October, during the gathering period for cardamom, galangal fruits, and rattan fruits. At other times, traders/exporters in the Nong Khiaw area sell NTFPs to other traders/exporters in the Nam Bak or Luang Phabang areas.

One can safely state that the agro-forest product trading on demand in foreign countries is widespread across the country from the provincial towns to the remote villages. The important point to note is that the cross-border trading made it possible for Chinese traders and exporter in Vientiane to carry out "Direct Trading." This is one of the characteristics of the NTFP trading after *Chintanakan Mai*.

IV–4 *Income and Expenditure of Benzoin Trading*

In the study area, income from agro-forest product trading was larger than retail income, such as that from general stores. It may be said that this is specific to this study area where particularly valuable NTFPs such as benzoin are gathered.

In the case of agro-forest product trading, the income is large, but the costs are also large. Here, clarification of the realities of agro-forest product trading is provided through an explanation of the relationship between the trading price and the cost at every trade point from the gatherer to the exporter. Here, the benzoin trade is focused on here as an example. It is comparatively easy to follow the trade flow of benzoin because there are only three export companies in the country.

The trading price and the cost at every trade point in 2002 are shown in Fig. 9. The trading price of benzoin in the gathering area is set at a price in Laos Kip equivalent to 4 US$ every year. However, sometimes the benzoin trading price fluctuates owing to competition among traders.[25] Even though the purchase price in the study area rises, traders cannot increase the trading price accordingly because of pressure from foreign customers. Therefore, the exporter's profits[26] decrease when the local price increases.

The gatherer does not incur costs from gathering benzoin. There is no direct cost, although the land tax for the swidden field might be considered as a cost because benzoin is gathered in fallow swidden plots.

The Level-1 traders sell benzoin purchased at 38,000 Kip/kg (about 4 US$) to traders in the Nong Khiaw area or Exporter-A at 42,000 Kip/kg (about 4.4 US$). The profit obtained is 4,000 Kip/kg (about 0.4 US$). However, it is necessary to pay a fee of 500,000 Kip (about 52.6 US$) for an annual trading permit to the district office, which is the equivalent of income tax. If the trader deals only in profitable NTFPs such as benzoin,

25) In the study area, a group related to Exporter-A and a group related to Exporter-B competed strongly over the purchase of benzoin in 2001. At the beginning of trading, the price was 35,000 Kip/kg (about 3.9 US$/kg) in March, but reached 55,000 Kip/kg (about 6.1 US$/kg) in May.

26) In this paper, family labor, which has an opportunity cost, is included.

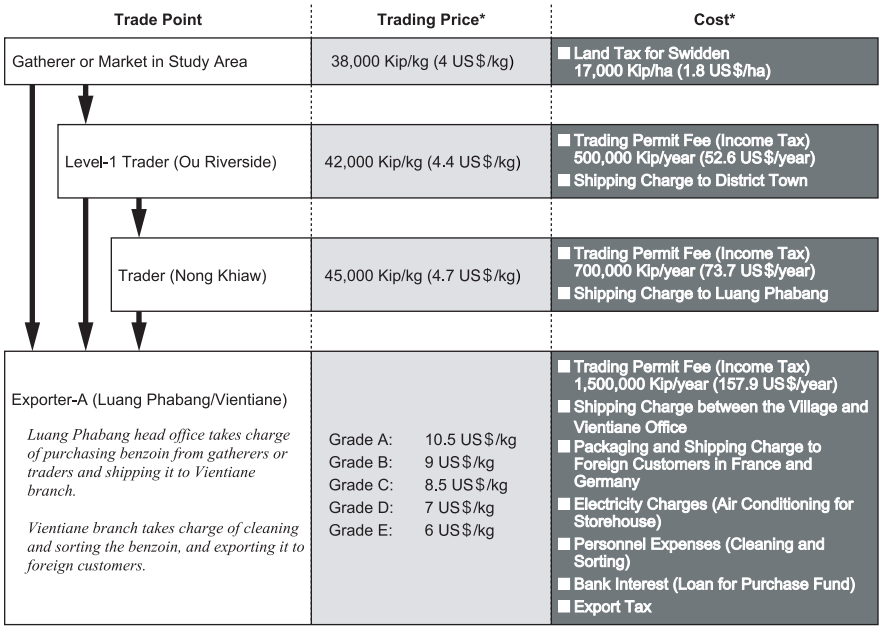


Fig. 9　Trading Price and Cost of Benzoin at Trade Point, 2002
Note: * 1 U. S. dollar (US$) was equivalent to 9,500 Kip as of April 2002.

the balance becomes a deficit unless 125 kilograms (about 500 US$, 4,750,000 Kip) of benzoin are traded. If a trader deals only in less profitable NTFPs such as *Puack Muack* and paper mulberry bark, and makes a profit of only 500 Kip/kg (about 0.05 US$), one ton of trade is needed. In the study area, only a few traders with sufficient financial resources are efficiently purchasing agro-forest products by specializing in benzoin, and the majority of traders mainly deal in NTFPs with a low unit price. It seems that the net profit of trading is not so great even though the amount of cash income is large. Of particular note is that traders who deal mainly in heavy, low-profit NTFPs have to bear the costs of transport, and so the profits decrease even further.

Traders in the Nong Khiaw area, which is the seat of Ngoi district office, are in almost the same situation as the Level-1 traders. Nevertheless, their trading permit fee is large compared with that for a Level-1 trader. In addition to this, the shipping charge for agro-forest products greatly affects the profit. The charge for transportation by truck from the Nong Khiaw area to the Luang Phabang area is 100,000 Kip/ton (about 10.5 US$). The period of benzoin trading is limited to three months, and the shipping charge is not expensive because the product is lightweight. However, the traders transport three tons of other products once a week on average. The annual shipping charge of all products amounts to 14,400,000 Kip (about 1,515.8 US$).

Exporter-A in Vientiane exports the benzoin to France and Germany, at 15 tons to

each country per year. When exporting, the benzoin is divided into five grades from A to E according to the size of the resin. Little high-grade resin remains after cleaning and sorting. The trading permit fee that Exporter-A has to pay is 1,500,000 Kip (about 157.9 US$). Other charges in addition to this are the cost of transport between the mountain villages and the Vientiane office, and the costs of packing and transport to foreign customers in France and Germany. Moreover, many other costs are incurred compared with other traders, such as personnel expenses to pay workers for the benzoin grading, the cost of electricity for air-conditioning in a storehouse,[27] bank interest,[28] and export tax.

For the NTFP gatherers in the mountains, the only cost is the land tax, so the more gathering that is done, the more the gatherer profits. On the other hand, the agro-forest traders must process a considerably large amount of product to make a profit because they have to pay high trading permit fees. The cost of trading in benzoin increases exponentially from remote areas, to provincial towns, to large cities. The international trading price of valuable NTFPs such as Siamese benzoin is also high, and the domestic trader requires considerable capital to carry out the purchase.

In the study area, although there were 28 agro-forest product traders in 2001, only 15 traders bought more than 125 kilograms of benzoin, which represents a value equivalent to the trading permit fee. Three traders did not purchase benzoin because they had insufficient funds, and a lot of benzoin was purchased by traders outside the study area. The traders in the remote area cannot obtain loans from banks because they are unable to obtain a mortgage. Exporter-A in Vientiane can obtain a bank loan, but the loan amount is small. Moreover, even if Exporter-A purchases agro-forest products by taking out a large bank loan, the high interest on the loan is prohibitive.

In a developing country such as Laos, agro-forest product traders and exporters face considerable difficulty in the raising of funds. If the exporters reduce funds for purchasing agro-forest products from traders, the traders, who are at a subordinate level to exporters, must in turn reduce the quantity of products they purchase. Then, the NTFP gatherer is forced to decrease the amount of products gathered. As a result, the cash income of mountain people decreases drastically. A shortage in purchase funds among the traders immediately results in a decrease in the income of the agro-forest product gatherers in the mountains.

---

27) Benzoin has a milk white color when gathered, then changes to brown when it oxidizes. It is necessary to cool the product for dehumidification in storehouses to prevent oxidation before export.

28) Bank interest is greatly affected by the exchange rate of the Lao Kip to the US dollar. The Kip loan interest rate in 2002 was high, at about 30%.

V　Changes in Agro-forest Product Trading and Natural Resource Use

Changes in agro-forest product trading and natural resource use in the northern mountainous region of Laos are shown in Fig. 10. On the basis of the discussion in the preceding section IV-1, the patterns of trading and resource use can be classified into three groups. During the colonial period, private traders and *Lām* purchased agro-forest products from mountain people. These products were sent to traders in the former capital Luang Phabang and shipped to Thailand or Vietnam. Under the communist regime, the agro-forest products were purchased by governmental traders stationed in the governmental-managed store. These NTFPs were then exported to Vietnam via Xamneua during the *Pathet Lao* government period and to Bangkok via Vientiane during the Lao PDR period. Then, during the *Chintanakan Mai* period, the borders with Thailand, China, and Vietnam began to be opened from the late 1980s, and cross-border trade was re-established. Private trading was revived in both urban and rural areas.

The gathering of the NTFPs shown in Table 3, excluding benzoin and cardamom, started being gathered after the opening of the borders. Information about demand in foreign countries received through the domestic traders led to the gathering of new NTFPs in the mountains. A network of private domestic traders has been expanding throughout the country, and has played an important role in the transmission of information to the northern mountainous region of Laos since the *Chintanakan Mai* period.

The trading flows of agro-forest products from the study area to various destinations are very complicated. Agro-forest product traders appeared in various urban areas after the *Chintanakan Mai* period. It has been clarified that traders in smaller urban areas have engaged in "Direct Trading" with Chinese traders, and have thereby gathered new types of NTFPs in the mountains. These agro-forest products started to be exported directly to

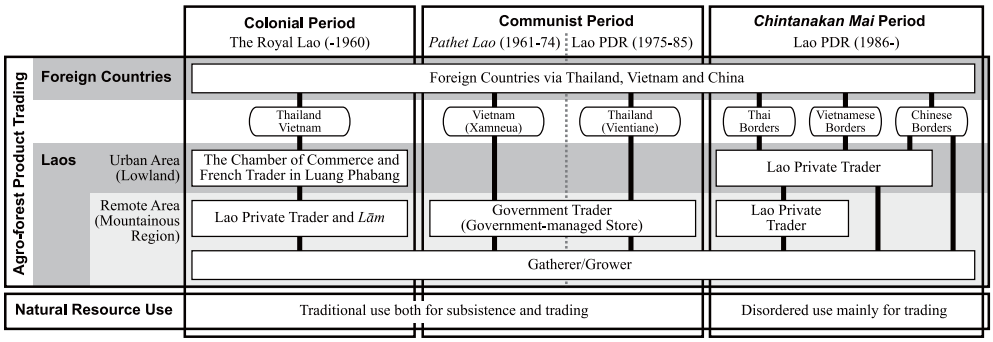


Fig. 10　Changes in Agro-forest Product Trading and Natural Resouce Use in Northern Laos

China from mountainous areas.

For the time prior to the colonial period, and because the functions of mountains and lowlands differed, it is considered that the social structure of northern Laos in that period can be represented as a dichotomy between the mountain people as gatherers and the lowland people as traders. This structure is explained by the relations between ethnic groups that were historically established by the *Lām*, who had strong ties with mountain people, especially the Khmu, who were used for manual labor by the lowland people. Mountainous regions experienced commercial activities, such as periodic markets, general stores, and agro-forest product traders, under the communist period, and were directly affected by the Chinese economy after the *Chintanakan Mai* period. As a result, it has become more difficult to understand the social structure of northern Laos in the context of this dichotomic typology. Additionally, from a spatial viewpoint, the northern mountainous region of Laos has not been isolated but connected with the lowlands by a longstanding and well-established river transportation system. The social structure in northern Laos, therefore, must now be considered within the context of the globalization of agro-forest product demand, and beyond local ethnic relations. Such changes in the social structure have been triggered by the opening of borders that accompanied the *Chintanakan Mai* period.

Regarding the challenges of globalization for the northern mountainous region of Laos, the sustainable use of natural resources is a key issue. Although mountain people traditionally used natural resources mainly for subsistence before the *Chintanakan Mai* period, their use has sometimes been disordered when related to trading. None of the newly gathered NTFPs, which have been exported to China since the 1990s, are traditional goods used as food or medicine. These NTFPs are plants that had previously been gathered in China, but are not any more. It is particularly surprising that gatherers and traders do not know the intended use of the newly gathered NTFPs. Local people, especially the Khmu people who know a lot about NTFPs, had little interest in the species until they started to gather them for sale. Therefore, they know little of the resource potential and reproductive power of the plants. Although newly gathered NTFPs in the study area are not precious species, there is a possibility that excessive gathering will lead to their drastic decline. All surveyed farm households, except those engaged in commercial activities, are gathering the NTFPs for export. Even though local gatherers and traders do not know how these NTFPs are used in China, they unquestioningly accept the information provided by foreign traders on this issue.

The government prohibits the gathering of certain natural resources such as Chinese cinnamon (*Cinnamomum cassia*) [GoL., NAFRI, NUoL and SNV 2007: 330], and the export of certain ornamental plants such as orchids is regulated by quotas set by district and provincial offices [*ibid*.: 375]. Regulation, however, has yet to be effectively enforced. Effective local governance regarding natural resource management will be needed in the future. A field study on natural resources in the northern mountainous region of Laos

and a survey of foreign demand for NTFPs, especially with regard to China, might be required.

VI　Conclusion

This paper has introduced the history of agro-forest product trading in the northern mountainous region of Laos showing how trading can be traced back to the Lān Xāng Kingdom era. In this era, *Lām* collected agro-forest products from mountain people as tax. In addition, private traders were involved in the purchase of products from them. However, during the *Pathet Lao* period, government-managed stores located along the Ou River replaced the private traders, and purchased agro-forest products and sold commodities at the same time. During the *Chintanakan Mai* period, the government-managed stores were closed and private traders re-emerged from ethnic Lao households located on the river. Agro-forest trading spread to the Khmu households along the river, then finally to the Khmu and Hmong households in the mountains. However, general stores are currently only operated by ethnic Lao households on the riverside. In addition to this, agro-forest product traders who trade outside the study area are found only in riverside households.

Even in areas without road access, people in the study area could initiate commercial activities using navigable rivers as Laos has had a developed river transportation system for a long time. In northern Laos where there are many mountainous areas, major roads are being constructed with foreign aid, but many roads remain in a poor condition. Therefore, traders still rely on rivers to export products.

After the closure of the government-managed stores, two periodic markets were held on the Ou riverside, and permanent general stores are located in an ethnic Lao village. These provide the opportunity for mountain people to buy agro-forest products and to sell commodities. The supply of natural resources from the mountains to lowlands once began with a brokerage form via *Lām*, before transforming into private traders including Chinese merchants. Although the mountains of northern Laos seem to face the powerful tide of globalization at the present stage, as pointed out in Chapter Ⅰ of this paper, the trading between the mountains and lowlands has always existed for a long time and the form of trading has varied across the ages.

The trading networks are in the process of spreading throughout the country, and the flows of agro-forest products and commodities are increasing. It seems reasonable to suggest that the private traders serve as an important driving force in the development of agro-forest product trading. They obtain information regarding demand of foreign countries and encourage the mountain villages to gather NTFPs on demand from foreign countries. Although it was conceivable that the ethnic minorities such as the Khmu and the Hmong did not engage in commercial activities before *Chintanakan Mai*, the traders

were always the ethnic Lao. However, after *Chintanakan Mai*, the Level-2 and Level-3 traders started to cover remote villages without road access. In addition to this, in some cases, Chinese merchants are also engaged in trading in the study area. This paper has also shown that not only road maintenance and improvement led to the transformation of the nation from being "land-locked" to "land-linked-," after *Chintanakan Mai* but it has also made clear that private traders, regardless of national and ethnic distinctions, appeared. As a result of these ongoing changes, the mountains of northern Laos have been and continue to be further pulled into the global market at a rapid speed and as such require more scrutiny in further studies.

Acknowledgements

This survey was made possible through the support of the people of Ngoi district, Luang Phabang province. I received excellent advice from the forest and agriculture team of the project entitled "A Trans-disciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005," headed by Professor Tomoya Akimichi, the Research Institute for Humanity and Nature, Japan. The author would like to express sincere thanks to all these people.

This study was partly funded by the Toyota Foundation, Grant No. D01–A–046, and Grants-in-Aid for Scientific Research, Scientific Research-C, No. 16510188 (2004–07) from the Japan Society for the Promotion of Science.

References

Asian Development Bank (ADB). 2007. *Midterm Review of the Greater Mekong Subregion Strategic Framework (2002–2012).* Manila: ADB.

Chazée, Laurent. 1999. *The People of Laos: Rural and Ethnic Diversities*. Bangkok: White Lotus.

Cohen, Paul T. 2009. The Post-opium Scenario and Rubber in Northern Laos: Alternative Western and Chinese Models of Development. *International Journal of Drug Policy* 20(5): 424–430.

Culas, Christian. 2000. Migrants, Runaways and Opium Growers: Origins of the Hmong in Laos and Siam in the Nineteenth and Early Twentieth Centuries. In *Turbulent Times and Enduring Peoples: Mountain Minorities in the South-east Asian Massif*, edited by Jean Michaud, pp. 27–47. Richmond, Surrey: Curzon Press.

Forbes, Andrew D W. 1987. The "Cin Ho" (Yunnanese Chinese) Caravan Trade with North Thailand during the Late Nineteenth and Early Twentieth Centuries. *Journal of Asian History* 21(2): 1–47.

Government of the Lao PDR (GoL). 2004. *National Growth and Poverty Eradication Strategy*. Vientiane: The Committee for Planning and Investment.

Government of the Lao PDR (GoL), Department of Agriculture. 2002. *Agricultural Marketing in Lao PDR*. Vientiane: Ministry of Agriculture and Forestry.

Government of the Lao PDR (GoL), NAFRI.; NUoL.; and SNV. 2007. Non-timber Forest Products in the Lao PDR: A Manual of 100 Commercial and Traditional Products. Vientiane: The National Agriculture and Forestry Research Institute.

Government of the Lao PDR (GoL), National Statistical Centre. 1999. *The Households of Lao PDR: Social and Economic Indicators Lao Expenditure and Consumption Survey 1997/98 (LECS 2).* Vientiane: State Planning Committee.

Halpern, Joel M. 1958. *Aspects of Village Life and Culture Change in Laos*. New York: Council on Economic and Cultural Affairs.

————. 1959. Trade patterns in northern Laos. *The Eastern Anthropologist* 12(1): 119–124.

International Monetary Fund (IMF), Statistics Department. 2002. *International Financial Statistics: Yearbook*. Washington D. C.: International Monetary Fund.

Ishihara, Hiroshi. 1987. *Teiki-ichi no Kenkyu: Kino to Kozo* [A Study on Periodic Markets : Function and structure]. Nagoya: Nagoya Daigaku Shuppankai [Nagoya University Press].

Izikowitz, Karl Gustav. 1951. *Lamet: Hill Peasants in French Indochina*. Goteborg: Elanders Boktr.

Jönsson, Kristina. 2009. Laos in 2008: Hydropower and Flooding (or Business as Usual). *Asian Survey* 49(1): 200–205.

Khontaphane, Sirivanh; Insisiangmay, Sathanbandith; and Nolintha, Vanthana. 2006. *Impact of Border Trade in Local Livelihoods, Lao-Chinese Border Trade in Luang Namtha & Oudomxay Provinces*. Vientiane: United Nations of Development Programme.

LeBar, Frank M.; and Suddard, Adrienne, eds. 1960. *Laos: Its People, Its Society, Its Culture*. New Haven: Hraf Press.

LeBar, Frank M.; Hickey, Gerald C.; and Musgrave, John. K. 1964. *Ethnic Groups of Mainland Southeast Asia*. New Haven: Hraf Press.

Lintner, Bertil. 2008. Laos: At the Crossroads. In *Southeast Asian Affairs 2008*, edited by Daljit Singh, and Tin Maung Maung Than, pp. 171–183. Singapore: Institute of Southeast Asian Studies.

Mya Than. 2006. Intra-regional and Cross-border Economic Cooperation. In *The Mekong Arranged and Rearranged*, edited by Maria Serena I. Diokno and Nguyen Van Chinh, pp. 141–170. Chiang Mai: Mekong Press.

Pholsena, Vatthana; and Banomyong, Ruth. 2006. *Laos: From Buffer State to Crossroads?* Chiang Mai: Mekong Press.

Rattanavong, Hounphan. 2008. The Changing Livelihoods of the Akha in Muang Sing and Muang Long in Laos. In *Living in a Globalized World: Ethinic Minorities in the Greater Mekong Subreagion*, edited by Don McCaskill, Prasit Leepreecha, and He Shaoying, pp. 259–276. Chiang Mai: Mekong Press.

Shi, Weiyi. 2008. *Rubber Boom in Luang Namtha: A Transnational Perspective*. Vientiane: GTZ.

Skinner, G. William. 1964. Marketing and Social Structure in Rural China, part I. *The Journal of Asian Studies* 24(1): 3–43.

Stuart-Fox, Martin. 1998. *The Lao Kingdom of Lān Xāng: Rise and Decline*. Bangkok: White Lotus.

————. 2001. *Historical Dictionary of Laos*, 2nd Edition. Lanham, Maryland: Scarecrow Press.

————. 2009. Laos: The Chinese Connection. In *Southeast Asian Affairs 2009*, edited by Daljit Singh, pp. 141–169. Singapore: Institute of Southeast Asian Studies.

Thongmanivong, Sithong; and Fujita, Yayoi. 2006. Recent Land Use and Livelihood Transitions in Northern Laos. *Mountain Research and Development* 26(3): 237–244.

Vercouttre, Claude. 1959. Present State of Laotian Economy. In *Kingdom of Laos: The Land of the Million Elephants and of the White Parasol*, edited by Rene de Berval, pp. 459–468. Saigon: France-Asie.

Walker, Andrew. 1999. *The Legend of the Golden Boat: Regulation, Trade and Traders in the Borderlands of Laos, Thailand, China and Burma*. Honolulu: University of Hawai'i Press.

Yokoyama, Satoshi. 2001. Nogai Katsudo no Donyu ni Tomonau Raosu Sanson no Seigyo Kozo Henka: Oudomxay-ken Phongsavang-mura o Jirei to shite [The Changing Occupational Structure of a Laos Mountain Village: A Case Study of Phonsavang Village, Oudomxay Province]. *Jinbun Chiri* [The Human Geography] 53(4): 307–326.

————. 2004. Forest, Ethnicity and Settlement in the Mountainous Area of Northern Laos. *Southeast Asian Studies* 42(2): 132–156.

Ziegler, Alan D.; Fox, Jefferson M.; and Xu, Jianchu. 2009. The Rubber Juggernaut. *Science* 324: 1024–1025.

Southeast Asian Studies, Vol. 47, No. 4, March 2010

Can Paper Mulberry Contribute to Building Sustainable Rural Livelihoods in Northern Laos?

Andreas NEEF*, Pornsiri SUEBPONGSANG**, Chanhsom MANYTHONG***
Wirachinee TACHEENA† and OGATA Kazuo††

Abstract

Most ethnic minority villages in northern Lao PDR continue to rely on non-timber forest products (NTFPs) for much of their subsistence and cash economy. Paper mulberry (*Broussonetia papyrifera*) is an important NTFP in many parts of northern Laos, providing opportunities for earning cash income, particularly for women. Since the plant has been successfully domesticated by local people, it has also been widely proposed as the basis for a sustainable agroforestry system. The major objectives of this article are to investigate the production, processing and marketing system of paper mulberry and to assess its potential to contribute to building sustainable rural livelihoods in northern Lao PDR. We also elucidate how this perennial plant has been affected by recent government policies, changes in resource management — from gathering to domestication — and current land use transitions, drawing on a case study from Pha Oudom district, Bokeo province, northern Laos. Whether a sustainable production and supply-chain management system for paper mulberry can be developed that provides a reliable — albeit modest — source of income for many ethnic minority villagers in northern Laos will largely depend on the capacity of local producers to enhance product quality and to become more active and equal actors in the value chain, but most of all on the political will of the Lao government to rethink its controversial agriculture and forest policies that aim at reducing agricultural diversity and restrict access to NTFPs through resettlement of formerly forest-dependent communities.

Keywords: paper mulberry, non-timber forest products, agroforestry systems, rural livelihoods, northern Lao PDR

* Faculty of Agriculture, Kyushu University, Fukuoka, Japan
Corresponding author's e-mail: aneef@agr.kyushu-u.ac.jp
** Department of Agricultural Economics, Faculty of Agriculture, Chiang Mai University, Chiang Mai, Thailand
*** Graduate School of Bioresources and Bioenvironmental Sciences, Kyushu University, Fukuoka, Japan
† University of Hohenheim, c/o Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand
†† 緒方一夫, Institute of Tropical Agriculture, Kyushu University, Fukuoka, Japan

I　Introduction

Forests play a central role in the livelihoods of ethnic minorities in northern Laos. Non-timber forest products (NTFPs) in particular are crucial resources for both the subsistence economy and for cash income [Yokoyama 2004; Rigg 2006; Akimichi 2009]. Based on studies of the Asian Development Bank (ADB) and the United Nations Development Program (UNDP), Rigg [2005] reports that between 60 and 75% of poor villages in Laos depend on the forest for most of their non-rice subsistence needs and for at least half of their cash income.

Paper mulberry (*Broussonetia papyrifera*) is an important non-timber forest product (NTFP) in northern Laos, providing opportunities for earning cash income, particularly during the dry season, where the collection of the bark does not compete with other activities. Mulberry paper is durable and can be further processed into various high-value products. In Chiang Mai, Thailand and in Luang Prabang, Laos, paper mulberry is manufactured into a wide variety of products for the booming tourist industry. Paper mulberry is also considered for its potential to improve upland rice-based fallow systems because of its rapid growth, its relative resilience to fire and its capacity to suppress weeds and improve soil fertility [Watanabe *et al*. 2004; Sakurai *et al*. 2005]. Studies suggest that nutrients in deeper layers of the soil are absorbed by the trees and then returned to the soil in form of organic matter by the tree's biomass, which can benefit other cash crops and rice production [Forsen *et al*. 2001].

The objective of this paper is to investigate production systems, processing activities and the degree of commercialization of paper mulberry and to determine how this crop affects rural people's livelihoods and resource management. The paper also aims at eliciting the impact of current government policies on the future contribution of NTFPs to rural development.

II　Study Sites and Methodology

The overview of the contribution of NTFP-based value chains to household cash revenues and livelihoods in three northern provinces of Lao PDR (Section Ⅲ) is based on information gathered during a brief consultancy conducted in February/March 2008 for the Institute of Project Planning (IP-Consult), Stuttgart, which has been implementing project components of a large-scale Lao-German rural development project (Rural Development in Mountainous Areas of Northern Lao PDR – RDMA) instigated by the German Agency of Technical Cooperation (GTZ) in the provinces of Bokeo, Luang Namtha and Sayabouri (Fig. 1).

The study villages were chosen after discussions with the local agricultural or

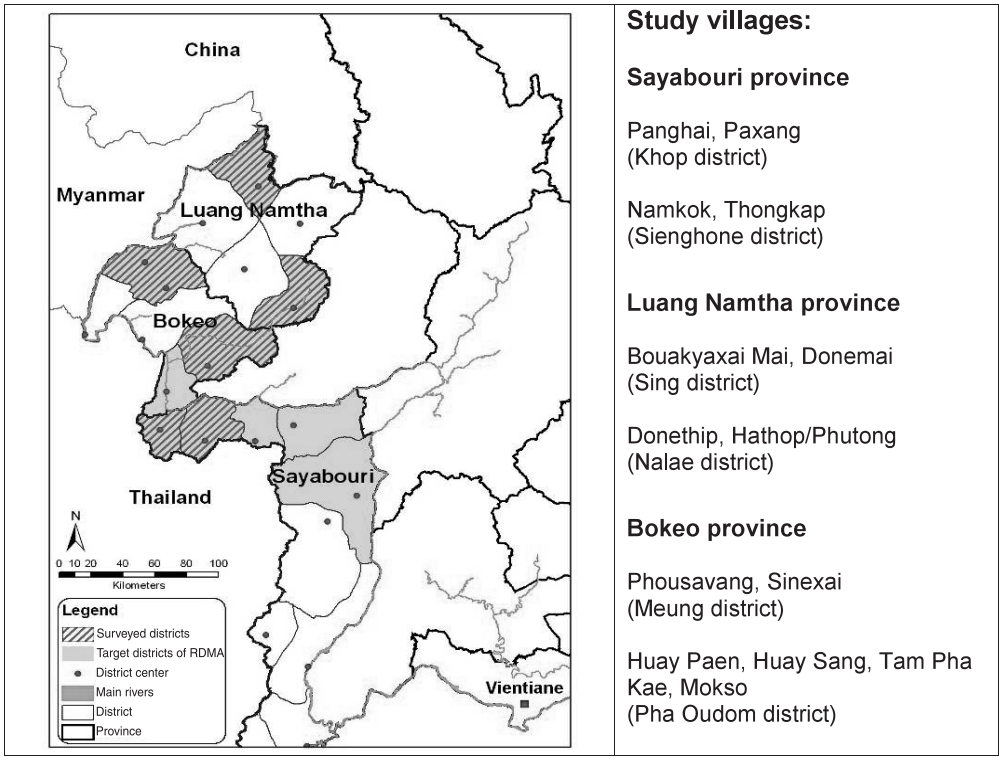


Fig. 1 Map of Surveyed Provinces, Districts and Study Villages
Source: Map by Peter Elstner

natural resource management advisors of RDMA. In all 12 selected study villages, group interviews with the village headman and members of the village committee were conducted. Interested villagers were also invited to join. Participation in the group meetings ranged from 3–20 persons, with an average of 6–8 participants. Additional information was gained from unstructured interviews with NTFP traders in Sienghone district and from a local manager of NTFP nurseries in Pha Oudom district. Direct observation was applied in the case of NTFP processing and trading. Relevant project documents, monitoring data and journal articles were collected and reviewed as secondary information.

The in-depth analysis of the paper mulberry value chain (Chapter Ⅳ) was done in three villages of Pha Oudom district, Bokeo province, during an interdisciplinary study project conducted from March-May 2007 and coordinated by Dr. Andreas Neef and Dr. Pornsiri Suebpongsang. Primary data were obtained from field surveys, observations during harvesting and structured interviews with 45 farm households of three different ethnic minority groups (Lamet, Khmu, Hmong) and three Lao traders in Pha Oudom district, Bokeo province, northern Laos, and a Thai processor in Sankampaeng district, Chiang Mai province, North Thailand. Additional secondary information was used to

analyze the marketing system.

III　Contribution of NTFP-based Value Chains to Rural Livelihoods in Three Northern Provinces of Lao PDR

The purpose of this section is to present recent trends in the contribution of non-timber forest products (NTFPs) and their value chains to household income and rural livelihoods, with a major focus on plant-based NTFPs.

III. 1　*Naturally Occurring NTFPs and Contributions to the Rural Cash Economy*

Naturally occurring NTFPs have long been an important supplement for rural people's diet in northern Lao PDR. Due to enhanced accessibility of villages and rising demand in neighbouring countries, particularly Thailand and China, they have also become a major source of cash revenues (Table 1).

The figures presented in Table 1 are only rough estimates by members of the village committees during the group interviews based on data of the entire village. Thus, they only present the average contribution of NTFPs to household cash revenues and do not consider labour costs and other input costs (this also applies to the figures and calculations in Chapter Ⅳ). Due to difficulties in estimating cash revenues from livestock and hunting, only the "plant-based" household cash revenues were calculated. Yet, the figures show a clear trend: in those areas that have been only recently connected to markets for NTFPs and where farmers are primarily subsistence-oriented, the average contribution of plant-based NTFPs is still relatively high, particularly in Nalae and Meung, two districts that have remained fairly isolated until 2005. In more market-oriented districts, such as Khop district in Sayabouri, bordering Thailand with good market opportunities for Job's Tears, maize and sesame, the contribution of NTFPs to plant-derived household cash revenues has already declined to less than 15% on average. In Khop district, the diversity of commercial NTFPs is also diminished. The lowest economic importance of NTFPs can be witnessed in Sing district, Luang Namtha province, mainly as a result of rubber expansion into former forestland and swidden cultivation areas.

Table 1　Main Plant-based NTFPs and their Contribution to Household Cash Revenues

Districts	Main Commercial Plant-derived NTFPs	Average Contribution to Plant-based HH Cash Revenues in Percent [1)]
Nalae (Luang Namtha)	Sugar palm, incense bark, mushrooms	20–50
Meung (Bokeo)	Sugar palm, rattan shoots, incense bark	15–20
Pha Oudom (Bokeo)	Paper mulberry, incense bark, sugar palm	15–20
Khop (Sayabouri)	Paper mulberry, incense bark, broom grass	5–15
Sing (Luang Namtha)	Broom grass	＜ 5

Note: [1)] Village committees' estimate; main author's survey 2008

III. 2 *Current Pressure on NTFPs Due to Government Policies*

The government of Lao PDR is getting increasingly serious in its fight against swidden cultivation, with the target of eliminating this practice — deemed unsustainable by agricultural and forest officials — by the year 2010. Relocation of villages from upland forest areas — causing a doubling of the population in some lowland and midland regions — and various types of 'encouragement' to establish commercial tree plantations have considerably reduced fallow periods within only a few years, a process that has taken several decades in neighbouring countries, such as Thailand and Vietnam, where swidden cultivation also has been branded as a backward and unsustainable practice by policy makers and extension workers who tend to ignore scientific evidence in favour of swidden agriculture in certain environments. A number of recent studies have found that some types of swidden cultivation, such as rotational swiddening and composite swidden systems can be fairly sustainable practices, even under rising population pressure [cf. Rigg 2005; Tran Duc Vien *et al*. 2009].

Closely related to the shortening of fallow periods in swidden fields is the reduced availability or complete disappearance of a range of NTFPs that can only develop after a sufficiently long fallow period. Table 2 shows some of the problems related to NTFP availability that villagers in the 12 study villages reported in the group meetings. The trend towards shorter fallow periods induced by government policies and rising popula-

Table 2 Shortening of Fallow Periods and Related Problems for NTFP Availability in the Surveyed Districts

District	Fallow Length	Reported Problems
Nalae (Luang Namtha)	4–6 years	Sugar palms have disappeared from swidden fields, villagers have difficulties in protecting their NTFPs against outsiders
Pha Oudom (Bokeo)	3–4 years	Cardamom can only be found in protection forest, paper mulberry and *peuak meuak* (for incense bark) need to be planted
Meung (Bokeo)	3 years	No time for rattan to reach maturity, the occurrence of sugar palms is drastically diminished
Sienghone (Sayabouri)	2–3 years	Rattan shoots are sold (at lower prices) instead of the more profitable rattan canes, sugar palms have disappeared
Khop (Sayabouri)	1–3 years	No sugar palms in the entire area since 1999, *bong* bark disappeared in 2007, paper mulberry mostly harvested from plantations
Sing (Luang Namtha)	0–1 year	Broom grass remains the only naturally occurring NTFP with some commercial value, bamboo shoots need to be planted

Source: Main author's survey 2008
Note: Sample of two villages per district; information based on statements made in group meetings

tion pressure significantly reduces the diversity of NTFPs. Fig. 2 depicts the close link between swidden fallow periods and the availability of selected NTFPs. While the relatively low-value NTFPs, such as broom grass and paper mulberry, can thrive in short fallow systems, high-value NTFPs like cardamom, rattan and sugar palm need much longer fallow periods to reach maturity.

The current dynamics of extraction and cultivation of naturally occurring NTFPs are visualized in Fig. 3. While broom grass is in a rapid expansion phase, the extraction of bamboo and rattan shoots appears to be relatively stable, while natural stands of paper mulberry and sugar palm and — in particular — rattan canes are currently on the decline

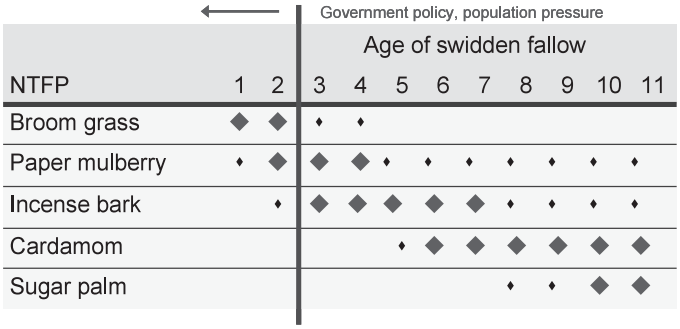


Fig. 2 Link between Swidden Fallow Periods, Major Driving Forces and Availability of NTFPs

Source: Based on Yokoyama [2004] and main author's survey 2008
Note: Quantity gathered: small ♦, moderate ◆

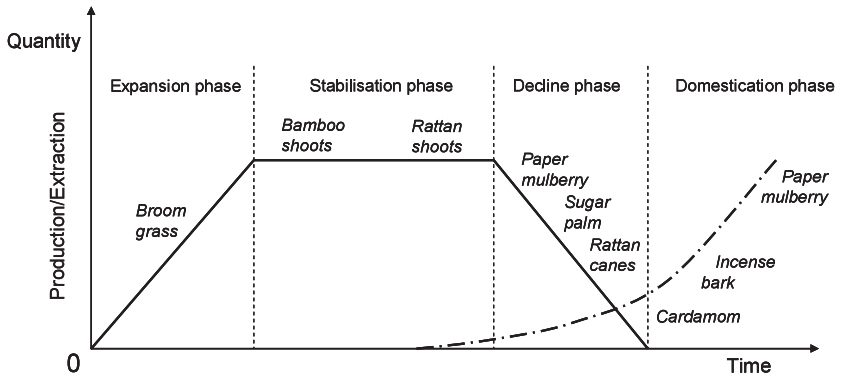


Fig. 3 The Dynamics of Extraction and Cultivation of Major NTFPs in the Three Target Provinces

Source: Draft based on Homma [1995] and Ribeiro and Darnhofer [2007]; main author's survey 2008
Note: The curves depict trends for individual NTFPs only.

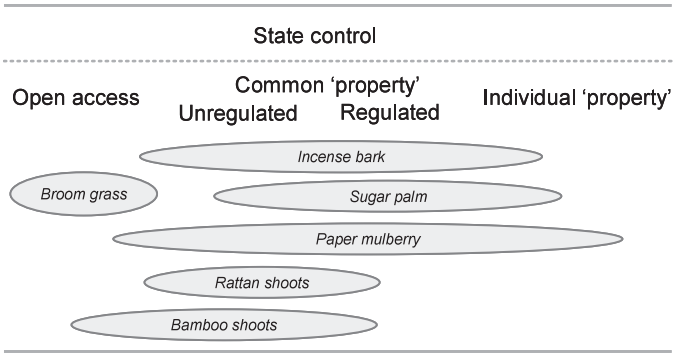


Fig. 4 Types of Access and Tenure Regimes for NTFPs in the Target Provinces

Source: Main author's survey 2008

Note: 'Unregulated property' refers to communally managed resources without established rules and regulations regarding extraction; 'regulated property' refers to resources whose extraction is subject to rules and regulations devised by a communal authority and generally accepted by community members.

due to over-exploitation. Cardamom could either be about to disappear in most areas and/or on the brink of a slow domestication process in other regions, while incense bark and particularly paper mulberry have already been successfully domesticated in Pha Oudom, Bokeo province and in most parts of Sayabouri province.

In this dynamic environment, the types of access and tenure regimes for NTFPs are also quickly adapting to new realities (Fig. 4). While until recently natural stands of paper mulberry used to be considered as an unregulated common property by many ethnic groups [cf. Yokoyama 2004], its extraction has now become more regulated in several locations. In some villages, such as Panghai in Khop district, Sayabouri, paper mulberry stands are regarded as individual property within the production forest in which each family knows the boundaries, since the area had been used for swidden cultivation of upland rice prior to the land use planning process.

The extraction of sugar palm seeds is also regulated: mobile traders would arrange an appointment a few days in advance with the village headman, who then announces to all villagers that they can start to harvest palm seeds. During this very short period, villagers are allowed to extract as much as they can find on a 'first-come, first-served' basis. Only in a Black Lahu village in Meung district, the village committee reported that villagers can claim individual use rights to sugar palms by marking them with a special sign. In all communities outsiders are not allowed to harvest sugar palm, paper mulberry and incense bark. Broom grass, on the other hand, is regarded in all villages as an open access resource, as it now grows nearly everywhere in short-fallow fields and along roadsides. This finding contrasts with an earlier study of Yokoyama [2004] who found that broom grass could only be gathered on individual swidden fields.

IV　NTFP Value Chains: Paper Mulberry in Pha Oudom District, Bokeo Province

The successful domestication of paper mulberry (*Broussonetia papyrifera*) suggests that new opportunities are arising for developing sustainable agroforestry systems in northern Laos, particularly as farmers are under intense pressure to reduce their fallow periods. Paper mulberry is a particularly interesting perennial crop as it can be used for multiple purposes (soil improvement, weed suppression, animal feed, cash income from bark, fuel wood) and its production and management system is very flexible, making it suitable for a variety of socio-economic conditions [Aubertin 2004; Watanabe *et al*. 2004; Fahrney *et al*. 2007; Manythong 2008; Ogata *et al*. 2008; Saito *et al*. 2009].

IV. 1　*Characteristics of the Farm Households*

Demography. On average surveyed farm households can be characterized as a large family that consists of around eight people. Yet, ethnic differences are considerable. In Huay Paen (Lamet/Khmu) the medium family size is around five persons, while in Tam Pha Kae (Hmong) the family size is much larger, with about nine persons slightly higher than in Huay Sang (Khmu). About three family members work on the farm, and nearly all of them are involved in the paper mulberry production system (Table 3).

Cropping systems. Most farm households practice multiple cropping systems, with rice,

Table 3　Demographic Characteristics of the Farm Households

Variable	Mean Number of Family Members			
	Huay Paen (n= 13)	Huay Sang (n= 16)	Tam Pha Kae (n= 16)	Total (n= 45)
Family size				
Total family members	5.5	8.7	9.2	7.9
Male	2.5	4.8	4.6	4.2
Female	2.9	3.9	4.6	3.8
Age structure				
under 10 years old	1.2	3.1	3.3	2.6
10–60 years old	4.2	5.3	5.6	5.1
older than 60 years	0.1	0.3	0.3	0.2
Average number of family member work on farm	2.8	3.6	3.4	3.3
Family members involved in paper mulberry production				
Male	0.8	0.4	1.1	0.8
Female	1.6	1.8	1.7	1.7

Source: Authors' survey 2007

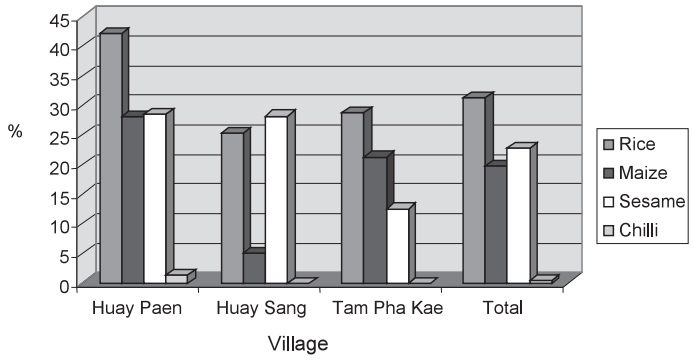


Fig. 5 Contribution of Major Crops to Total Crop-based Cash Revenues
Source: Authors' survey 2007

maize, chili and sesame being the most important crops. Maize, upland rice and chili are planted in June, while sesame is planted in July. The cropping systems in Huay Paen are more diversified than those in Huay Sang and Tam Pha Kae (Fig. 5). This is probably due to the fact that Huay Paen is located closer to the center of Pha Oudom district and therefore has better market access.

IV. 2 *Socio-economics of NTFPs*

Contribution of NTFPs to the household economy. The most important NTFPs in the study area include paper mulberry (*Broussonetia papyrifera*), sugar palm (*Arenga westerhoutii*), broom grass (*Thysanolaena latifolia*) and incense bark from *peauk meuak* (*Bochmeria malabarica*). Most households are involved in paper mulberry production especially in Tam Pha Kae and Huay Sang (Fig. 6).

Farm and household economy. The average family cash revenues from cropping and NTFPs for all households in the sample was 1,652,217 Kip in 2006/07. Households in Huay Paen generated the highest average cash revenues with 2,845,565 Kip, while Huay Sang had the lowest with only 793,725 Kip per year (Table 4). Considering the source of cash revenues, the village with the highest average cash revenues had the lowest contribution of paper mulberry cash revenues in total cash revenues. The correlation between cash crop revenues and paper mulberry revenues is negative which means that for poorer households paper mulberry provides a crucial supplementary source of cash revenues (Fig. 7).

As confirmed by other studies, poorer households collect significantly more plant-based NTFPs compared to more affluent households. In households with average plant-based cash revenues of less than 2 million Kip, NTFPs provided between 31.5% (in Huay Paen) and nearly 80% (in Tam Pha Kae) of the total plant-based cash revenues. This underscores the importance of NTFPs as a safety net for the poor and as a crucial

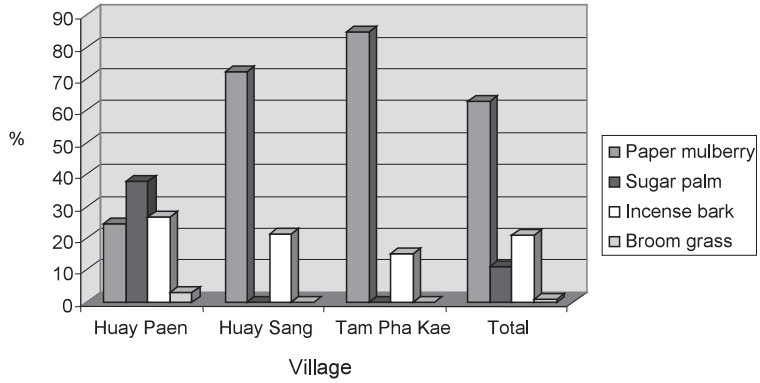


Fig. 6　Contribution of Major NTFPs to Total NTFP Cash Revenues
Source: Authors' survey 2007

Table 4　Cash Revenues from Various Activities

Cash revenues	Huay Pean (n＝13)	Huay Sang (n＝16)	Tham Pha Kae (n＝16)	Total (n＝45)
Revenues from cash crops (Kip/year)	2,845,565	793,725	1,541,113	1,652,217
Cash revenues from NTFPs (Kip/year)	478,215	141,188	249,550	277,080
Cash revenues from paper mulberry (Kip/year)	79,523	104,063	197,675	130,258
Contribution of paper mulberry to total cash revenues	2.8	13.1	12.8	7.8

Source: Authors' survey 2007

provider of cash revenues during food insecure periods. Families endowed with enough agricultural land can derive relatively high cash revenues from crop production and rely much less on NTFPs including paper mulberry production and harvesting.

We also found a positive correlation between the number of female family members and family cash revenues from paper mulberry (data not shown) which implies that paper mulberry is predominantly an income opportunity for women.

IV. 3　*Production and Collection Systems of Paper Mulberry*

IV. 3. 1　*Production*

In northern Laos, ethnic minority groups have collected paper mulberry bark from the forests surrounding their villages for decades. Paper mulberry prefers moist alluvial soils [Aubertin 2004; Fahrney *et al*. 2007; Saito *et al*. 2009]. River and stream valleys or lowland moist areas are the best places for this perennial plant to grow. However, due to population pressure, decline of forest resources and over-harvesting, today villagers have

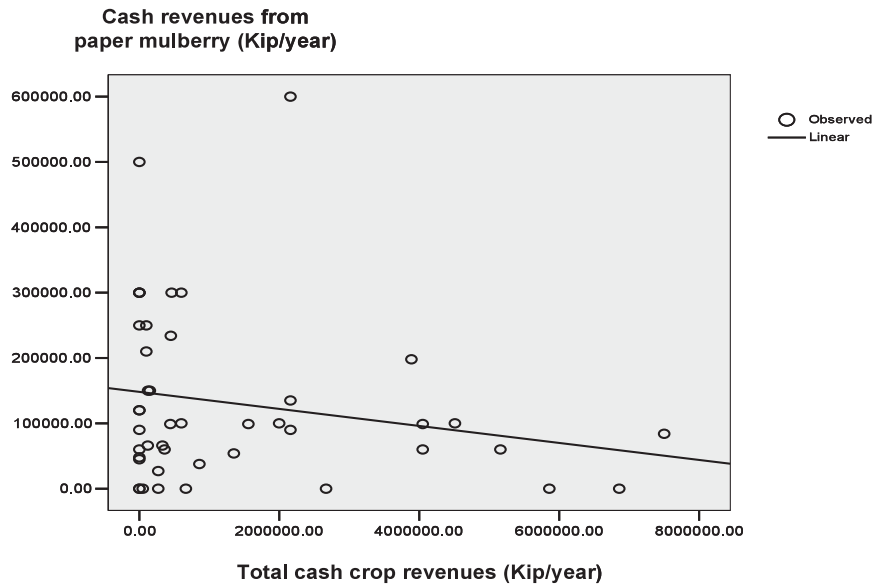


Fig. 7 Relationship between Revenues from Paper Mulberry and Total Cash Crop Revenues

Source: Authors' survey 2007

Table 5 Contribution of Cash Revenues Classified by Source and Wealth Class of Farmers

Wealth Class of Farmers by Total Plant-based Cash Revenues (Kip)	Huay Paen (n= 13)		Huay Sang (n= 16)		Tam Pha Kae (n= 16)	
	Cash crops	NFTP	Cash crops	NFTP	Cash crops	NFTP
< 2,000,000	68.5	31.5	39.4	60.6	20.8	79.2
2,000,000–4,000,000	91.5	8.5	96.0	4.0	86.2	13.8
> 4,000,000	87.2	12.8	97.2	2.8	98.3	1.7

Source: Authors' survey 2007

to spend more time and labor to collect the same amount of bark as before. In addition, the product collected from the forest is often of inferior quality since villagers harvest whatever bark of paper mulberry trees they can find because of competition with other collectors and the lack of management and harvesting regulations. As a result, some farmers have started to grow paper mulberry in their home gardens, upland rice fields and fallows [Fahrney *et al.* 2007]. Growth rates on the upland fields are considered lower than in lowland areas where it is possible to reap the first harvest 6–8 months after planting the trees. In contrast, in the upland fields farmers may need to wait 10–12 months for the first harvest.

Forsen *et al.* [2001] reports that in the Lao PDR paper mulberry is grown in three different ways, namely in natural stands, cultivated stands and inter-cropping systems.

Paper mulberry bark harvested from natural stands is considered as a NTFP and mainly found in secondary hillside forest. The determination of the source of the bark is important since traders who want to export bark that is classified as NTFPs need to obtain a quota from the government and pay a 'natural resource tax.' Paper mulberry bark that stems from cultivated stands is exempted from the quota and tax system. Yet, we could not find out how tax collectors would determine — or how traders can provide evidence — whether mulberry bark comes from cultivated or natural stands.

Harvesting from natural stands does not require any capital investment and little labor input in terms of management such as planting and pruning. However, since the price for paper mulberry bark increased and more people have begun to collect the bark in Pha Oudom district, it is becoming harder to find natural stands of paper mulberry. This can be described as the problem of an open access resource that becomes degraded (see Chapter Ⅲ. 2). Another disadvantage with collecting bark from natural stands is that the yield is often low and the quality is poor compared to bark harvested from plantations.

As paper mulberry is among the NTFPs that can be easily domesticated, more land-rich farmers in Pha Oudom district have started to cultivate paper mulberry in their fields. The most entrepreneurial villagers have even set up small nurseries, partly supported by external development assistance (see example in Box 1). Some farmers are growing paper mulberry trees on upland rice fields. This system can be considered as inter-cropping: in their upland rice field, farmers would plant rice in the second half of May and then transplant paper mulberry seedlings in July. In some rice fields young shoots and seedlings of paper mulberry grow from roots and seeds from the previous generation that was cut and burned before planting rice; in this case farmers just keep the shoots and seedlings and add more seedlings into the field if needed.

The GTZ-funded project RDMA Bokeo supported the establishment of a private NTFP and fruit tree nursery in Huay Paen, a village with Lamet and Khmu population. The village does not have any wet-rice area, but the upland agricultural area is relatively large and during the land use planning process big areas of conservation, protection and production forests have been delineated. Mr. Kammanh, the manager of the NTFP and fruit tree nursery, is the village's vice-headman and member of the village committee, responsible for land use planning. He obtained a credit from the Village Development Fund (VDF) of 4,000 Baht and contributed his own budget of 3,000 Baht. Last year he sold 1,500 seedlings of paper mulberry, 1,500 seedlings of *peuak muak* (for production of incense bark), 400–500 seedlings of agarwood and around 275 seedlings of mango and jackfruit to farmers from Huay Paen and neighbouring villages. His net benefit after paying back his loan to the VDF was around 3 million Kip (ca. 10,700 Baht or 330 US-$) in 2007.
Despite his success he will reduce the area of the nursery this year from 3,500 m^2 to 700 m^2. He stated that he lacks the labour force to manage such a big nursery. He will grow rubber on one of his two upland plots next year, along with 15 other farmers in his village, and needs to invest a lot of labour into this new activity.

Box 1 Successful Domestication of NTFPs: The case of Mr. Kammanh in Huay Paen Village, Pha Oudom District, Bokeo Province
Source: Own survey, February 2008

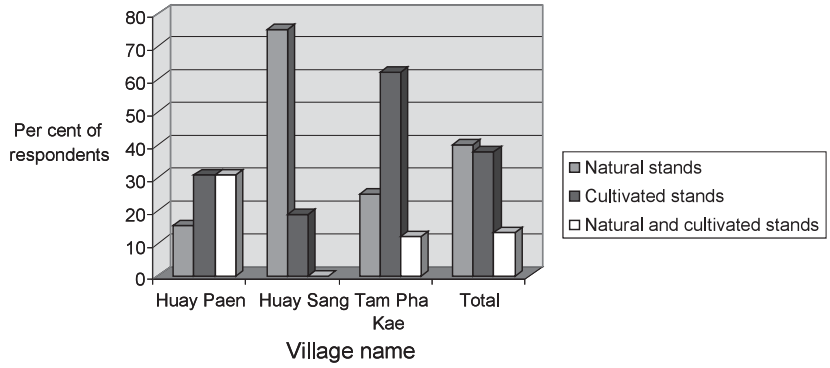


Fig. 8 Types of Paper Mulberry Production Systems

The example in Box 1 shows how external project support in Pha Oudom helped to establish a village nursery for various NTFPs. Yet, it also shows the challenges that such initiatives face with the current expansion of rubber plantations.

Hmong farmers in Tam Pha Kae appear to be particularly keen on securing cash income from mulberry bark production and benefitting from the various other by-products of paper mulberry trees. The majority of the respondents in this village stated that they have established paper mulberry plantations in recent years (Fig. 8). Some farmers reported they have been growing paper mulberry on more than 1 hectare and harvest around 500 kg per season.

In sum, the particular appeal of paper mulberry cultivation is that the crop requires relatively little management and that farmers can use it very flexibly, i.e. they can adjust plant densities, growing periods, harvesting times and plant parts used according to their specific needs [Aubertin 2004; Fahrney *et al.* 2007].

IV. 3. 2 *Harvesting and Post-harvest Handling*

Within one day a farmer can collect between 10 and 30 kg of fresh bark. Farmers harvested bark from whatever paper mulberry trees they found, which usually are old trees (two to three years old). Farmers reported that they had been informed by local traders to collect primarily the bark from young trees (around one year of age) and to separate the bark from the young and old trees to obtain different grades and prices. Yet, most of the respondents collected the bark from older trees to get more weight per unit of labor. Usually, the collectors mix the bark of different qualities and sell it to the trader as one grade, which then yields the lowest price (referred to as grade C). Most of the farmers harvest the bark from the main stems, only occasionally bark is collected also from the branches. Debarked stems and branches are left to dry and then used for fuelwood if the harvesting areas are not too distant from the residential area.

When paper mulberry bark is harvested, the stems of the trees are cut about 40

centimeters above the ground. The bark is pulled from the stems and occasionally from the branches. Then farmers carry the bark back to the village where they have to strip the outer bark off as soon as possible; otherwise it would be very difficult to peel once the bark becomes dry. After peeling, the inner bark would be dried for two to three hours and kept in a dry place until the local trader arrives.

Some studies report that harvesting of paper mulberry bark is done all year round, while others suggest two main periods, namely late February to the beginning of April and September to October [Forsen *et al*. 2001; Fahrney *et al*. 2007; Saito *et al*. 2009]. However, from our study site, farmers harvested only from February to April due to available labor in a time where they do not need to work in the rice fields or are occupied with other agricultural activities. In addition, respondents indicated that this time — the hot dry season — is very suitable for debarking and drying the bark.

A village trader in Tam Pha Kae (Hmong) reported that including bark from natural stands and cultivated stands, he collected more than 2 tons a year from the villagers. He also indicated that on average a family in this community got a harvest of around 100 kg

1

3

2

4

Photos 1–4 Debarking Paper Mulberry Stems (Photo 1), Carrying the Fresh Bark from the Field to the Homestead (Photo 2), Stripping the Inner Bark (Photo 3), and Sun-drying the Cleaned Inner Bark (Photo 4).

of dry bark annually. By contrast, in Huay Paen village (Lamet and Khmu) the average harvested bark per family was reported to be only 50 kg per year.

In order to assess the time spent for post-harvest handling and determine the weight loss, we recorded the entire process in several occasions. We found that the farmers spent one hour for peeling 5 kg of the bark. On average, one farmer got 15 kg of the bark so they spent three hours in the afternoon for peeling all the bark. After the peeling process, farmers would sun-dry the inner bark for 2–3 hours. During the process — from the fresh bark to the dry inner bark — around 40% of fresh weight was lost. Hence, in one day, the farmers got 9 kg of dry inner bark from 15 kg of the fresh bark, indicating a conversion ratio of fresh bark to peeled and dried bark of 0.6.

From an average of 15 kg of fresh bark collected in one day, 9 kg of dried inner bark can be obtained after labor-intensive, manual cleaning and sun-drying. The price for 1 kg of dried bark was around 2,700 Kip in 2007, which implies a total gross margin of 24,300 Kip (2.43 US-$) per day. When the opportunity costs of time for the farmers are calculated at 1 US-$ per day, the net profit of 1.43 US-$ per day appears attractive, particularly as the harvesting period of paper mulberry is flexible and does not compete with agricultural activities.

Since stripping of the inner bark is a time-consuming activity, the RDMA project in cooperation with the Uplands Program tested the efficiency and economic viability of machine-stripping of the inner bark in comparison with manual stripping. Fig. 9 shows that the machine — a prototype developed by Kasetsart University in Bangkok, Thailand — is mostly superior to manual cleaning in terms of time needed, except for two ranges of diameter (5−5.9 and 11−11.9). The machine has been successfully used by an innovative farmer in Huay Paen who stated that farmers in neighbouring villages have expressed their strong interest in using the machine. Yet, before promoting the use of machines on a wider scale, the gender impact needs to receive attention since manual stripping is traditionally women's work and machine-stripping tends to be done by men

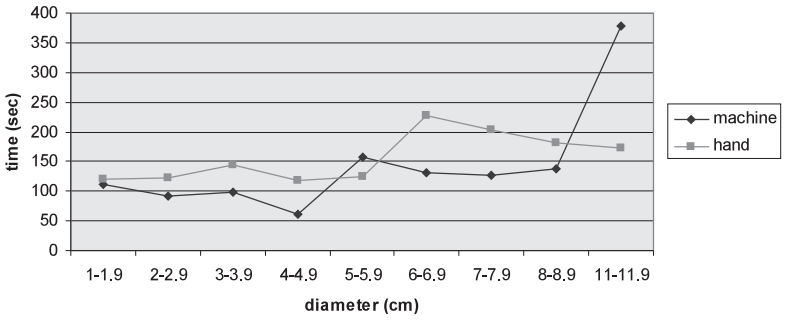


Fig. 9 Time Requirement of Manual vs. Machine Stripping of Inner Bark of Paper Mulberry

Source: Authors' experiment 2007

Photo 5　Khmu Woman Stripping the Inner Bark of Paper Mulberry

Photo 6　Testing the Labour Requirement and Economic Viability of Machine Stripping

(Photos 5 and 6).

IV. 4　*Commercialization of Paper Mulberry Bark*

Paper mulberry has been harvested and processed into paper in Laos for many decades. In earlier times, for example, mulberry paper was used for wrapping opium. Recently new markets have opened up through tourism and exports [Forsen *et al*. 2001]. In a first step, the dried inner bark is further processed into pulp which is the main material for producing paper. This type of paper (commonly known as *saa* paper in Lao PDR and Thailand) is used for making a variety of products, such as boxes, envelopes, picture frames, paper strings, lamps, and umbrellas. Yet, none of the respondents in our sample in Pha Oudom district processes either pulp or paper. Only 4.4 % of the respondents knew that the final product of their bark is paper.

IV. 4. 1　*Marketing channels in Lao PDR*

The inner bark is marketed by three types of traders: village collectors, district collectors and provincial traders. Each trader plays a different role in the marketing channel and offers various services in the value chain, such as transport, credit and storage.

Village collectors. The village collector buys the bark and/or other cash crops from the farmer in the village and from the nearby village. In the study area there are 1–2 village collectors in each village and they pay the farmers in cash. There is usually a farmer in the village who acts as the village collector. The village collector will mainly transport the bark to district traders in Pha Oudom.

District traders. The district traders buy cash crops from the village collectors or directly from farmers, store them and then transport them to provincial traders, for example in Bokeo province or in Luang Prabang province. Selling to the provincial trader in Bokeo province is the preferred destination, as the trader would get lower profit

from selling in Luang Prabang owing to the higher transportation costs. Moreover, Luang Prabang provincial traders prefer to buy the bark in a compressed form in order to be able to take a larger quantity. The provincial traders would give only one grade for the entire bark in the truck and then offers the price related to the estimated grade. The main reason for not exporting the bark directly to Thailand indicated by district traders was that they fear the complexity of the export process and the high export expenses, including shipping cost by boat and customs tariffs. The costs and net profits of farmers, village collectors and district traders are shown in Table 6.

Yet, village collectors do not operate in every village, many district traders collect the dried bark directly from individual farmers or farmers may bring their produce to the district trader with their own means of transportation (e.g. on foot). Hence, the entire marketing chain within Laos is characterized by a simple, linear structure with various profit-taking stages (Fig. 10).

Table 6 Costs and Profits of Different Actors in the Value Chain (per kg of dried bark)

Item	Farmer	Village Collector	District Trader
Price (Kip)	2,700	3,000	4,465
Gross margin	2,700	300	1,465
Opportunity costs	1,100	—	—
Transportation costs	—	72	500
Taxes and duty	—	—	400
Net profit	1,600	228	565

Source: Authors' survey 2007

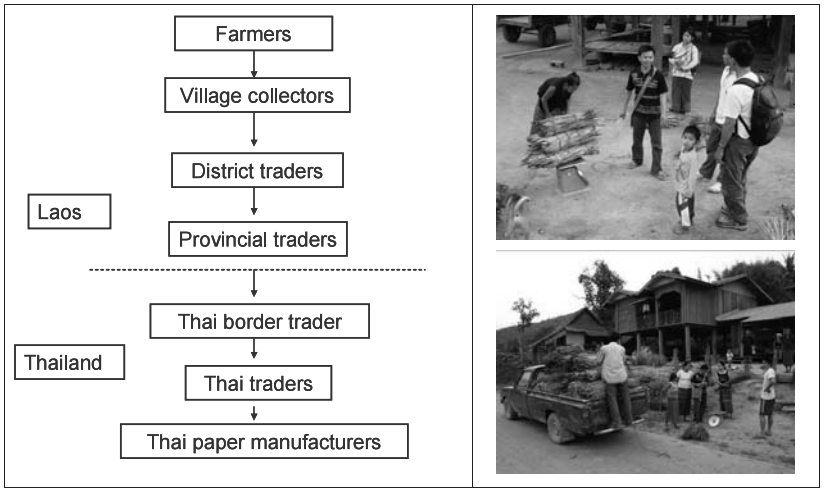


Fig. 10 Linear Marketing Channels for Paper Mulberry in Laos and the Main Importing Country Thailand

Provincial traders. The bark from Pha Oudom is mainly sold to two provincial traders without any quota. The traders would buy all the bark from Pha Oudom which shows the potential of increasing paper mulberry production. The trader transports the bark to a border point in Huay Xai. The bark is transported by boat to the border traders in Chiang Khong in Chiang Rai province, northern Thailand. The freight-space of the boat ranges from 5–30 tonnes, depending on the vessel. The bark is sold in a pre-graded form to Thai traders. Most of the time the payment is done in cash, but during the period of oversupply the provincial trader has to give Thai buyers a credit for up to one month [Forsen *et al*. 2001]. The average purchasing price of the provincial trader at the beginning of 2007 was 14–19 baht per kg depending on the grade.

IV. 4. 2　*The Thai Part of the Supply Chain*

The total national consumption of paper mulberry bark in Lao PDR is estimated at not more than 100 tonnes per year [Helberg 2005], while most of the bark harvested by the estimated 27,000 Lao bark collectors is destined for export to Thailand. The final grading of the dried bark is also done in Thailand which effectively blocks imports of processed mulberry bark (e.g. in the form of pulp or paper sheets) through a high import tariff system. In the entire commercialization process of paper mulberry, Thailand turns an imported raw material worth less than 1 million US-$ annually into paper products worth around 50 million US-$ [Midgley *et al*. 2007].

Thai border traders. Forsen *et al*. [2001] reported that there are many different border traders buying cash crops from local traders in Laos and selling them to manufacturing companies in Thailand. Some Thai border traders buy ungraded bark and grade it themselves. The lack of storage facilities is a major problem for Thai border traders forcing them to sell it to Thai paper manufactory without being able to stock-pile it in times of oversupply and lower prices.

The information transfer between the bark's origin and the end market of the bark can be classified as insufficient and non-transparent. Thai border traders do not know the origin of the bark from Laos, while Lao farmers do not know the final users of the dried bark and which types of products the bark will be processed into.

Trade flows at the Thai-Lao border. According to the report of the Customs Office at the Thai-Lao border in Chiang Rai and Loei provinces, the import quantity of paper mulberry bark from Laos has fluctuated since 2002 due to the instability of Thai domestic supply and demand for imported paper mulberry bark and the variability of supply in Laos (Table 7).

Manufacturers in Thailand. Paper mulberry bark has been used in Thailand as raw material for handmade paper for a long time, especially in the northern part. Traditionally the paper has been used for Buddhist scripts, temple decorations at festival times, umbrellas, fans and kite making. In former times it was also used as a filter in the manufacture of lacquer ware. Farmers also used to make strings and ropes from

Table 7 Quantity and Value of Paper Mulberry Shipped from Laos to Thailand at the Chiang Khong Border from 2002–06

Year	Quantity (in tonnes)	Value (Baht)
2002	181	1,457,492
2003	471	3,298,000
2004	733	5,133,806
2005	470	3,331,351
2006	208	1,455,127

Source: Authors' survey 2007; data from Chiang Khong border office 2006

mulberry fibers prior to the introduction of substitute materials, such as sisal and nylon [Aubertin 2004]. Today it is used for a wide variety of domestic and industrial purposes, including paper towels in hospitals, wrapping and gift paper, wallpaper, lampshades, bookmarks, picture-frames and greetings cards.

The largest processing factory with an annual capacity of 1,500 tonnes of bark is located in Sukhothai province [Fahrney *et al*. 2007]. Paper mulberry bark in Thailand is produced both with machines and by hand. Approximately 55 % of the paper is processed with machines and the rest by hand [Forsen *et al*. 2001].

Exports from Thailand to other countries. While low-quality paper is processed into domestic paper products, high-grade mulberry bark and processed mulberry paper from Thailand is exported primarily to Japan and South Korea. The highest quality — super A — is exported without further processing to Japan where the bark is reportedly processed into special paper for banknotes, liturgical objects, lanterns and luxury stationary [Aubertin 2004; Fahrney *et al*. 2007]. Demand in South Korea appears to be similarly fluctuating as domestic demand in Thailand: according to Kang and Kohroki [2008] imports of paper mulberry increased from 88,000 tonnes in 2003 to 143,000 tonnes in 2005 and then dropped sharply to 67,000 tonnes in 2006.

IV. 5 *Impact of Government Policies and Land Use Change on the Future of Paper Mulberry Production Systems*

According to Aubertin [2004] the Lao government has not shown much interest in paper mulberry production. She reports that the plant neither was included in the national agricultural census of 1998/ 99 nor did it appear in the list of plants for which the Ministry of Agriculture issued production forecasts for the 1999/ 2000 harvest. This lack of interest contrasts sharply with the great deal of local innovation as regards paper mulberry domestication and farmers' experimentation with a variety of mixed cropping systems based on paper mulberry which appears to have not been actively supported by the District Agricultural and Forestry Offices in northern Laos.

The legal framework that may affect the further development of paper mulberry production —and other NTFPs — has been described as fragmentary and inconsistent [Rigg 2005; Ribeiro and Darnhofer 2007]. The Lao Forest Law differentiates between customary use of NTFPs for subsistence purposes and the commercial use of NTFPs, the latter being regulated by quotas and taxes [GoL 1996; Helberg 2005; Ribeiro and Darnhofer 2007]. While groups with long-standing forest use rights are entitled to collect

NTFPs and firewood in production forests, they can only do so without causing damage to the forest — which is open to varying interpretations [cf. Rigg 2006]. Frequent resettlements also contribute to insecurity of land use and prevent villagers from developing sustainable management systems for NTFPs.

The Land and Forest Allocation policy is driven by the government's goal to eradicate shifting cultivation and to stabilize agriculture. In sloping land, farm households can only receive up to three plots, which reduces the fallow period to a maximum of two years. Permanent land titles — LTD 01 or *bai ta din* — are allocated by the District Land Office (DLO) for permanent types of land uses, such as housing land, home gardens, paddy land and tree plantations. In rare cases such LTD 01 would also be issued for paper mulberry plantations, as stated by one DAFO officer in Sienghone district (Sayabouri), but this could not be verified in the surveyed villages in Pha Oudom district (Bokeo) where the land allocation process has been marked by particularly strong legal ambiguities and severe land use conflicts between and within local communities. Secure land use titles are definitely not issued for long-term land use on the basis of annual crops, and it is unclear whether they are issued for agroforestry systems, e.g. paper mulberry or teak trees intercropped with upland rice. One officer of the DLO in Meung district (Bokeo province) stated that the Land Law of 2005 does not clearly indicate whether combinations of annual crops and perennial crops or trees would classify as permanent land use systems. Hence, while paper mulberry plantations in mono-culture do not appear to be sufficiently supported by the official tenure policy, the more flexible integration of paper mulberry trees in multiple cropping systems seems to be even more bypassed and undermined by current government policies.

The natural occurrence of paper mulberry in Pha Oudom district appears to be particularly doomed if current trends of land use change from swidden farming to rubber monoculture continue. Rubber plantations promoted by foreign investors and the Lao government alike have not only reduced the area of production forests and swidden agriculture, but are also increasingly entering into paddy fields and protection and conservation forests. In this process, thousands of land-poor ethnic minority villagers are gradually losing a significant source of income and a crucial buffer against seasonal food and cash shortages.

V　Conclusions: Potential and Constraints of Developing Paper Mulberry Value Chains in Support of Sustainable Rural Livelihoods

While Foppes and Ketpanh [2000: 15] expressed optimism that "Lao PDR has a remarkable opportunity to build a strong NTFP sub-sector as a basis for sustainable economic development in the Southeast Asian region, Rigg [2006: 128] holds that "the best outcome in the medium term is that NTFPs will become a niche livelihood activity undertaken by

the few, rather than the many". With regard to naturally occurring paper mulberry the position taken by Rigg seems to be the more likely scenario. Collection from natural stands will decline with negative implications for the poor and landless — and for ethnic minority women in particular, while more management-intensive systems and monocultures of paper mulberry may expand in the medium term, with potentially negative consequences for biodiversity. Whether paper mulberry can become a profitable component of sustainable agroforestry systems depends strongly on the willingness of the Lao government to support more diversified upland production systems rather than promoting rubber and other tree plantations as the single model for resource-based poverty alleviation in northern Laos. Recent studies have amassed sufficient evidence that agronomic performance and economic productivity of properly managed paper mulberry −upland rice rotations can be superior to traditional swidden systems [Watanabe *et al.* 2004; Fahrney *et al.* 2007; Saito *et al.* 2009].

The value-chain analysis for paper mulberry conducted in Pha Oudom has confirmed the typical weaknesses of the NTFP sector in northern Lao PDR; village-based processing of paper mulberry is limited to very early stages of the value chain (stripping the inner bark, cleaning, drying). There are currently few attempts by villagers to improve the quality of paper mulberry bark, although the trend towards bark collection from cultivated stands is likely to indirectly contribute to quality improvement. To date, villagers do not actively seek for marketing channels and due to the absence of producer or marketing cooperatives trade conditions and market prices cannot be negotiated, but are set by other actors, such as district and provincial traders and — in particular — by Thai importers. Lessons learned from various internationally funded projects in northern Lao PDR suggest that NTFP marketing groups can be successfully established with sufficient external support [e.g. Ingles *et al.* 2006]. Yet, there is no sufficient evidence that such marketing groups are viable beyond the project duration and whether such initiatives are taken up spontaneously in neighbouring villages.

Although overall demand for high-quality paper mulberry bark appears to remain strong, the nearly entire dependency on export markets (directly from Thailand and indirectly from demand in South Korea and Japan) makes paper mulberry production systems vulnerable to changes in foreign demand and the introduction of alternative fibres. To conclude, the future of paper mulberry value chains and their contribution to rural livelihoods depends on a variety of domestic and external factors, but above all on the political will of national decision-makers to rethink their controversial agricultural, forest and rural development policies.

Acknowledgements

The financial support of the Centre for Agriculture in the Tropics and Subtropics, University of Hohenheim, Stuttgart, the Eiselen Foundation Ulm and the Institute of Project Planning, Stuttgart, for conducting the field research is gratefully acknowledged. Bernhard Mohns, team leader of

RDMA, Bokeo, and his Laotian counterparts gave us invaluable logistic support during the field study in Pha Oudom district. The quality of the paper benefitted greatly from the constructive comments of three anonymous referees.

References

Akimichi, T. 2009. An Illustrated Eco-History of the Mekong River Basin. Bangkok: White Lotus.

Aubertin, C. 2004. Paper Mulberry in Lao PDR: A Successful Case of Forest Product Domestication. In *Forest Products, Livelihoods and Conservation: Case Studies of Non-Timber Forest Product Systems*, Vol 1, edited by K. Kusters, and B. Belcher, pp. 222–240. Bogor: Indonesia: CIFOR.

Fahrney, K.; Boonnaphol, O.; Keoboualapha, B.; and Maniphone, S. 2007. Indigenous Management of Paper Mulberry in Swidden Rice Fields and Fallows in Northern Lao P. D. R. In *Voices from the Forest: Integrating Indigenous Knowledge into Sustainable Upland Farming*, edited by M. Cairns, pp. 475–489. Washington, DC: Resources for the Future.

Foppes J; and Ketphanh, S. 2000. Forest Extraction or Cultivation? Local Solutions from Lao PDR. Paper presented at the workshop on the evolution and sustainability of 'intermediate systems' of forest management, FOREASIA, 28 June–1 July, Loften, Norway.

Forsen, M.; Larsson, J.; and Samuelsson, S. 2001. Paper Mulberry Cultivation in the Luang Prabang Province, Lao PDR. *Minor Field Study* no. 140. Uppsala: Swedish University of Agriculture Science.

GoL (Government of Laos). 1996. *The Forestry Law* [unofficial translation by Dirksen Flipse Doran and Le Lawyers and Counselors]. Vientiane, Lao PDR: GoL.

Helberg, U. 2005. *Development of Sustainable Supply Chains for NTFP and Agricultural Products for the Northern Districts of Sayabouri Province*. Vientiane, Lao PDR: RDMA (GTZ).

Homma, A. 1995. Current Issues in Non-Timber Forest Products Research. Proceedings of the Workshop "Research on NTFP" held from 28 August to 2 September 1995 in Hot Springs, Zimbabwe. Bogor, Indonesia: CIFOR.

Ingles, A. W.; Kethpanh, S.; Andy S. Inglis, A. S.; and Manivong, K. 2006. Scaling Sideways and Up-ways: Identifying Factors that Affect the Adoption of Forest-based Livelihoods Development Interventions in Lao PDR. Final Report. Vientiane, Lao PDR: The World Conservation Union (IUCN).

Kang, H. M.; and Kohroki, K. 2008. A Study on the Cultivation and Production of Korean Paper Mulberries and Korean Paper Manufacturers. *Journal of the Faculty of Agriculture, Kyushu University* 53(1): 291–297.

Manythong, C. 2008. Ecology and Utilization of Paper Mulberry in Northern Laos. Unpublished M. Sc. thesis. Fukuoka, Japan: Graduate School of Bioresources and Bioenvironmental Sciences, Kyushu University.

Midgley, S.; Blyth, M.; Mounlamai, K.; Midgley, D.; and Brown, A. 2007. *Towards Improving Profitability of Teak in Integrated Smallholder Farming Systems in Northern Laos*. ACIAR Technical Reports No. 64. Canberra: Australian Centre for International Agricultural Research (ACIAR).

Ogata, K.; Manythong, C.; Phonsavanh, L.; Tajeena, W.; Fukuda, S.; and Miyajima, Y. 2008. Utilization of Paper Mulberry by Farmers in Laos: A Comparative Study of the Villages of Bokeo and Luang Prabang. International Symposium "Interdependencies between Upland and Lowland Agriculture and Resource Management." Book of Abstracts, pp. 129–130. Stuttgart: University of Hohenheim.

Ribeiro, M. M.; and Darnhofer, I. 2007. Understanding the Supply Chain of Paper Mulberry Bark in Lao PDR Using Causal Mapping. Cali, Colombia and Vienna, Austria: Centro Internacional de Agricultura Tropical (CIAT) and University of Natural Resources and Applied Life Sciences.

Rigg, J. 2005. *Living with Transition in Laos: Market Integration in Southeast Asia*. London and New York: Routledge.

————. 2006. Forests, Marketization, Livelihoods and the Poor in the Lao PDR. *Land Degradation and Development* 17: 123–133.

Saito, K.; Linquist, B.; Keobualapha, B.; Shiraiwa, T.; and Horie, T. 2009. *Broussonetia Papyrifera* (Paper Mulberry): Its Growth, Yield and Potential as a Fallow Crop in Slash-and-Burn Upland Rice System of Northern Laos. *Agroforestry Systems* 76: 525–532.

Sakurai, K.; Okabayashi, Y.; Tanaka, S.; Watanabe, E.; Boonyanuphap, J.; and Nouanthasing, L. 2005. Can Shifting Cultivation on Acid Soils in the Southeast Asia Be Sustainable in the Future? A Case Study in Northern Laos. *Soil Science and Plant Nutrition* 51(5): 767–770.

Tran Duc Vien; Rambo, A. T.; and Nguyen Than Lam, eds. 2009. *Farming with Fire and Water: The Human Ecology of a Composite Swiddening Community in Vietnam's Northern Mountains*. Kyoto, Japan and Melbourne, Australia: Kyoto University Press and Trans Pacific Press.

Yokoyama, S. 2004. Forest, Ethnicity and Settlement in the Mountainous Area of Northern Laos. *Southeast Asian Studies* 42(2): 132–156.

Watanabe, E.; Sakurai, K.; Okabayashi, Y.; Nouanthasing, L.; and Chanphengxay, A. 2004. Soil Fertility and Farming Systems in a Slash and Burn Cultivation Area of Northern Laos. *Southeast Asian Studies* 41(4): 519–537.

Southeast Asian Studies, Vol. 47, No. 4, March 2010

Time-geographic Analysis on Natural Resource Use in a Village of the Vientiane Plain

NISHIMURA Yuichiro*, OKAMOTO Kohei** and Somkhit BOULIDAM***

Abstract

This study aims to describe the spatio-temporal aspects of rural daily lives based on natural resource use. We developed new research methodologies using GPS and GIS to collect person-trip data in regions where it is difficult to use questionnaires. By applying the methodology to research conducted in the Vientiane plain, Laos, we have found that this new methodology makes it possible to obtain detailed information about people's daily activities, specifically: what activities were carried out, at what time, where, and with whom. The research site was Dongkhuwaai Village, Xaithany District, located about 30 km by road from Vientiane. The villagers live traditionally, depending on rice crops in the rainy season and use various natural resources. We analyzed their daily activities both in the rainy season and in the dry season. As a result, we found that the daily activities of the villagers had nature-related constraints. They spent all their time in the settlements and there were no modern forms of time discipline (synchronized activity by household members).

We also investigated the influence of urbanization on rural lives. In recent years, a growing number of foreign companies have begun investing in Vientiane and the vicinity, hoping to take advantage of low labor costs. Commuting to such factories has started from Dongkhuwaai Village. However, the number of commuters is not increasing because villagers already have other sources of income from selling natural resources such as aquatic products, mushroom, bamboo shoots, insects, firewood and so on.

Keywords: daily activity, natural resource use, time-geography, urbanization, Laos

I Introduction

In recent years, Vientiane municipality has been experiencing the rapid penetration of the market economy and urbanization. As a result of this, village economies in the surrounding areas have been seeing a shift from a subsistence based economy to a cash-oriented one as the chances to explore emerging opportunities of income generation have arisen. Although the potentiality and risks of this shift are often discussed from an economic perspective [Nonaka *et al*. 2008b], the shift in itself is affecting the social life of

* 西村雄一郎, Aichi Institute of Technology
e-mail: nishimura@aitech.ac.jp
** 岡本耕平, Graduate School of Environmental Studies, Nagoya University
*** National University of Laos

villagers in Dongkhuwaai village where our study was carried out. Villager's daily life consists of working, commuting, consuming and enjoying leisure with their family, relatives, neighbors, and friends at home, within the village territory, and outside the village. This study focuses on the daily life of peri-urban village people and examines changes in their lives induced by the penetration of the market economy based on a spatio-temporal analysis of their behavior. In order to collect the necessary information including where, when and how long each individual's activities continue for various job activities such as farming, hunting and gathering, fishing, housekeeping social interaction and communication such as shopping, sales, and visiting friends or relatives, this study adopted a time-geography approach. Special attention is paid to natural resources use because it has and will characterize Laos' development [Kono *et al*. 2010].

Time-geographic, which was originally developed by the Swedish geographer Torsten Hägerstrand, describes the relation between individuals and natural and social environments as an interaction among "matters" in time and space [Hägerstrand 1970; 1989]. That is to say, an individual's daily life is structured through their relationships with various things in nature and other individuals in society. By using a time-geography approach, matters such as human beings, animals, plants and things can be described as "paths" in time and space, and the interactions between these matters can be represented as connections of paths. Furthermore, paths themselves are under a variety of constraints which can be classified into the following three types [Hägerstrand 1970; 1989; Gregory 1981].

(a) Capability constraints, which limit the activities of individuals through their own physical capabilities and/or the facilities they can command.
(b) Coupling constraints, which define where, when and for how long the individual has to join other people, and use tools and materials in order to produce, transact or consume.
(c) Authority constraints, which impose certain conditions of access on particular space-time domains.

The paths of matters change under various temporal scales, being subjected to daily, monthly, seasonal and annual rhythms and furthermore, they are constrained temporally as well as spatially. Matters can exist or act only within specific places that are changeable in various temporal scales. As such, spatio-temporal change and constraints come not only from nature but also from society [Hägerstrand 1970; 1989].

Pred has described how workers in nineteenth-century U. S. cities who were employed in factories and large-scale shops, were forced to follow a time discipline that they had not experienced previously during the early stages of industrial capitalism. "Factory and large-scale shop work inculcated a sense of time that was greatly different from the sense of knowing, for example, when cows were to be milked or when fires were to be fed in order to maintain a smelting or heating process" [1981: 9–10]. This was the emergence of nine-to-five work, and such work is described in the time-geographic notion as the

trajectory of a worker's path which must meet that of a factory machine located in a specific place. However, paths choreographed by the modern factory mode of production are very different from paths in agriculture or hunting and gathering. Paths in production directly using natural recourses are swayed by the influence of nature, but are more flexible and impromptu.

This paper presents an analysis of time-space allocation in the daily lives of the villagers in the Vientiane plain, Laos, from a time-geographic perspective. Previous time-geographical studies have focused on the quality of life of urban residents in developed countries. This study tries to bring a time-spatial perspective to the studies of rural life depending on natural resource use.

In order to fully understand people's daily lives, precise and detailed data is needed about people's paths in time and space, but it has been almost impossible to get such data in Laos using previous survey methods. Therefore, we first develop a new methodology to collect information on people's daily lives then analyze the differences in daily activities between the rainy season and the dry season. Under the tropical monsoon climate, the natural environment in the Vientiane plain drastically changes from the rainy season to dry season, which places constraints on villager's natural resource use. In this paper, we focus on social change. In recent years the penetration of the market economy and the spread of urbanization into the suburban area of Vientiane has been influencing people's daily lives which had previously been dependent on the subsistence complex of agriculture, hunting and gathering, fishing and so on. In focusing on these dynamics, this paper examines the actual circumstances of influence as observed in the field.

II　Research Area and Methodology

Research Area

The area we researched was Dongkhuwaai Village, Xaithany District, located about 30 km by road from Vientiane, the capital city of Laos (Fig. 1). The number of households was 263 as of October 2005, all of which stood close together, centered around a Buddhist temple, and surrounded by rice fields and forests. The village's main economic activity was rice cultivation in the rainy season, primarily for self-consumption. Various natural resources were utilized in securing cash income: fishing in the rivers, ponds, or rice fields, the hunting and gathering of plants, insects and small animals in the forests, and the production of charcoal, salt, and the grazing of cattle and buffaloes [Ikeguchi and Nishimura 2007].

The village had one car, 25 motorbikes, 98 bicycles, and 52 hand tractors as of 2006. For public transportation, a bus called a *songteo* ("two-row coach" in Lao) connected the village to Vientiane with journeys twice a day, which took about 1.5 hours on the

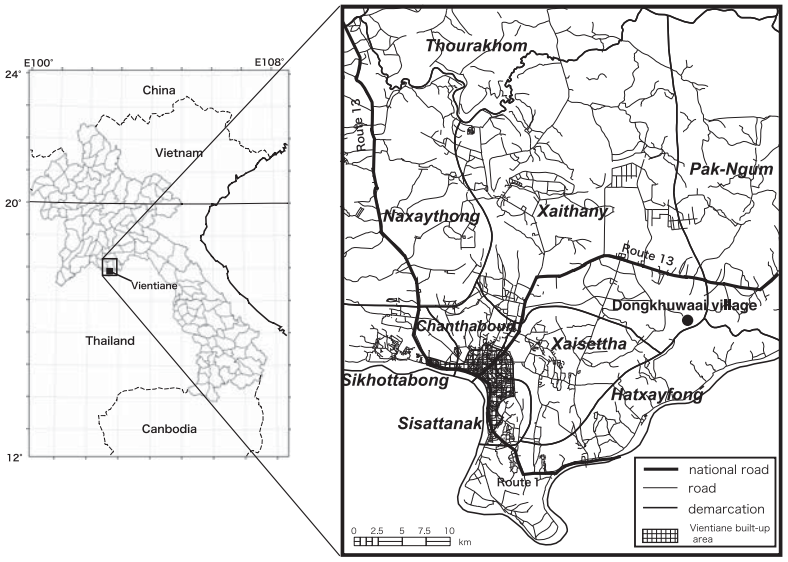


Fig. 1 Research Area
Source: Nishimura *et al*. [2008]

one-way trip along the long unpaved road. Because of the limited transportation means, there were very few who commuted outside the village.

Survey Method

Many time-allocation studies have adopted questionnaires (activity diaries) or direct observation of informants [Noma 1988]. However, it is difficult to use questionnaires in the rural areas of developing countries due to problems such as illiteracy, the fact that few people possess watches, and the lack of detailed place names in these areas. Direct observation also has limitations, as it is not possible to obtain information from many informants simultaneously. We developed a new survey method combining interviews with the use of GPS and GIS [Nishimura *et al*. 2008].

The procedures were as follows. (1) Each informant was asked to carry a wristband GPS receiver for an entire day. The GPS unit recorded information relating to the spatio-temporal aspects of the informant's activities. (2) After 24 hours of GPS recording was completed, the data was stored and represented visually using GIS software (Arc View 9.1). The investigator worked out the shape of the spatio-temporal path of each informant through the mapping of track points with time information. (3) Subsequently, as GPS data reveals almost nothing about the content of activities, the investigator interviewed each informant to clarify the details of the activities; what activity was carried out, at what time, where, and with whom.

By carrying out a pilot survey in May 2006 in which four households in Dongkhu-

waai Village participated, we verified that the new survey method had the following merits. (1) The use of GPS improved the accuracy of the spatio-temporal data. (2) GPS data could be easily correlated with satellite images and map data, which enabled us to consider people's daily activities in combination with various geographical phenomena. (3) Investigators could obtain information outlining an informant's movements from GPS data before conducting interviews, thereby improving the efficiency of interviews.

The investigation required three days per household. On the first day we visited each survey household and explained the methods of investigation, and obtained consent for the survey. On the second, we visited the household surveyed when the household members woke up, and asked each of them to put a portable GPS on his/her wrist or waistband. On the third, we visited the households surveyed in the morning and retrieved the GPS devices from them. We took the GPS to the research station, and extracted the track log and displayed the location and time of tracks of each surveyed person on satellite images of Dongkhuwaai Village using GIS. After this, we worked out each person's chart of travel of the day surveyed (the second day) and visited the informant's home again in the afternoon or evening interviewing them in detail about their movements while showing them their GPS track logs on the laptop PC display.

This method required three investigation days for each household. If we staggered the survey schedule (i.e. on the second day, begin the first day for another household), we could investigate 10 households in 12 days. Because we investigated four households concurrently, we were able to collect data from 40 households in 12 days. We prepared 40 portable GPS devices for the survey (for each day we used 40 GPS for eight households, considering the average number per household is about five in the village).

The main surveys were both conducted in the rainy season (August 27 to September 7, 2006) and the dry season (March 4 to 22, 2008) with 40 households participating. The households surveyed were the same in both seasons and all of the members of the households except infants who were living in these homes at this time were surveyed. The 40 households for the survey were chosen so that each of the following five household types were represented: 1) Households engaged in fishing, 2) Households engaged in grazing, 3) Households engaged in retail or brokerage work, 4) Households receiving wages from manual labor, 5) Households engaged in neither fishing, grazing, retail, brokerage nor wage labor.

The number of participants in the rainy season was 154, and there were 149 in the dry season. Five of the 40 households were excluded in the rainy season survey since all of the members were living in a hut in the rice fields in the eastern area of the village. Therefore the data included 138 persons from 35 households for the rainy season survey. Table 1 shows the number of informants by sex and age.

Table 1 Number of Informants by Sex and Age

In Rainy Season 2006

Age	Male	Female	Total
under 10 y	13	14	27
10 y–	8	18	26
20 y–	13	14	27
30 y–	12	12	24
40 y–	4	10	14
50 y–	8	8	16
60 y–	2	2	4
Total	60	78	138

In Dry Season 2008

Age	Male	Female	Total
under 10 y	10	12	22
10 y–	14	9	23
20 y–	13	20	33
30 y–	12	16	28
40 y–	8	10	18
50 y–	6	8	14
60 y–	4	2	6
70 y–	1	2	3
80 y–	0	1	1
Total	68	80	148

Data: activity survey

III Data Construction

Debugging GPS Data

A GPS device records the informants' "track log" which contains information about a series of track-points along routes that the informant travels, including latitude, longitude and time. This study used *Garmin Foretrex 101* as GPS devices and set the mode of track-point recording interval on "automatic." In this mode, the device records many track-points while an informant is moving and no track-points when there is no movement.

GPS devices might record mistaken track points when the conditions for receiving a satellite signal are weak. Generally, acquiring a signal tends to be difficult inside buildings and in the jungle. In Dongkhuwaai Village, devices easily picked up satellite signals almost everywhere because the houses were wooden and ventilated and the forests were not dense. Since data was recorded with high precision, deviate data could be identified easily. Based on verification of the track logs, we removed a track-point as mis-recorded if it was located over 50 m away from the point recorded just before.

Merging GPS Data with the Data from Activity Diaries

As mentioned above, on the third day of the investigation, the researcher interviewed informants about their behavior for the preceding day. A laptop PC displayed the informants' tracks on satellite images of Dongkhuwaai Village, which enabled them to recall their actions more easily. While interviewing, the researcher wrote down the information from the interview and completed the activity diary of each informant. The sheets of the activity diary gave details of the informants' behavior in chronological order, together with the behavior of other members of the household (Fig. 2).

A form of person-trip data was made from these activity diaries. In the case of a person-trip survey in urban areas,[1] the destination of the trip is generally a facility and it is not hard for the traveler to recognize the arrival time. But in rural villages such as Dongkhuwaai, especially in areas where hunting and gathering or grazing is carried out, it is not that easy to clarify the trip or activity for the traveler and to identify the arrival time at the destination place. Therefore, this study presumes that a unit of outdoor

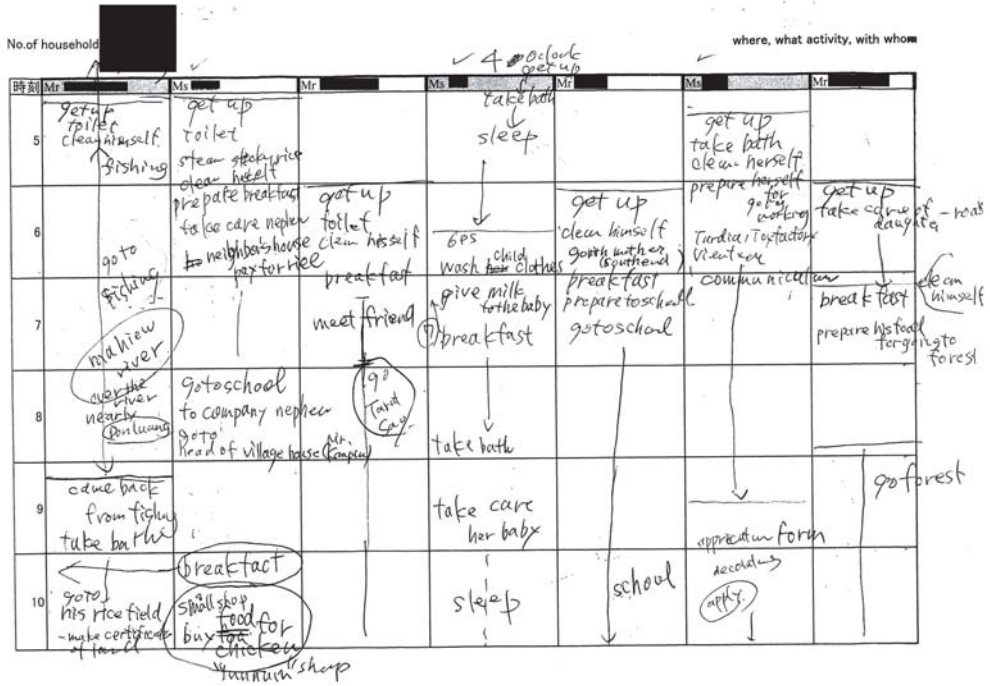


Fig. 2　An Example of Activity Diary by Interview

1) In Japanese metropolitan areas, large-scale person-trip surveys have been conducted every 10 years by administrative organizations for transportation planning.

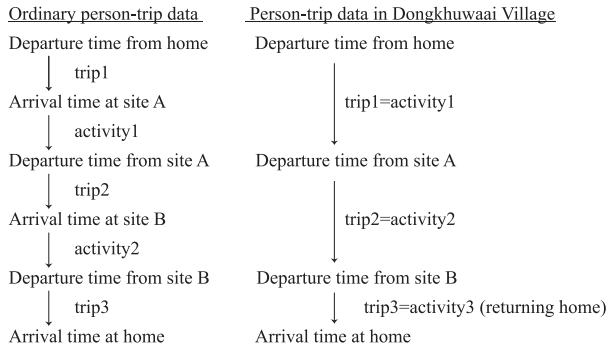


Fig. 3 Person-trip Data in Dongkhuwaai Village

behavior began with the departure from a certain site and ended with the departure from the next site that the informant traveled to, without dividing the time between the trip and the activity, as seen in Fig. 3.

Next, various activities which the villagers performed outdoors were classified into seven categories; i.e. work, shopping, leisure, social communication, attending school, other activities, and returning home. In addition, "work" activities were divided into subcategories; fishing, hunting, gathering, agriculture, grazing, trade, wage labor, lumbering/making charcoal. In regards to the classification of activities, the international time budget study by Szalai [1972] is well-known. As its classification has too many categories, mainly based on daily lives in industrial cities, this study employs its own classification of activities.

Finally, person-trip data made from the activity diary was merged with the GPS data. Categorized activity codes were assigned to all outdoor track points of GPS data by comparing the time information of both data.

Merging GPS Data with Land Use Data

Land-use data was polygon data which divided Dongkhuwaai Village into seven categories such as settlements, paddy fields, vacant lands, forests, artificial forests, riparian forests and water areas. Settlement means a housing area. Since the housings of the Dongkhuwaai Village were agglomerated, the settlement was included in one polygon. A vacant area was an uncultivated grass field mainly used for grazing. Riparian forest is a low-dense forest that is flooded in rainy seasons. For all of the track points a judgment was made about whether they were located inside the boundaries of the village, and also the track points inside the village were assessed to decide which land-use polygon they belonged to using ArcView 9.1.

IV Analysis

Number of Trips

Table 2 shows the number of trips by kinds of activity. The average number of trips in a day was 7.7 in the rainy season and 9.5 in the dry season. These figures are extremely high in comparison with the results of other surveys conducted in the urban areas of developed countries. In surveys conducted in Japanese metropolitan areas, the number was approximately two to three in the person-trip survey and two to four in the activity diary survey [Arai *et al*. 1996]. Even in Japan, the average number of trips was relatively high in rural areas. According to the activity diary survey conducted by Arai in Kiyomi Village in Gifu Prefecture [Arai 2001], the average number of trips amounted to more than six. Especially in the case of full-time farm households, the average number was around nine. Thus the number of trips in rural areas is high both in Laos and Japan.[2)]

According to the activity diary surveys conducted on weekdays in Japanese cities, the number of trips by married females was considerably higher than those by married males because of the frequent outdoors activities the women engaged in for housekeeping and child rearing. When the married females had jobs, the number of trips increased further [Arai *et al*. 1996]. A similar result was obtained among part-time farmers' households and non-farmers' households in Kiyomi Village in rural Japan. On the other hand, among full-time farming households, the number of trips by both males and females was high as full-time farmers managed to carry out multiple farming activities in various sites in the village, for example rice fields, vegetable fields, livestock barns, etc. which were located separately to each other. That made the number of their daily trips high.

Moreover, most full-time-farmers went back home for lunch and went out again for farming after lunch, which was also the reason why daily trips by Japanese full-time farmers were more frequent than those by both office workers and part-time workers. In Dongkhuwaai Village, farmers were engaged in various kinds of jobs related to natural resource use. Also, they returned home for lunch and a nap around lunchtime. Almost all adult villagers in Dongkhuwaai could be regarded as full-time farmers, excluding a few exceptions. The total number of trips was high, with a small gender difference, which is consistent with the result in Kiyomi Village in rural Japan.

Table 2 shows the contents of the outdoors activities (purposes of trips) by the

2) The average trip number in metropolitan areas of Southeast Asia like Phnom Penh and Jakarta was two to three. These are similar results to those for urban areas of Japan. (EASTS ICRA Project Report —A Comparative Study on Urban Structures and Transportation Systems in Asian Metropolitan Cities— 2003–05 http: //www.easts.info/activities/icra/2003/ICRA-Hyodo.pdf)

Table 2 Average Number of Trips (by Kinds of Activity, All Informants)

		Rainy Season (2006. Aug.)				Dry Season (2008. Mar.)			
		Adult male	Adult Female	Child	Total	Adult male	Adult Female	Child	Total
Work	all work	2.02	1.68	0.64	1.59	1.84 (0.18)	1.90 (0.45)	1.58 (0.45)	1.82 (0.23)
	fishing	0.45 *+	0.02 *+	0.04	0.17	0.14+ (0.30)	0.13+ (0.10)	0.00 (0.10)	0.11 (▲ 0.05)
	hunting	0.04	0.08	0.07	0.07	0.13 (▲ 0.08)	0.03 (▲ 0.03)	0.31 (▲ 0.03)	0.11 (0.05)
	gathering	0.13	0.24	0.29	0.21	0.09 (0.04)	0.12 (▲ 0.07)	0.31 (▲ 0.07)	0.14 (▲ 0.07)
	agriculture	0.28	0.14	0.04	0.17	0.18 (0.10)	0.19 (0.05)	0.08 (0.05)	0.17 (▲ 0.00)
	grazing	0.30	0.32	0.11	0.27	0.59 (▲ 0.29)	0.37 (0.11)	0.31 (0.11)	0.44 (0.17)
	trading/retailing	0.36	0.65	0.11	0.44	0.18* (0.18)	0.74* (0.18)	0.35 (0.18)	0.46 (0.02)
	paid work	0.11	0.06	0.00	0.07	0.11 (▲ 0.00)	0.10 (0.04)	0.00 (0.04)	0.09 (0.02)
	lumbering/charcoal making	0.34	0.16	0.00+	0.19	0.39 (▲ 0.05)	0.15 (0.03)	0.23+ (0.03)	0.25 (0.07)
	other	0.02	0.02	0.00	0.01	0.04 (▲ 0.01)	0.07 (0.05)	0.00 (0.05)	0.05 (0.03)
Shopping/household work		0.79	1.24	0.54+	0.94+	0.91* (▲ 0.12)	1.51* (0.33)	1.35+ (0.33)	1.26+ (0.23)
Leisure/playing		0.49	0.32	2.54	0.83	0.36 (0.13)	0.24 (▲ 0.05)	2.42 (▲ 0.05)	0.66 (▲ 0.20)
Social communication		0.91	0.94+	1.14+	0.97	1.29 (▲ 0.37)	1.43+ (0.18)	0.54+ (0.18)	1.22 (0.13)
Attending school		0.11	0.13	0.50+	0.20	0.27 (▲ 0.16)	0.07 (0.01)	1.27+ (0.01)	0.35 (0.16)
Other		0.38	0.25	0.11	0.27	0.41 (▲ 0.03)	0.22 (0.13)	0.15 (0.13)	0.28 (0.15)
Returning home		2.72+	2.95+	3.04+	2.89+	3.73+ (▲ 1.01)	3.74+ (0.93)	4.38+ (0.93)	3.85+ (0.96)
Total		7.43+	7.51+	8.50+	7.68+	8.80+ (▲ 1.38)	9.10+ (2.08)	11.69+ (2.08)	9.44+ (1.77)

Note: Parentheses indicate the difference from the rainy season
(child: preschool children and elementary school student/the number of informants (rainy season 2006 male: 47, female: 63, child: 28) (dry season 2008 male: 56, female: 66, child: 26))
* indicates statistical significance at 0.05 between male and female
+indicates statistical significance at 0.05 between the seasons
Data: activity survey

people in Dongkhuwaai Village. Work trips dominated over returning home trips. Although there were more work trips by males than females on the whole, a gender difference was seen according to the kind of work. The gender difference was striking in the field of fishing in the rainy season. On the other hand, trading (vending of natural resources, operating small shops and so on) and shopping/household work were high among females in the dry season.

More trips were counted in the dry season than the rainy season, which means the people are more active in the dry season. The total number of trips by males and females were not so different. Fishing activity decreased among males and increased among females in the dry season. Social communication increased among females in the dry season. Lumbering/charcoal making was very popular among children in the dry season. Such work sometimes means play for children.

Spatial Distribution of Trips

Figs. 4a and 4b show the spatial distribution of all the GPS track points of the surveyed villagers. The white dots represent the tracks of 138 persons in the rainy season and the black ones represent the tracks of 149 persons in the dry season. The base map exhibits the land use classification that Professor Ono of Niigata University produced from the

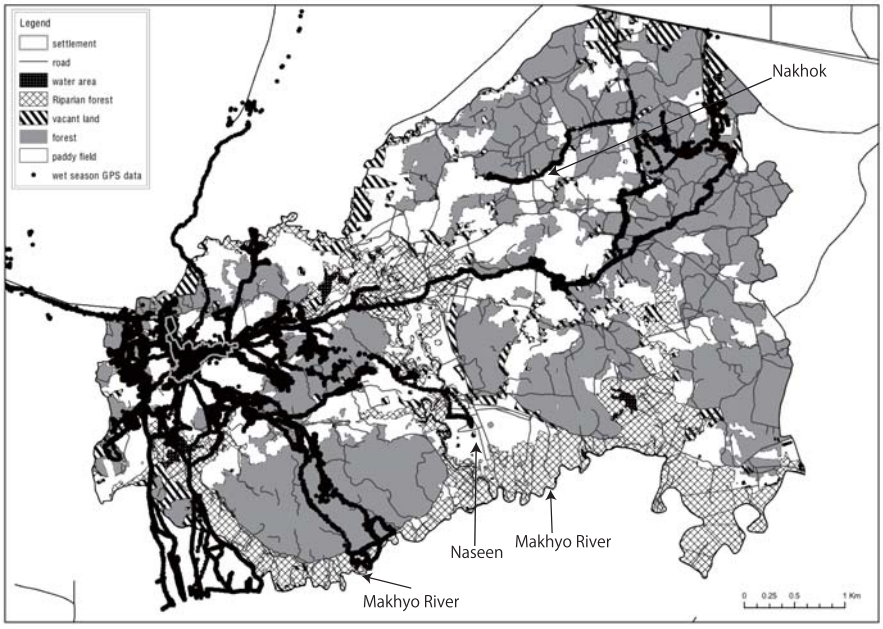


Fig. 4a Spatial Allocation of Activity by All Informants and Landuse of Dongkhuwaai Village in the Rainy Season (2006)

Data: GPS survey by authors, land use and village border data, Dr. Eisuke Ono, road data (outside of village) form Mekong GIS data, JICA

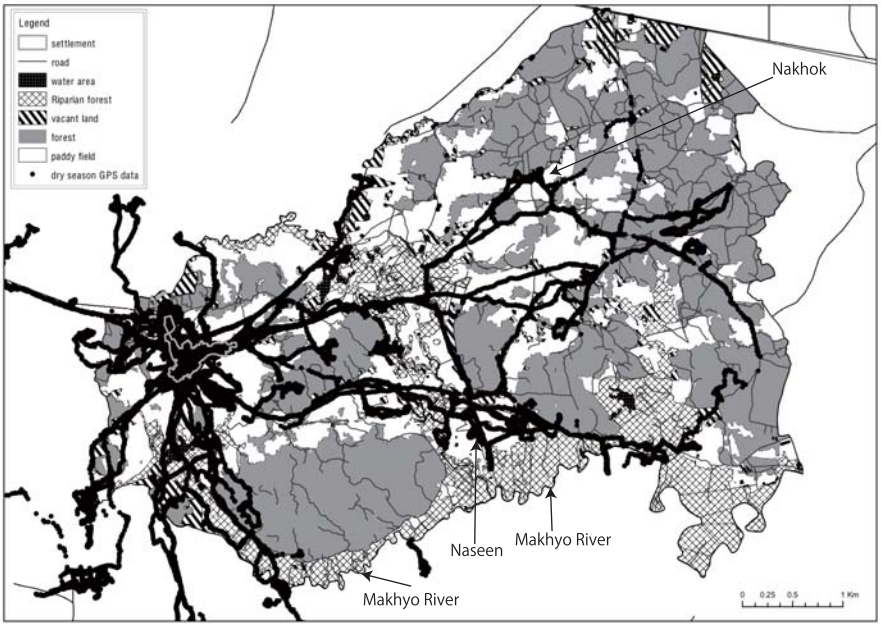


Fig. 4b Spatial Allocation of Activity by All Informants and Landuse of Dongkhuwaai Village in the Dry Season (2008)

Data: GPS survey by authors, land use and village border data, Dr. Eisuke Ono, road data (outside of village) form Mekong GIS data, JICA

satellite image taken on February 2006 with ground truth.

The track points have concentrated on the settlement area located in the west of the village. Many white points are distributed near the northeast edge of the village. That is the area called Nakhok where many *tienna* exist. A *tienna* is a villa used for cultivation. It is a raised flooring type of house, and below the floor level is a feeding area for cattle and buffaloes. Village people live within a settlement area in the dry season and some of them live in the *tienna* or commute there in the rainy season. *Tiennaes* are scattered among the rice fields in the village, mainly in the Nakhok area several kilometers northeast away from the settlement. In the rainy season, the region between the settlement and Nakhok is submerged so the people go via Route 13 in the north of the village by tractors, taking a very roundabout way to get to their *tienna*, Some walk straight there, chest-deep in water.

The southern part of the village along the Makhyo River, where land use is riparian forest in the dry season, floods and becomes a fishery in the rainy season. Many white-dotted lines reach there in Figs. 4a and 4b. Most of them are tracks made by for middle-aged and old-aged males going fishing in the rainy season. Waters move to the south in the dry season, so black-dotted lines stretch to the south to find the fishery. As for the central southern region of the village called Naseen, dry-season rice cultivation is possible

because the Makhyo River is near there. Some villagers visit Naseen for agriculture in the dry season. The rice fields in Naasen are completely submerged in the rainy season.

Outdoor Activity and Land Use

Table 3 shows the duration of outdoor activities for each land use. It indicates the relationship between land use and activity from the combination of GPS data, land use data and activity information from the interviews. The activity time in Table 3 shows the total time for travel to the destination and time spent at the destination. For example, the activity time for fishing includes the time the person spent traveling to the fishery and the time spent fishing there. So the activity time for fishing is distributed not only in water land use but also in settlement land use and so on.

Table 3 shows that the total time spent on fishing, hunting and gathering was more than the time for the agricultural tasks in both the rainy season and the dry season. It is supposed that agricultural tasks do not consume much time except during the season for transplanting and harvesting. The rainy season starts from the beginning of May and ends at the beginning of October. Transplanting of the paddy fields starts at the beginning of May, and finishes at the beginning of August in Dongkhuwaai village [Nonaka *et al*. 2008a]. The research period was from the end of August to the beginning of September and it did not correspond to the busy season for rice cultivation.

The activity time for fishing is longer than the time spent on agriculture time in the rainy season. Fishing activity is carried out in the rice fields or riparian forests flooded by the river near the southern village boundaries in the rainy season.

As for grazing and taking care of cattle and buffalo, the method of pasturing differs between the rainy and the dry season. In the rainy season, villagers take the cattle and buffalo to the forest to graze them and ensure that they do not eat rice in paddy fields. On the other hand, cattle and buffalo are pastured without guard in the dry season because there is no such danger. However, the villagers wait for their cattle and buffalo to come back at the end of the settlement for a long time every evening and they sometimes go to look for their animals. According to Table 3, the main land used for grazing is paddy fields and forest in the rainy season, while about 80% of land used for grazing is settlements in the dry season, which means the villagers spend a long time within their settlements after leaving their home to wait for their cattle and buffaloes to return. Thus, the activity time for grazing is longer in the dry season than in the rainy season. Lumbering and charcoal production also occupies most of the time in the dry season.

Activity time for wage labor is not long compared with fishing and agricultural tasks. The opportunities for wage labor are very limited within the village and most wage labor is conducted outside the village, and some villagers commute to Vientiane. Although the working hours are long for a person who engages in wage labor, the average activity time is shortening because few people engage in wage labor. The average working time is longer in the rainy season due to long overtime work in the

Table 3 Outdoor Activity and Landuse

Rainy Season (by all informants)

Main Category	Sub Category	Inside Village (%)								Outside Village (%)	Total Outdoor Activity Time (minute) (%)	
			Water area	Riparian forest	Vacant area	Settlement area	Artificial forest	Forest	Paddy field			
Work	fishing	74.4	0.1	10.4	2.7	28.3	0.0	2.4	30.7	25.6	4,314	(6.3)
	hunting	98.7	0.1	3.5	6.8	39.3	0.0	22.1	27.0	1.3	927	(1.4)
	gathering	100.0	0.0	0.5	3.5	48.9	0.0	18.0	29.2	0.0	1,986	(2.9)
	agriculture	98.4	0.3	0.3	9.0	25.4	0.0	43.0	20.7	1.6	2,749	(4.0)
	grazing/care of	98.5	0.0	0.4	15.1	20.4	0.0	27.2	35.4	1.5	3,508	(5.1)
	trade	92.7	0.0	0.0	0.7	90.4	0.0	0.1	1.6	7.3	6,310	(9.2)
	wage work	24.3	0.0	0.0	0.0	22.3	0.0	0.0	2.0	75.7	3,199	(4.7)
	lumbering/charcoal	98.0	0.0	1.6	0.6	22.7	0.0	46.2	26.9	2.0	4,283	(6.2)
	other	4.7	0.0	0.0	0.0	4.5	0.0	0.0	0.2	95.3	754	(1.1)
Shopping/household work		82.0	0.0	0.0	0.5	78.2	0.0	1.1	2.3	18.0	3,921	(5.7)
Leisure/playing		98.3	0.0	0.0	2.9	86.2	0.0	0.5	8.7	1.7	12,559	(18.3)
Social communication		77.8	0.2	0.0	0.8	72.5	0.0	0.4	4.1	22.2	11,944	(17.4)
Attending school		65.4	0.0	0.0	3.1	60.9	0.0	0.1	1.4	34.6	3,570	(5.2)
Other		98.0	0.2	1.1	12.6	53.2	0.0	6.1	25.4	2.0	8,519	(12.4)
Returning home		98.9	0.0	0.0	0.4	93.0	0.0	0.8	4.9	1.1	58,050	
Unknown		93.7	0.0	0.0	0.3	79.0	0.0	1.5	13.0	6.3	5,104	
Total		91.8	0.1	0.5	2.3	74.9	0.0	4.5	9.6	8.2	131,696	

Note: Parentheses indicate the proportion to total activity time excluding returning home and unknown

Dry Season (by all informants)

Main Category	Sub Category	Inside Village (%)								Outside Village (%)	Total Outdoor Activity Time (minute) (%)	
			Water area	Riparian forest	Vacant area	Settlement area	Artificial forest	Forest	Paddy field			
Work	fishing	46.5	1.7	10.6	2.8	18.8	0.0	10.6	3.7	53.5	2,539	(2.8)
	hunting	75.3	0.1	2.6	26.0	40.7	0.0	2.3	3.6	24.7	1,583	(1.7)
	gathering	81.6	0.0	0.5	1.2	47.3	0.0	10.3	22.4	18.4	5,021	(5.5)
	agriculture	76.8	0.5	17.0	5.3	32.3	0.0	6.2	16.0	23.2	4,618	(5.0)
	grazing/care of	94.1	0.1	5.6	0.4	79.9	0.0	1.5	6.7	5.9	10,347	(11.2)
	trade	85.5	0.0	0.6	3.5	77.9	0.0	0.3	3.2	14.5	5,601	(6.1)
	wage work	13.4	0.0	0.0	0.7	11.8	0.0	0.3	0.6	86.6	1,486	(1.6)
	lumbering/charcoal	90.6	0.0	0.8	1.1	75.3	0.0	2.8	10.6	9.4	6,955	(7.6)
	other	76.8	0.5	1.8	15.5	16.2	0.0	34.3	9.0	23.2	1,152	(1.3)
Shopping/household work		92.6	0.0	0.1	2.6	82.8	0.0	1.9	5.2	7.4	15,898	(17.3)
Leisure/playing		98.6	0.0	0.0	0.9	91.1	0.0	0.8	5.8	1.4	5,781	(6.3)
Social communication		96.7	0.0	0.9	1.6	88.0	0.0	3.4	2.8	3.3	16,733	(18.2)
Attending school		64.1	0.0	0.0	6.5	55.5	0.0	0.4	1.7	35.9	4,082	(4.4)
Other		91.4	0.0	0.3	0.8	85.8	0.0	0.6	3.8	8.6	10,227	(11.1)
Returning home		95.9	0.1	0.3	0.5	88.9	0.0	1.0	5.1	4.1	55,121	
Unknown		89.1	0.0	0.0	0.1	84.5	0.0	0.3	4.2	10.9	22,139	
Total		90.4	0.1	1.3	1.6	79.8	0.0	2.1	5.7	9.6	169,281	

Note: Parentheses indicate the proportion to total activity time excluding returning home and unknown

factory where some villagers worked to produce Christmas goods, as will be mentioned later.

Both males and females stayed within the village most of the day and spent more than 70% of the time surveyed in the settlement. The percentage of time spent in the settlement was six percentage points higher among females than males (table omitted). This shows that females are more involved in housekeeping jobs, child rearing, and social activities in the settlement. On the other hand, males are relatively more involved in the jobs of hunting, gathering, and cultivating outside the settlement. So the time spent in the riparian forest, water area, and the paddy fields was longer among males.

V　Seasonal Changes of Natural Resource Use

Most villagers spent time inside the village, and natural resource-based activities without employment were common in the village. We focused on one of the households whose members have a direct connection to the natural environment. We drew the daily paths of the household members and analyzed the time-spatial relationship between human activity and the natural environment. Figs. 5a and 5b shows the daily paths in which the

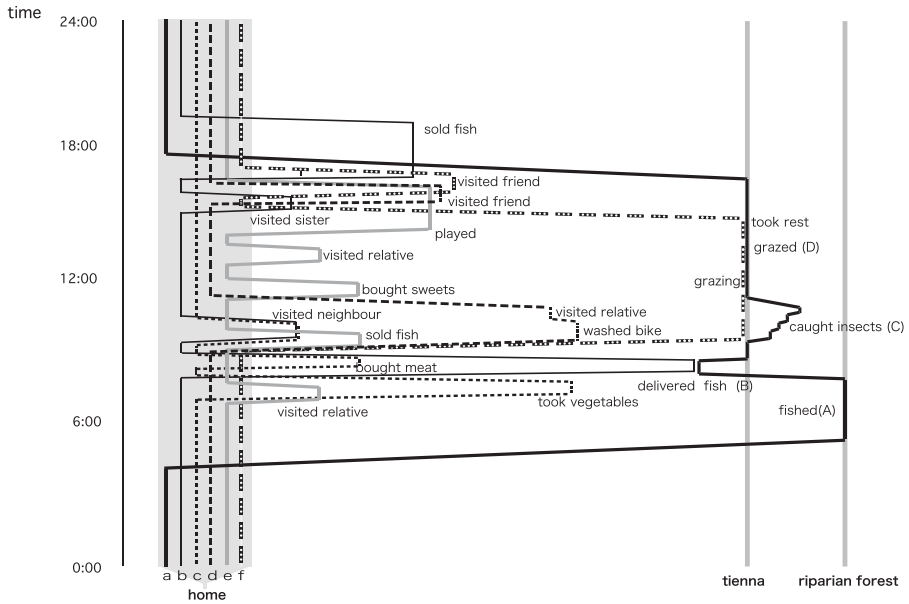


Fig. 5a　Daily Paths of One Household (Rainy Season, 2006)
Note: a: husband (52), b: wife (51), c: daughter (21), d: daugher's husband (25), e: grand daughter (6), f: son (19)
Data: activity survey (2006)

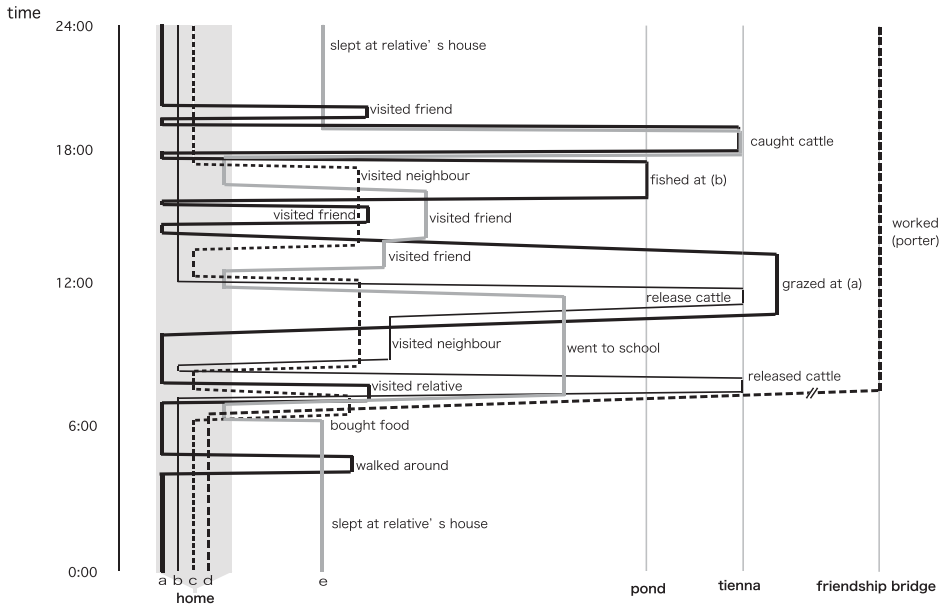


Fig. 5b Daily Paths of One Household (Dry Season, 2008)
Note: a: husband (54), b: wife (53), c: daughter (23), d: daugher's husband (27), e: grand daughter (8)
Data: activity survey (2008)

time-space movement of each household member is arranged. The vertical line indicates the time of day, while the horizontal line represents each different location in which outdoor activities were practiced and the relative distance from the home [Carlstein 1982; Arai *et al*. 1996]. Fig. 5a shows household members' activities in the rainy season, while Fig. 5b shows them in the dry season.

The activities of the household indicate that the human behavior of this village is adjusted to the seasonal change of the natural environment. The water area and riparian forest becomes a fishing spot in the rainy season, and the forest and riparian forest become grazing spaces in the dry season. The people's livelihood changes seasonally to fit the ecological setting.

Here, we present example data from one household, which consists of six members. The husband (52 years old in 2006), the wife (51 years old), the daughter (21 years old), the daughter's husband (25 years old), the granddaughter (six years old) and the son (19 years old) spent most of their time inside the village in the 2006 rainy season. The husband in particular used the natural environment for fishing, hunting or grazing. The husband woke up very early in the morning around 4 am to prepare for fishing. The reason for going fishing very early in the morning was to get a big catch of fish. His activity was adjusted to the ecological cycle of fish activity. The fisherman set the fishing net the previous evening. In the heat of the day, the fish hid in the shade of the trees and they

became more active at nighttime as they searched for food. In the early morning, the fisherman drew in the net to catch the fish before they lost freshness [Akimichi *et al*. 2008].

Fig. 6 displays his GPS tracks. The black dotted line indicates his travel in the rainy season. He went to the river located to the south of the village; he checked the fishing net and caught fish at five places (around Point A in Fig. 6). After that, he delivered these

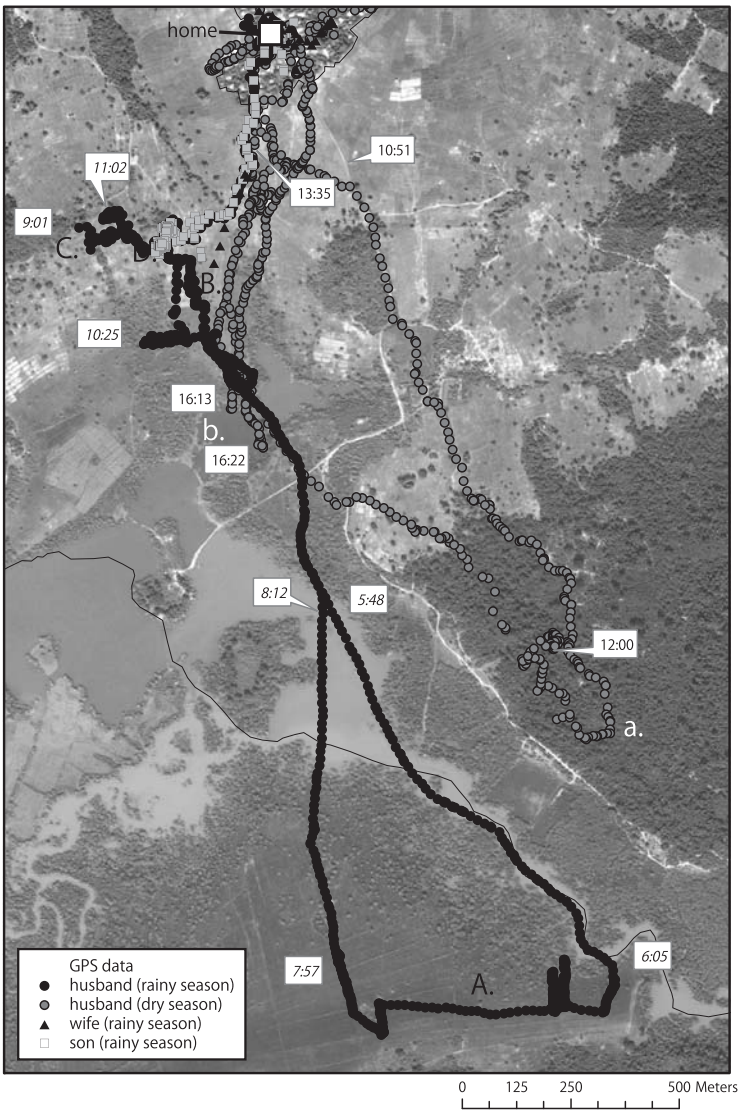


Fig. 6　Detailed Spatial Allocation of the Activities
Data: GPS survey by authors, QuickBird satellite image (October, 2006)

fish to his wife. The husband and the wife met at point B and he went to the *tienna* in point C. At the *tienna* he took care of his cattle and after that he went to the forests near the *tienna* to catch insects to feed to the cattle. He spent some time at the *tienna* to graze the cattle and took some rest, returning back home around 4 : 30 pm. His son also came to the *tienna* to graze cattle at around 10 am and they worked together and rested for about four hours.

In the dry season of 2008, the activity of the husband changed to fit the seasonal change of the natural environment. He did not go fishing in the early morning because the volume of river water became very low and they could not catch any fish in the river. The husband went to the forest and the riparian forest (he could not go there in the rainy season because the river water covered that area) to feed his cattle (around point a. Fig. 6). He returned home and went to a pond for fishing in the afternoon (around point b. Fig. 6). In the dry season he could catch fish at several big ponds located to the southwest of the village.

As seen from this example, the seasonal changes of the natural environment influenced the changes in the daily paths of the people. This situation is analyzed from the time-geographic concept of the constraints.

The daily path of the husband in the rainy season was affected by several related constraints. Fishing in the very early morning meant that if he took the chance to get a good catch, he had to fit his daily path to meet the activity patterns of the fish. Their activity patterns followed the daily, seasonal and ecological cycle of the river environment. The morning is when the fishermen can make the time-space bundles with the path of the fish, and most fishermen in the village wanted to go to the river very early on in the morning. The end of August is the main growing season of the fish that come from the Mekong River from May to July, and this was why the fishermen spent a long time at the river during our research period.

The fishermen had another coupling constraint. The selling of fish has to be done at an appropriate time. Small cyprinid fish caught with tangle nets have to be sold quickly because they have already died when they are caught [Ikeguchi and Nonaka 2008]. Many fishermen in this village sold the fish in the research period, and freshness and adjusting to market demand were important for selling them at a good price. The selling of fish is assigned to the women as part of the gender division of labor in the village. This situation, the coupling constraint between the husband and wife, affects the daily time-space path. The wife went to the meeting point near the river to sell the fresh fish in the village, and this was the time-spatial peg of the activity of both husband and wife. It was the strategy of the family to meet the market demand and this was one of the main constraints on the husband's daily path.

The daily life of the villagers in the natural environment is not like the slow, calm village life. The rainy season was a busy time for the fisherman because his daily path had several constraints related to the natural environment and the economic environ-

ment, and he needed to adjust and coordinate his daily activities.

On the other hand, such constraints were not shown in the dry season. The husband went fishing in the late afternoon because there was not a severe coupling constraint with fish. The activity patterns of the fish were not affected by the daily ecological cycle and the husband had the flexibility to be able to time his fishing activity.

The environmental setting also constrained the capability of human and buffaloes' activities. The water and riparian forest areas lost water in the dry season and the villagers had no barrier to their activities. They could easily enter these areas and use the land as a grazing area. The paddy field also changed to vacant land and they used it as a place for feeding buffalo. These changes indicate that the capability constraints were reduced and the flexibility of activities was increased in the dry season.

The analysis indicates that the daily activities of the villagers were still closely related to the seasonal/daily ecological cycle of the natural environment. The activities of the household members are separated from each other and the rigid constraints did not exist with other members inside both the settlement and/or home. The home was not a time-space peg of the daily activities and the settlement or activities outside of it were more important than the home. Such loose coupling constraints between villagers shape the character of their daily living.

VI　Influence of Urbanization

Recently, many labor-intensive industries have been established in Laos. They are export-oriented, and some of them are financed by foreign capital. Most employees in these factories are young women. Since the 1990s, there have been an increasing number of such factories located in Vientiane municipality. Sewing factories are typical of such industries. According to the member list of Lao association of textile industries in 2004 (92 member companies), 26 members (28%) are direct foreign-invested and 10 members (11%) are joint corporations of Lao and foreign companies. Eighty-eight members (96%) are located in Vientiane municipality [Nishimura and Okamoto 2007]. There are a growing number of employment opportunities in and around Vientiane. However, the areas within commuting distance of the factories are restricted due to the poor transport system. Dongkhuwaai Village, which is located about 30 km from Vientiane, was beyond the commuting distance of the factories. Small-scale commuting started in February 2006 in this village. A factory near Friendship Bridge, which connects with Thailand, offered commuting jobs to the village. Founded in 2005 by Thai direct investment, it makes 3-D picture books for children. Moreover, commuting to a French garment-washing factory started in February 2007. These factories run commuter buses (*songteo*). Dongkhuwaai is the furthest village that the buses reach and it takes approximately one hour and a half each way to the factories.

Monthly basic pay is 30–35 US$ in the factories. Allowances for overtime work are added. Regular working hours are 8 : 00–17 : 00, but workers often come back to the village at midnight to do overtime work to meet the market demand for Christmas in the US and European countries. Almost all the commuters are young females. Commuting to the factory has brought cash earnings to young women in the village. However, the turnover rate of these young women is relatively high for the following reasons:

1) Wages are so low that they cannot regard work at the factory as a rewarding job.
2) There are alternative ways to get cash in this village, such as fishing, hunting and gathering. The selling price of natural resources is relatively high (Table 4).
3) They are burdened with long overtime work, a long commuting time, and work on the weekends.
4) They have to spend weekdays in a different place and on a different schedule from other members of their household.

The last reason is very time-geographic. To clarify the time-space constraints in the daily lives of factory workers, we provide an example of one household in Dongkhuwaai Village in which one member commutes to the factory.

Fig. 7 shows the daily path of the household in the rainy season. This household consisted of the mother (53 years old), the eldest son (26 years old), the daughter (19 years old), and the second son (16 years old). The daughter was a worker at the picture book factory. She left the village by commuter bus before 6 : 00 in the morning, and worked at the factory all day long. The time she returned home was usually around 10 pm when her mother and brothers had already gone to bed. She came home later than usual at 10 : 30 pm on the day surveyed. Other members of the household were staying in the village. The eldest son went to a *tienna* in Nakhok to take the cattle to the forest in the morning. The mother in the household surveyed also went to the *tienna*, and collected firewood and nuts called *Makbokk* near there in the afternoon. The second son com-

Table 4 Income by Hunting/Gathering

Products	Household	Income (/month, US$) (10,000 kip= 1 US$)
Aquatic products	84	63.6
Mushroom • bamboo shoots	76	38.9
Wild edible plants	9	30.2
Insects	43	31.5
Mammals	7	30.6
Firewood	21	56.9
Salt	18	14.7
Vegetables	3	153.3
Rice	51	63.1 (/year)

Note: Most active month of households whose members engaged in hunting/gathering. Incomes from vegetables and rice were not deducted from the cash cost.
Data: Socio-economic survey (all households in DK village in 2005)

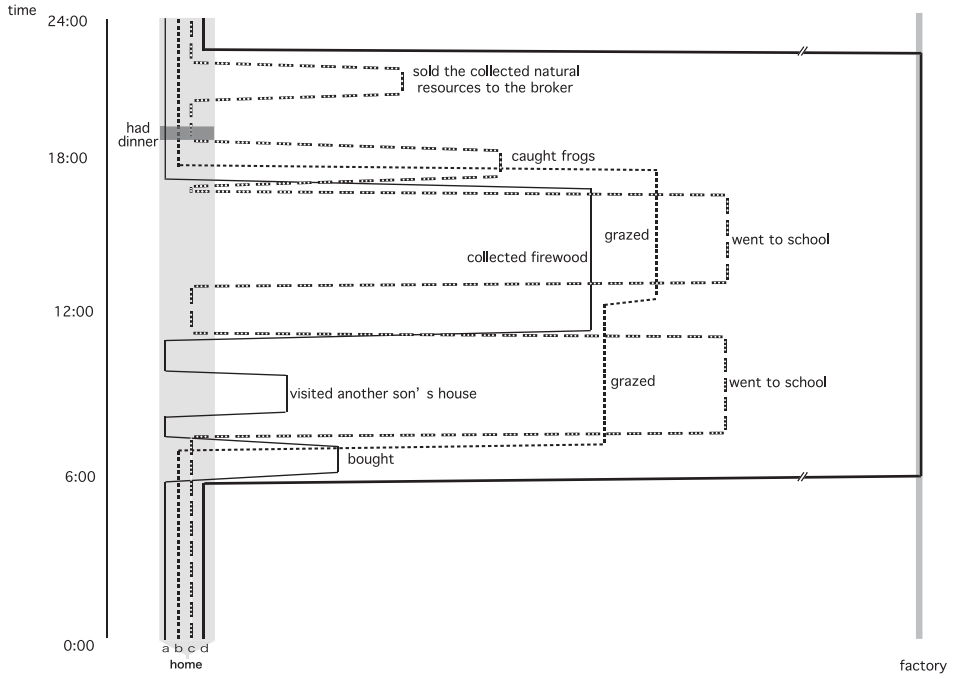


Fig. 7　Daily Paths of the Wage Worker and Her Household Members (Raing Seeson, 2006)
Note: a: mother (53), b: son (26), c: daughter (19), d: son (16)
Data: activity survey (2006)

muted to the junior high school in Huaxien village neighboring Dongkhuwaai Village. He went to catch frogs after school on the day surveyed, and after supper he visited a middleman in the village to sell *Makbokk* that his mother had collected that afternoon. He sold Makbokk weighing 1.3 kilograms for 7,500 kip (75 cents).

Thus, the household members other than the daughter spent the day with nature in the village; hunting and gathering and cattle grazing. On the other hand, the daughter worked far from the village from the early morning to midnight. This shows how the time-space of her daily life was quite different to the other household members.

The reason for the time-spatial distinction between the daughter and the other household members was that there was a severe coupling constraint on the daughter's daily activity. The daughter's daily path and the path of the facility of the factory make the bundle [Hägerstrand 1970] that restricted the daughter's activity. The long time commuting and the lack of her-own transport removed the possibility of flexible use of break time. She had very limited possibility for activities with members of the village on workdays because the most of the villagers' activities did not have such a severe coupling constraint (Table 5).

What we can see from the above example is how globalization is introducing a new

Table 5 The Change of Livelihood and Work Place, Timing of Work and Use of Space

Kind of Work	Working Place	Timing of Work	Living Space	Social Communication
work related natural environment	mainly working inside village	seasonal cycle ecological cycle	seasonal cycle ecological cycle contiguous use of ecotone	closely connected, longterm
paid work	working outside village	factory and global market demand	segmental use of space	limited opportunity, short

type of wage labor to Dongkhuwaai Village. It ties up the laborers with the worktable of the factory for long hours and forces them into the same work routine day after day; a routine that sees them leave the village early in the morning and return late at night. The time-space paths of factory laborers are simple and stiff depending on the commuter bus schedule, which are very different from the diverse and flexible paths of other villagers. In the time-geographic diction, laborers have to be riveted to the factory (a coupling constraint) under the supervision of a manager (an authority constraint) without their own means of transportation (a capability constraint).

Thus factory labor outside the village creates severe constraints and makes communication with family members and neighbors almost impossible on weekdays. Wages are too low to be an incentive for them to continue this unhappy labor. Low wages brings about a high turnover rate. Factories try to hold employees more than the necessity to cope with a high turnover rate. In the case of the factory making picture books, they kept about 600 laborers for 400 persons workload in 2006 when we interviewed the personnel director of the factory. Over-employment depresses the wage. Turnover rate is higher in the farmers' busy season. In Dongkhuwaai Village, not a few females were absent for rice planting from factories before quitting their factory job. The factories are subject to the seasonal fluctuation of the workforce and the management have to coordinate their production not only in changes in the demand of the global market but also to the seasonal changes of the workforce and their relation to the natural environment of the Vientiane plain [Nishimura and Okamoto 2007].

VII Conclusion

This study aimed to clarify the spatio-temporal aspects of daily lives based on natural resource use on the facing market economy. We have analyzed the spatio-temporal structure of rural daily lives based on natural resource use, and examined the influence of urbanization on rural daily lives.

We developed new research methodologies using GPS and GIS to collect person-trip-

data in a region where it is difficult to use questionnaires. By applying the methodology to research in the Vientiane plain in Laos, we found this new methodology made it possible to gain detailed information about people's daily activities, namely what activities were carried out, at what time, where, and with whom. The research field was Dongkhuwaai Village, Xaithany District, located about 30 km by road from Vientiane where the villagers lived traditionally, depending on rice crops in the rainy season and use of various natural resources. We analyzed their daily activities both in the rainy season and in the dry season.

We found that the villagers spent most of their day in the village, and their activity paths were closely connected to each other in a narrow settlement space. However, there were a small number of synchronized activities among the household members and the coupling constraints on them were not clear. The settlement was more important than home for their activities. The home was not time-space pegs of the daily activities. The villagers spent much time in other places in the settlement apart from their own houses as the starting and ending points of activities. There seemed not to exist a modern time discipline in which all of the household members had dinner or watched television together at a fixed time. The loose coupling constraints between villagers affected their daily activities.

The daily activities of the villagers were still closely related to the seasonal change of the natural environment. At present, the activities related to natural resource use such as fishing, hunting and gathering still continue to occupy a considerable part of the time-spatial allocation of rural daily lives. There were also some important constraints with the natural environment, land use, animals, or plants.

On the other hand, the penetration of the market economy has increased the opportunity for various types of wage earning near Vientiane. In recent years, a growing number of foreign companies have invested in Vientiane and the vicinity because of low labor costs. Dongkhuwaai Village has found itself become a source of laborers commuting to factories. That might be a cause of the radical changes in the rural lives in Vientiane plain which can be summed up in the three following points: first, the introduction of wage work means not only a change in the income generating method, but also transitions of the activity patterns and living time-space. Secondly, the daily lives of the household members doing wage jobs are in sharp contrast to the daily lives of other household members who depend on natural resource use even though they live in the same household. In such households, the daily paths of the members have severe coupling constraints and there is a lack of daily communication time. Finally, these changes imply that the penetration of the market economy could cause changes in the social relationships in the village and change how a household/family ought to be.

At the turn of the 21st century, "global factories" have finally reached Laos for cheaper labor. Laos is the one of the latest developing countries to be pulled into the global economy. Today, Laos, Cambodia, and Vietnam are replacing the former cheap-

wage countries of Thailand, Philippines, and Indonesia in Southeast Asia.

The cheap-labor-oriented enterprises newly established in these countries have absorbed unskilled workers not only from urban areas but peri-rural areas. In the 1980s, many factories including the foreign invested were located in local cities in Thailand. According to the long-term observation studies in Don Daeng Village in northeast Thailand, the villagers' daily lives have been dramatically changed since the 1980s due to the increase of commuting to the factories in and around Khon Kaen city [Fukui 1996]. Farmers in Don Daeng Village were split into many part-time rice farmers and few full-time vegetable farmers. In Funahashi's study, the proportion of the off-farm income in annual household income of all the villagers has increased from 21.3% in the 1960s to 57.8% in the 1980s to 82.0% in 2002 [Funahashi 2006]. What this indicates is as the villagers became commuters, their living space are segmented into workplace and home, and their living time are segmented into working hours and non-working hours.

Is Dongkhuwaai village following the same road as Don Daeng village? The beginning of small-scale commuting to the factories could be a symptom in Dongkhuwaai. Although many villagers experienced factory work from 2006, most of them stop going to the factories. It implies that the villagers are showing anxiety in the face of socio-economic change that such work brings, reacting against the risks and undesirable influence to family/ village life.

On the other hand, the wage labor is not the only way to earn cash in this village. Fishing, hunting and gathering bring the villagers respectable income (Table 4). These activities are flexible in space and time. Unlike factory labor, they do not bind people to a certain place for long hours of the day. These activities are also initial-cost-free, unlike vegetable production that needs the irrigation facilities.

The marketing of fish, insects, small animals and wild plants have increased since the 1990s, along with the introduction of a cash economy into rural areas showing that many villagers, including children, have become involved in fishing, hunting and gathering for cash-income. The construction of social relationships between the family or other persons in the village through natural resource use remains important activities. However, if too many people become engaged in these activities, this may lead over-exploitation and the deterioration of bio-diverse habitats. We would have to further think about how to balance the natural resource use, the villagers' activities and these risks.

References

Akimichi, Tomoya; Ikeguchi, Akiko; Goto, Akira; and Hashimura, Osamu. 2008. Mekong Gawa Shusuiiki no Gyoro to Kisetsu Ido. In *Ronshu Monsun Ajia no Seitaishi*, 1 : *Seigyo no Seitaishi*, edited by Yasuyuki, Kono. pp. 163–182. Tokyo: Kobundo.

Arai, Yoshio. 2001. Noson no Jikan to Kukan [Rural Time and Space: Time-geographical Discussion]. In *Chikoku no Tanjo: Kindai Nippon ni okeru Jikan Ishiki no Keisei* [Development of Sense of Time in Modernization/Japan], edited by Takehiko Hashimoto and Shigehisa Kuriyama. Tokyo:

Sangensha.
Arai, Yoshio; Okamoto, Kohei; Kamiya, Hiroo; and Kawaguchi, Taro. 1996. *Toshi no Seikatsu to Jikan [Space and Time in the City]*. *Tokyo: Kokon-Shoin*. 205 p.
Burns, Lawrence. D. 1979. *Transportation, Temporal, and Spatial Components of Accessibility*. D. C. Heath and Co. 152 p.
Carlstein, Tommy. 1982. *Time Resources, Society and Ecology: On the Capacity for Human Interaction in Space and Time in Pre-industrial Societies*. Lund: Lund Studies in Geography B, No. 49.
Fukui, Hayao. 1996. Expansion of Arable Land and Its Cessation: The Case of Northeast Thailand. *Southeast Asian Studies* 33(4): 675–702.
Funahashi, Kazuo. 2006. *A Forty Years Fixed Point Observation at the Northeast Thai Village: The Case Study of Don Daeng/Don Charoen Villages* (Research Report of Grant-in-Aid for Scientific Research (A)). 229 p.
Gregory, Derek Time-geography. 1981. *Dictionary of Human Geography*, edited by R. J. Johnston. New York: Free Press.
Hägerstrand, Torsten. 1970. What about People in Regional Science? *Papers and Proceedings of the Regional Science Association* 22: 7–21.
————. 1989. Reflections on "What about People in Regional Science." *Papers of the Regional Science Association* 66: 1–6.
Ikeguchi, Akiko; and Nishimura, Yuichiro. 2007. *Kazoku Rodo no Sedaisa to Shigen Riyo Katsudo* [Generation Difference of Family Work and Natural Resource Use]. 2007 nendo Nippon Chiri Gakkai Yokoshu Kumamoto Daigaku [Abstracts, 2007 the Conference of the Association of Japanese Geographers in Kumamoto Univ.].
Ikeguchi, Akiko; and Nonaka, Kenichi. 2008. Heiya no Kurashi to Sakana [The Everyday Life and a Fish on the Plain: From the Village of the Vientiane Plain]. In *Hito to Sakana no Shizenshi: Haha naru Mekong Gawa ni Ikiru*, edited by Akimichi Tomoya and Kurokura Hisasi, pp. 9–32. Sekaish-isosha,
Kono, Yasuyuki; Nathan, Badenoch; Tomita, Shinsuke; Linkham, Douangsavanh; and Nonaka, Kenichi. 2010. Agency, Opportunity and Risk: Commercialization and the Human-nature Relationships in Laos: Introduction. *Southeast Asian Studies* 47(4): 365–373.
Nishimura, Yuichiro; and Okamoto, Kohei. 2007. Time-Geographic Analysis on the Change of Jobs in Vientiane Municipality, Laos. *The Lao Agriculture and Forestry Journal 2007* 58–66.
————. 2008. Vientiane heno Kojo Shinshutsu to Mura no Seikatsu. In *Vientiane Heiya no Kurashi*, edited by Nonaka, Kenichi. Tokyo: Mekong.
Nishimura, Yuichiro; Okamoto, Kohei; and Boulidam, Somkhit. 2008. Raosu Shuto Kinko Noson ni okeru GPS GIS o Riyo Sita Sonraku Jumin no Seikatsu Kodo Chosa [Daily Activity Survey in Lao Suburban Village Using GPS and GIS]. *Chigaku Zasshi* [Journal of Geography] 117(2): 568–581.
Noma, Haruo. 1988. Noson Shakai ni okeru Jikan Haibun Kenkyu (Time Allocation) no Kontekusuto. *Jinbun Chiri* 40(2): 144–163.
Nonaka, Kenichi; Adachi, Yoshinao; Itabashi, Norihito, Sivilai, Sengdouang; and Boulidam, Somkhit. 2008a. Ikimono o Hagukumu Suiden to sono Riyo. In *Vientiane Heiya no Kurashi*, edited by Nonaka, Kenichi. Tokyo: Mekong.
Nonaka, Kenichi; Saito, Haruo; and Adachi, Yoshinao. 2008b. Kounki de Mori o Taberu. In *Ronshu Monsun Azia no Seitaishi* 1 : *Seigyo no Seitaishi*, edited by Kono, Yasuyuki, pp. 71–83. Tokyo: Kobundo.
Pred, Allan 1981. Production, Family, and Free-time Projects: A Time-geographic Perspective on the Individual and Societal Change in Nineteenth-century. U. S. cities. *Journal of Historical Geography* 7: 3–36
Szalai, S. 1972. *The Use of Time: Daily Activities of Urban and Suburban Populations in Twelve Countries*. The Hague: Mouton. 868 p.

Southeast Asian Studies, Vol. 47, No. 4, March 2010

Conflict between Water Buffalo and Market-Oriented Agriculture: A Case Study from Northern Laos

TAKAI Yasuhiro* and Thanongsone SIBOUNHEUANG**

Abstract

This paper is a case study of the decline of water buffalo husbandry under the pressure of land use change in contemporary northern Laos. Since 2000, with the spread of market-oriented agriculture and the implementation of land use zoning, fallow areas suitable for grazing have been squeezed leading to a conflict between grazers and cultivators. Local government has prohibited the former from allowing their livestock to graze freely in the areas designated for commercial agriculture, encouraging them to establish fixed pasture areas. These grazing lands have experienced a number of problems stemming from the difficulty of implementing co-management, and after several trials many of the grazers sold off their water buffaloes to traders. This is compounded by another incentive that pushes them to sell off their buffaloes: the development of buffalo meat distribution mechanisms. The demand for meat has risen steadily in densely populated areas where many the new migrants from rural areas have started to show a tendency to purchase foods such as buffalo meat. Commercial dealings in water buffaloes seem to have hit their peak around 2005. However, after the peak, the boom has been on the decline due to the number of water buffaloes falling sharply in rural areas leading to difficulty for villagers to continue to graze water buffaloes in both traditional and innovative ways.

Keywords: water buffalo, grazing, fallow, land use, conflict, distribution, migration

I Introduction

In recent years, market-oriented production systems have started to replace customary subsistence-oriented diversified livelihoods in contemporary Laos which has seen it become a land-linked country in the Greater Mekong Subregion. People living in northern Laos near the Laos-China international border have been experiencing this change on a daily basis and are presently faced with options about whether to take a risk of pursuing short-term benefits to adjust to the market economy or to maintain their rural lifestyles including water buffalo grazing. Having these options at hand, their economic interests have divided and this differentiation has become a source of conflict

* 高井康弘, Faculty of Letters, Otani University, Koyamakamifusa, Kita, Kyoto 603–8142, Japan
e-mail: takaiyas@res.otani.ac.jp
** Information and Documentation Center (IDC), Lao National Academy of Social Sciences (NASS)

among them especially when concerned with their common resource land use management used previously for both swidden agriculture and water buffalo grazing. This paper aims to describe the processes of change of the local economy and its impacts on water buffalo grazing practices, to identify consequent conflicts among rural societies, and to examine the emerging vulnerability of the livelihood.

According to official statistics data, the number of water buffaloes (*Bubalus bubalis*) in Laos has ranged from about 1,000,000 to 1,200,000 head between 1990 and 2007 [NSC 2005: 73; MAF 2008: 55], while the national population estimates numbered 5,747,587 persons in 2006 [NSC 2007: 22]. Thus, on average, there is approximately one water buffalo kept per five persons in Laos. In the northern provinces, where this case study was undertaken, the number of water buffaloes was fewer than the central and southern provinces. Nonetheless, water buffaloes were commonly grazed by villagers as an important component of their livelihoods, particularly in the lowland areas along rivers and streams, until around 2004.

This paper introduces data collected in three provinces in northern Laos. First, we describe why and how villagers graze water buffaloes, focusing on grazers' decision-making processes. Secondly, we pay attention to the rapid decrease in the number of water buffaloes in the lowland areas of northern Laos. This paper explores these dynamics within the socio-economic background of the study area.

Official figures for the national and provincial water buffalo population have not shown any drastic changes over the past 10 years. However, information provided by local people, including village headmen, officers and traders, suggests that the number of water buffaloes has fallen sharply in the rural villages near the main roads between local cities and towns of northern Laos, starting around 2004.

The analysis presented here focuses on the growing conflict between grazers and cultivators and how this has brought about a decline in water buffalo numbers. The essence of this livestock-agriculture conflict is centered on a lack of grazing areas, as the implementation of land use zoning and the rapid expansion of commercial agriculture have squeezed the fallow lands previously used for grazing. Since the 1990s, there has been an expansion in the area under rainy-season cash crops in lowlands and foothills along the main roads. For example, hybrid corn provided by Thai and Vietnamese merchants has become popular in Oudomxay province. This corn is purchased by the merchants and sold at either Chinese markets by way of Mo Han or Vietnamese markets accessed through Dien Bien Phu. During this same period, dry-season paddy and vegetable cultivation has also expanded in the irrigated lowland areas.

On the other hand, since the end of the 1990s, the local government has started to implement land use zoning and land use planning based on the 1996 Forest Law. The intent of these policy directions was to promote both forest conservation and the development of a market economy in agriculture. In order to do this, a clear distinction between forest conservation areas and agricultural development areas was deemed

necessary. According to plans, forest lands are divided into several categories but no forest is allocated for swidden agriculture [Yokoyama 2004: 133]. As will be discussed in more detail below, young fallow in the swidden cycle is a suitable place for grazing water buffaloes. Fallow areas have decreased as swidden agriculture has been severely limited by land zoning and land use planning, and villagers have chosen to graze their water buffaloes and cattle in areas adjacent to agricultural fields resulting in a conflict with farming activities.

The analysis presented here is based on primary data gathered during the authors' field research in Oudomxay, Luang Phabang and Luang Nam Tha provinces, conducted from 2003 to 2009. Figs. 1 and 2 show the locations of studied villages, towns and cities. The next two sections introduce grazing practices in one of the study villages during the period of low conflict, and how those practices changed as conflict increased.

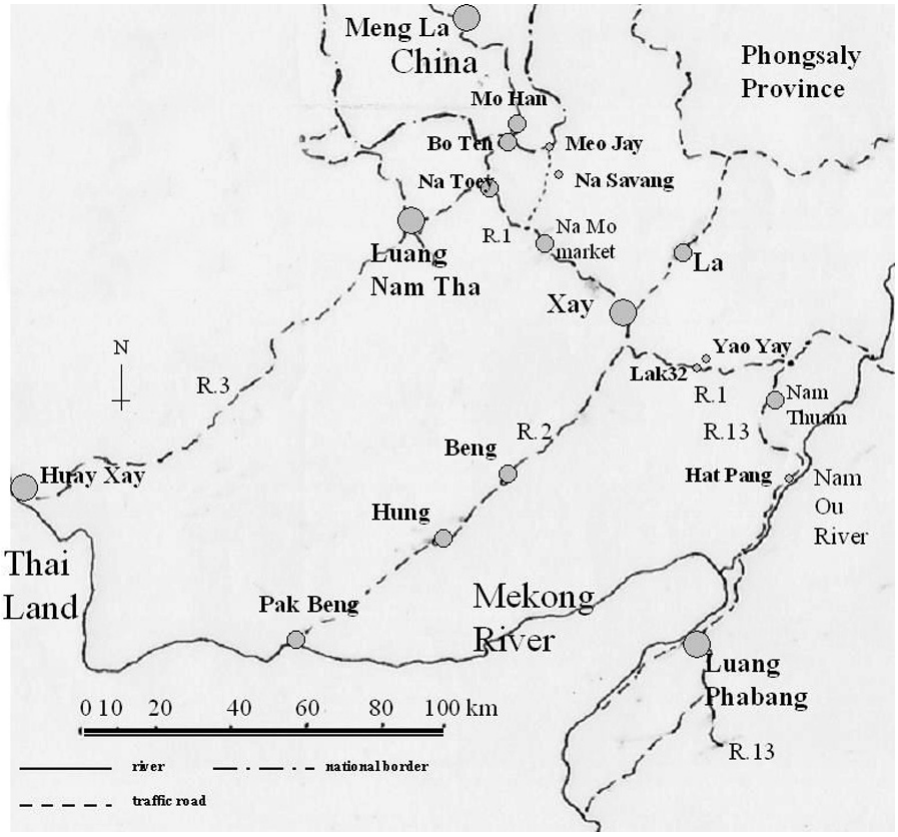


Fig. 1 Cities and Towns in Northen Laos
Source: Created by the authors

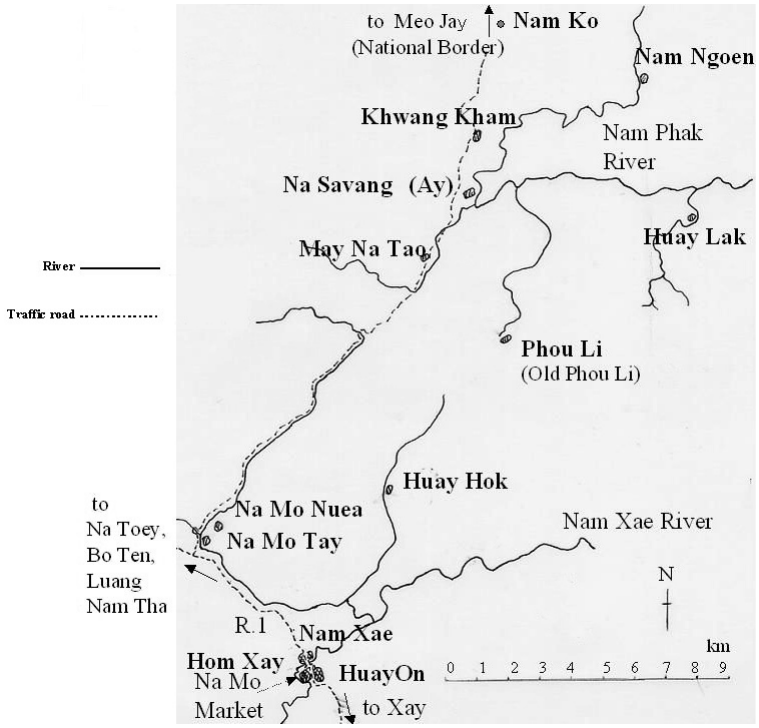


Fig. 2　Research Sites
Source: Created by the authors

II　Use of Water Buffalo in the Study Village

Na Savang, an administrative village in Na Mo district of Oudomxay province, is our main field research site in this study.[1)] The village, also known locally by its former name, Ban Ay, is located in the Nam Phak River basin near the border between Laos and China. Most of the villagers identify themselves as Yang or Tai Yang, an ethnic category within the Tai-Kadai ethno-linguistic group that includes the lowland Lao and other Tai-Lao groups. The Yang have been heavily influenced by the culture of the Tai Lue, the Yang adopted Theravada Buddhists traditions, who have inhabited the area for generations.[2)]

1) Official data on the composition of households in terms of ethnic group show that the ethnic Lao are not the majority group in most of the provinces of northern Laos. In Oudomxay province, for example, 49.7% of the 1998/ 99 population was Khmu, while Lue, Hmong and Lao were 16.5%, 14.2 %, 12.3% respectively [NSC 2000].

2) According to ethno-linguistic classification, the Yang is a small group of the Tai family. They inhabit northern Laos, northern Vietnam and southern Yunnan. Na Savang villagers came more than two hundred years ago from northern Vietnam to their present location, which was an ancient Lue territory that had been abandoned [Chazée 2002: 30].

Na Savang (or Ay) has a comparatively large area of flat lands, so most of the villagers cultivate paddy in the rainy season and many of them can produce enough rice to satisfy their own consumption needs. Besides agriculture, they go fishing, hunting for insects and wild animals and gathering edible plants in the surrounding area for daily dietary needs.

Villagers had limited opportunity to exchange agricultural or forest products with outsiders for money or other articles until the 1990s. Since around 2000, when the road between Na Mo district town and the Meo Jay border crossing was completed, interactions with small traders or peddlers from other places in northern Laos and China have increased.

Domestic animals, including large livestock and poultry, were an important part of village livelihoods throughout the period of transition from a more self-sufficient peasant economy to a mixed commercial-subsistence economy after completion of the road. Villagers preferred not to slaughter and consume their animals for several reasons. First, large livestock and poultry offered opportunities for exchange with outsiders for money or other articles. Second, buffalo meat, pork and chicken were valuable in preparing feasts for guests that formed the basis of mutual exchange in Lao peasant society. These feasts were held on such occasions as agricultural labor exchanges, life passage rituals and village festivals. Furthermore, buffalo meat, pork or chicken were also offered to various spirits such as the guardian spirit of the village.

Na Savang villagers used to raise water buffaloes, cattle, pigs and chicken mainly in or around their village or fields. According to Matsuura' s field survey data in 2004, the villagers owned water buffaloes more than cattle or pigs and the number of water buffaloes was more than double the number of households (see Table 1) [Matsuura 2004]. About 90 percent of the surveyed households possessed water buffaloes, at about 2.7 head per buffalo owner's household.

In addition to Na Savang, livestock data from Na Mo Tay village, located in a

Table 1 The Number of Livestock in Studied Villages (2004–08) (unit: head)

Village	Na Savang[a)]			Na Mo Tay[b)]		
	Buffalo	Cattle	Pig	Buffalo	Cattle	Pig
2004	309	129	134	200	0	—
2005	230	120	—	86	0	74
2006	192	76	159	—	—	—
2007	160	60	120	30	0	—
2008	126	79	129	0	0	10

Source: The Data of Na Savang (2004) were surveyed by Miki Matsuura (Graduate School of Asian and African Area Studies, Kyoto University at that time) [Matsuura 2004]. The others were from the village-head men of each village.

Note: [a)]Na Savang village was composed of 131 households in 2004.

[b)]Na Mo Tay village was composed of 74 households in 2004. Most of the villagers were the non-Buddhist Yang.

riverside area along the main road is presented (see Table 1 and Fig. 2). Na Mo Tay is also a Tai Yang village that grows wet rice, yet in comparison to Na Savang, Na Mo Tay villagers were less well-off, with smaller residential sites and agricultural fields. The villagers owned many water buffaloes but no cattle in 2004.

Among the large livestock and poultry, Na Savang villagers looked upon water buffaloes as the most valuable and useful livestock. First, water buffaloes were necessary for most of the villagers for cultivating paddy fields before hand tractors started to be used in the second half of the 1990s. Water buffaloes were also used for transporting agricultural products. Second, even after hand tractors became popular, the villagers continued to keep water buffaloes as their most valuable fungible asset, as they can be exchanged for either a large amount of money or goods if necessary. The males were sold or slaughtered by the villagers at feasts as the most valuable and tasty dish.[3] The females were kept, because the full aged animals produce offspring each year or two, thereby increasing the villages' assets. Third, villagers could reduce weeding labor in and around the fields and the village because water buffaloes efficiently grazed on the weeds, and additionaly their dung could be used as an effective manure for their paddy crop.

Water buffaloes were multi-functional livestock essential in maintaining the villagers' way of life. Until around 2006, the younger generation of village members maintained these animal husbandry practices in accordance with their cultural and economic norms.

Na Savang villagers used to inherit water buffaloes and cattle from their parents, who would normally pass on their animals to their sons and daughters equally. This can be best illustrated by the story of a 58-year old man and his family in 2007. He had inherited a water buffalo from his foster parents who had eight water buffaloes, while his wife inherited no water buffaloes from her parents. After the inheritance, they grazed the animals which subsequently produced offspring. They bought small Lao native cattle and grazed them, as well. Male offspring were sold when there was a need, and one male water buffalo was slaughtered for a feast for their first son's and the second son's marriages respectively. By the time the informant had turned 55, they owned 7 water buffaloes and 10 cattle. They divided them among his seven children, as can be seen in Table 2. In the next section, we describe how the villagers graze water buffaloes.

---

3) For example, Na Savang village and Khwang Kham village have a custom that the two villages slaughter a water buffalo jointly and villagers share the meat and drink liquors with their friends and neighbors on each precept day's eve called *mue hang* or *mue da* during the Buddhist Lent. Besides this custom, Na Savang villagers eat water buffalo meat at wedding parties and housewarming parties. They also eat it after sacrificing to the guardian spirits of Mueang Ay and the village every year. (In the old meaning, the *mueang* was a ritual or political unit binding local communities as villages.) They customarily have parties to eat the meat also during the *kin tiang* new year and the *Mahasat* Jataka Festival. Several villagers told us that it was a taboo for Na Savang villagers to eat beef during the Buddhist Lent because a cow was a foster mother of the Buddha in their local Jataka tales.

Table 2 Inheritance of Water Buffalo, Cattle and Paddy Field: A Case of a Villager in Na Savang in 2004

Children	Sex	Age	Marital Status	Feast at Marriage	Residence	Inheritance of Buffalo	Inheritance of Cattle	Inheritance Paddy Field
1	M	36	married	1 male buffalo	with parents	2 females	1 female	inherit
2	M	32	married	1 male buffalo	married out	2 females	1 female	inherit
3	F	29	married	non	married out	0	1 female	0
4	F	29	married	non	adopted out	0[a)]	0	0
5	M	24	unmarried	—	with parents	1 female	1 female	inherit[c)]
6	F	19	unmarried	—	with parents	unfixed	unfixed	0
7	F	17	unmarried	—	with parents	unfixed	unfixed	0
parents						1 female[b)]	6 females	

Source: Surveyed and interviewed by the authors

Note: a) The third and fourth children were twins, so the latter was handed over to the adoptive parents. She already received a female buffalo and a female cattle from the adoptive parents.

b) The parents kept a female water buffalo and six female cattle with them at the division in 2004. They told us they would like to give the sixth and seventh children two female cattle each in the near future but the inheritance was unfixed. They also told us they would give water buffalo's calves to their younger children when a water buffalo gave birth.

c) The parents held one hectare of paddy fields which were not divided among their three sons in 2004. The parents told us they would give the fields to their sons after the third son's marriage.

III Water Buffalo Grazing and Fallow Land

In rural areas of northern Laos, land remaining fallow after the harvest of both paddy and swidden agriculture is used for grazing water buffaloes.

In 2006, many of Na Savang villagers cultivated paddy in the rainy season only and after the rice harvest in November or December, whereby villagers allowed their water buffaloes to graze in and around their own fallow paddy fields during the daytime. Before it got dark, water buffaloes returned to their owner's remote seasonal cottage or to nearby their paddy fields, where they were hitched to the pillars underneath the cottage, and given rice straw which was stocked there.[4)]

Water buffaloes were allowed to move together freely across each owner's field, and the animals tended to move in groups. Each group had a few leaders which had reached full age.[5)] In February, the owner let male buffaloes mate with the females naturally.

4) For example, the rice straw of a popular traditional breed called *Khao Ta Kiat* is about 120 centimeters long and a traditional breed called *Khao Hok*'s straw is about 160 centimeters long.

5) The villagers call the leaders *huana hung khway* (the leader of water buffalo group), *mae phueng* (the mother of group) or *mae nyai* (big mother) in Tai or Lao. In most cases, the leaders are females about five to twelve years old. According to the villagers, the females↗

Even if an owner has females only, he could expect his females to get pregnant because there were always a few males in or around his water buffaloes' group.[6)]

After half a year's grazing on the fallow paddy fields, they plowed, harrowed and leveled the fields using their water buffaloes in May, June or July until the middle of the 1990s. However, most villagers cultivated their fields with hand tractors in 2006.

When rice transplanting had started, the owners, their sons or sons-in-law let their water buffaloes move from the paddy fields to the forest area (*poy pa*).[7)] According to villagers, *pa lao* — grass field, bush or young woods that have been fallowed for between one and four years after swidden cultivation — are appropriate for grazing lands.[8)] The grazers selected points near streams or ponds where plants such as *Panicum notatum (nya nyung), Imperata cylindrica* (L.) Beauv. (*nya kha*) or bamboos grew in bunches and let their water buffaloes graze in these areas during the wet rice planting season.

Na Savang villagers' cattle grazing practices differ from water buffalo. Although the villagers allowed Lao native cattle to graze on fallowed paddy fields during the dry season, they do not release cattle into the forest during the rainy season. Rather, they choose to keep cattle near the village throughout the year, as they believe it is bad for cattle to get wet. Furthermore, cattle require less grass than water buffaloes, so they can be kept nearer to the house where villagers can keep a closer watch on them. This is in contrast to water buffaloes, which are believed to be well-adapted to the more natural environment of the forest.

Since the 1990s, people grazing water buffaloes have formed several small, informal groups in order to manage their livestock during the rainy season when they move into

---

↘ are able to move in a group, though the full aged males have difficulty living together. So the groups tended to be composed of full aged females and calves.

6) In some villages, we were told that they did not castrate the males at all, though in other villages, including Na Savang the males aged over about six years old were castrated because the villagers perceived un-castrated elder males tended to become thin and hot-tempered trouble makers. Na Savang villagers told us that they kept the males under about five-year-old un-castrated because the younger males are useful for breeding.

7) The word *poy* is used in contrast with the word *liang* which carries the meaning to feed, take care, keep, and domesticate. The former means to set the water buffalo free all day long, while the latter includes part-time grazing during the dry season, as mentioned above. The word *pa* means forest, woods, bush and grass fields in contrast with the word *na* (paddy field) and *hai* (swidden). The former is land left under semi-wild or fallow conditions, while the latter is land that is managed by humans, and kept under artificial conditions.

8) The word *pa lao* is used in opposition to the words *pa kae* and *pa dong*. *Pa kae* means aged fallow forest, of more than about five years after swidden harvest. *Pa dong* means natural forest and deep fallow forest many years after the last swidden agriculture. In many cases, water buffaloes do not enter into these kinds of forest, because of a shortage of edible under grass and young trees.

the forest.[9)]

As mentioned above, the water buffaloes grazing in the adjacent plots of a fallow paddy area tended to form groups naturally during the dry season in 2006. In many cases, the owners of the water buffaloes grouping together in the dry season formed a rainy-season buffalo management group. The core members of this group tended to be a close partilineal descent group members who often have paddy lands and residential sites close to each other, as according to local practice, these lands were passed on from parents to sons, which contrasts to the more equitable inheritance of livestock among both sons and daughters.[10)] There were, however, several cases in which daughters inherited plots from their parents when the parents had large land or the daughters' husbands had little hope of inheriting land from their own parents.[11)]

Each grazing group used the forests of the upper or lower reaches of a stream near the grazers' paddy field and moved along the stream. Each group was thus known by the stream's name, such as the Hoy Stream Line Group (*khum say huay hoy*), and the Nam Lao River — Mixay Line Group (*khum say nam lao mixay*), and so forth. The Nam Phak River Line Group (*khum say nam phak*) is introduced below.

In 2006, the Nam Phak River Line Group was composed of nine water buffalo' owners with all members residing in the same settlement in the village. Each owner had 1 to 5 water buffaloes with a total of 31 water buffaloes in the group.

During the dry season, the members allowed their water buffaloes to graze in the fallow paddy fields called Na Ma and Na Luang (see Figs. 3 and 4). The eight members had their plots in these fields (Fig. 4). Fig. 5 represents their kin relationships.

Among the members, Mr. S had no plots in the Na Ma- Na Luang fields but owned two plots in other paddy fields. One of his plots was located near May Na Tao (a Khmu village) and the villagers allowed their animals to graze in the plot with his consent.[12)] Another plot belonging to Mr. S was used by the owner of a neighboring plot for grazing. The field where these plots were located were not large enough to accommodate a large

9) The members told us the local government officers advised them to organize the co-grazing groups, but they also explained to us that their groups were organized customarily before the advice was given.

10) The members who descended from the same patrilineal ancestor called each other *takun diao kan*. They tend to use their surname which include the same word showing this relationship.

11) For example, Mr. D inherited no pieces of land from his parents, so the parents of Mr. D's wife gave a plot of them to her. Mr. K's mother also inherited land from her parents for the same reason (see Fig. 5).

12) The Khmu, Kmhmu', Kamhmu or Kammu belong to the Mon-Khmer family of the Austroasiatic speakers, according to the ethno-linguistic classification. The Khmu are one of the original inhabitants of the Indochinese region, having lived here since before the arrival of other non-Mon-Khmer people. In old times, the Lao and Thai people called them by the name *Kha* which meant slave [Simana 1998: 1–2].

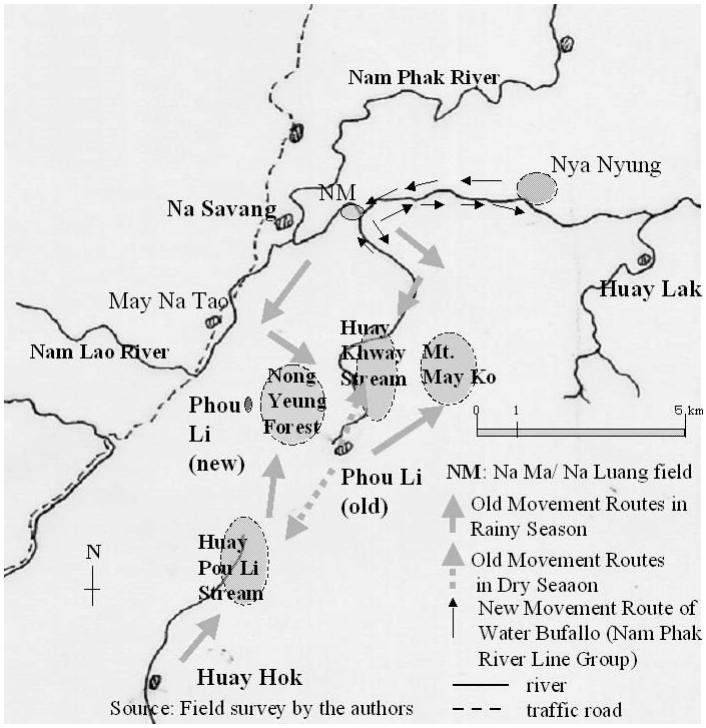


Fig. 3　Water Buffalo Grazing Routes
Source: Created by the authors

number of buffaloes grazing jointly, so Mr. S grazed his five buffaloes in the Na Ma field during the day and hitched them to the posts on the mountainside nearby during the night. This was done with the owners' consent, and demonstrates a case of the cooperation and compromise in using paddy fallow among the grazers during the dry season.

When the villagers started paddy transplanting, some or all members of the Nam Phak River Line Group encouraged a few water buffalo leaders to walk out of the paddy fields toward the eastern forest area along the Nam Phak River (see Fig. 3). The rest of the water buffaloes followed the leaders. The grazing area was located around the village border between Na Savang and Huay Lak (a Khmu village). Group members followed their water buffaloes and guided them to a suitable grazing area. After reaching this point, an elder male member performed an offering to the local spirits to ask for help ensuring the safety and good health of their buffaloes. After the offering, the members left their animals and returned home.

During the rainy season, the members walked into the forest area usually once every several days in order to check their water buffaloes. This was done by rotating group members, and they usually took a handful of salt in order to catch their interest. After

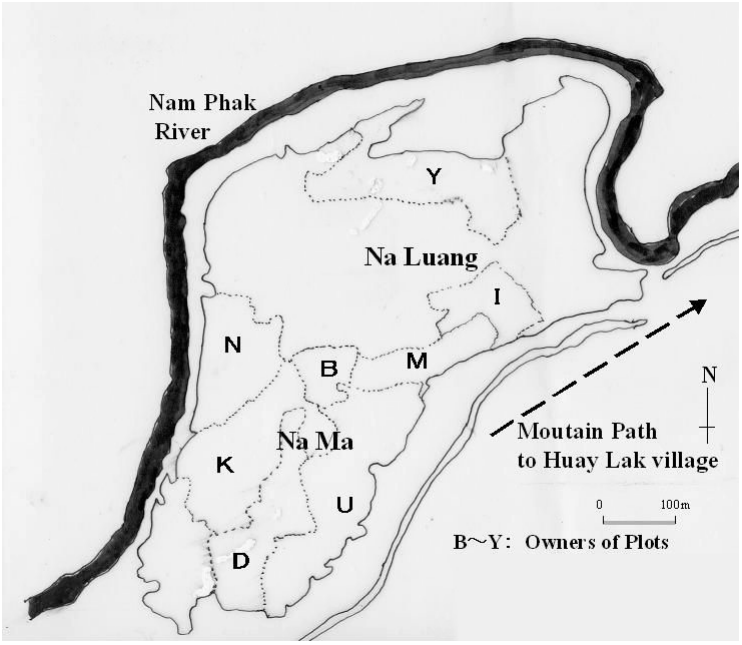


Fig. 4 Paddy Field Plots of Nam Phak River Line Group's Members in Na Ma-Na Luang area in 2006

Source: Created by the authors using Takashi Kotegawa's Field Data Map

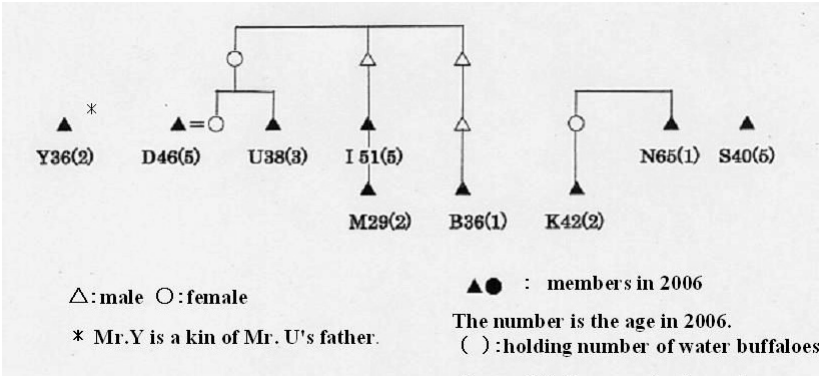


Fig. 5 Kin Relationship among Nam phak River Line Group's members in 2006

Source: Field survey by the authors

they found them, they inspected their bodies carefully and treated any injuries or illnesses with medicinal plants in the forest as necessary.[13] In any case, the person on duty had to report the conditions of each water buffalo to its owner. Before water buffaloes ate all the grass in the area, they were moved to a new spot. During the days when rice plants were in flower and they began to seed, the grazers moved water buffaloes to an area far from paddy and swidden fields and after the rice was harvested, water buffaloes were allowed to go back to paddy fields.

Na Savang villagers customarily graze water buffaloes as a component of their traditional livelihood, together with farming, fishing, hunting and gathering using both the fallow of both paddy and swidden fields for grazing. In this way, they are able to reduce the time and labor needed for feeding and weeding. Villagers prefer to graze water buffaloes and cattle freely, rather than resort to other options for more productive, low-risk grazing, despite damage they sustain from parasites, poisonous plants, wild beasts and injuries incurred during forest grazing. This is partially based on the thoughtful and restrained interactions among the members of local communities, where villagers, including both grazers and cultivators, cooperate closely with kin and neighbors to translate generalized norms of reciprocity into specific arrangements for managing natural resources.

IV　Selection of Grazing Area and Latent Conflict

The annual calendar of water buffalo grazing mentioned above, however, shows the latent conflict between agriculture and livestock. Grazers must control water buffaloes to avoid damage to paddy rice and swidden crops as when conflict points flare up, the grazers are urged to change their grazing areas. This happened in Na Savang several times in the 1990s, which will be described in the following section below.

Until the 1980s, Na Savang villagers used to let all of their water buffaloes move out to the southern areas called the Pa Nong Yueng Forest and the upper reaches of the Huay Khway Stream during the rainy season, because the fallow areas near Na Savang were not large enough to cater for the needs of their water buffaloes (Fig. 3).[14] The grazing areas were located in the territory of the White Hmong village named Phou Li. During grazing, Na Savang grazers used to go into forest grazing areas to check their water

13) For example, a Na Savang grazer told us that he mixed Mercurochrome, lime and hot pepper and applied the concoction to the bite from a venomous snake. In addition to the grazers' daily care, veterinarians of the local government visit Na Savang to vaccinate water buffaloes against parasite diseases twice a year, for the buffaloes grazing in the forest are at high risk of getting the diseases.

14) *Nong Yueng* means swamp or damp ground which never dries up. *Huay Khway* means water buffalo stream.

buffaloes once every week or two. After the paddy rice harvest, they would let their water buffaloes back into their fallow paddy fields.

In contrast, Phou Li villagers used to let their water buffaloes and Lao native cattle move to the Mt. May Ko area during the rainy season, and let them move to the upper reaches of the Huay Khway Stream or the Huay Phou Li Stream during the dry season (Fig. 3). However, Phou Li villagers had no paddy fields and cultivated swidden fields in the Pa Nong Yueng Forest during the rainy season.

In those days, it appeared that Phou Li villagers were tolerant of the Na Savang grazing in their village territory. They gave permission to allow about 300 water buffaloes from Na Savang to move into the Pa Nong Yueng Forest and the upper reaches of the Huay Khway Stream every rainy season. In addition to Na Savang grazers, Khmu people from Huay Hok village also grazed about 100 water buffaloes in the Pa Nong Yueng Forest and the upper reaches of the Huay Phou Li Stream (Fig. 3).

But many of Na Savang grazers have shifted their grazing points back to their own village lands in the early 1990s when Phou Li villagers became intolerant to Na Savang villagers' grazing. According to the ex-village headmen of both Na Savang and Phou Li, the village-border was delineated in the early 1990s. Villagers related some trouble cases whereby Phou Li cultivators shot at water buffaloes owned by Na Savang villagers to express their discontent when their animals ate their agricultural products. The ex-village headman of Phou Li commented on the troubles that it was natural that the cultivators had a right to get meat if the grazer did not pay any form of compensation. What this scenario suggests is that the growing consciousness of the exclusive ownership of village territory and the commercial value of agricultural products might have made the villagers intolerant.[15)]

After the withdrawal from the Pa Nong Yoeng Forest, most of Na Savang villagers continued to allow their water buffaloes to graze in several areas around their village during the rainy season between 1990 and 2008 as mentioned above. Each area was not large, so they had to subdivide their water buffaloes' group into smaller sizes.

Additionally, it has also become more difficult to graze animals in the fallow paddy during the dry season every year, as since the 1990s, farmers have started growing off-season vegetables after the rice harvest. Several land owners in the Na Ma — Na Luang fields have also being trying to grow various kinds of market-oriented agricultural products, such as watermelon, in the fields during the dry season. They have had to fence their plots to keep the animals out.

---

15) In 2004 and 2005, most Phou Li villagers moved to a new site near the Nong Yueng pond, following the local government's advice, because the new site was located near their agricultural fields and on the new road through this area. Cash-cropping has become popular among them since 2004. They left about 20 water buffaloes and 50 cattle in their pasture site near their old settlement in 2007. According to them, they reduced the number by half after migration. In 2007, the population was 268 persons in total 42 households.

In 2007, a member of the Nam Phak River Line Group told us that he kept his plot in the Na Ma field in order to let his water buffaloes graze during the dry season. He grew watermelons in his remaining plot in another field. However, another member of the group told us it became difficult for water buffaloes to graze in the Na Ma field. He subsequently moved his dry season grazing area out of the field.

Despite the Na Savang grazers' constant attempts to adapt to the changing conditions by shifting their grazing areas around, in the end many of them would abandon their husbandry efforts. In the next sections we describe how the growing sense of conflict led to a prohibition against free grazing in Luang Nam Tha and Oudomxay provinces, which ultimately brought about a decline in the number of water buffaloes in these areas.

V　Deepening Conflict and the Decline in Water Buffalo Grazing

The conflict between grazers and cultivators has been a real problem since around 2000. Damages from grazing animals are regularly reported to the village headman, who typically acts as a mediator between the grazer and the cultivator who sustained damage. A set of mediation rules has emerged and is regularly applied. In cases where the victim's guard fence was prepared well, the grazer must pay the same amount of rice as the damage. If the fence was not well-prepared, the grazer would be partly excused from compensation.[16] Around 2000, many village headmen began to advise villagers to set up barbed-wire fences around their agricultural fields to keep the animals out.

The above-mentioned prohibition of swidden agriculture and the spread of cash-cropping have been a source of tension with regards to livestock management. However, in more recent years, the boom in rubber planting in the hillside areas along the main roads has served to exacerbate these tensions. In northern Laos, rubber planting started in Luang Nam Tha province in the middle of the 1990s. Some of the pioneer planters have already begun to reap large benefits in the form of cash income from latex sales. These success stories spread rapidly among the communities of the area, offering farmers an attractive alternative crop. Since around 2005, rubber planting, both in plantations and small holder plots, has reached unprecedented proportions.

In many cases, the upland rice and other cash crops are planted among the young rubber saplings that have been planted in the swidden fields. But in the third year, as the tree canopy begins to close, the fields give way to rubber mono-cropping. Planters can expect to start tapping the trees for latex in the eighth year, and can normally sustain collection for approximately 30 years.

16) In cases whereby a group of water buffaloes or cattle owned by several grazers have damaged the crops, each of them should share the burden of compensation according to the number of the holdings.

Water buffaloes like to eat the rubber saplings, which has made the task of controlling grazing animals all the more difficult. For example, in Phou Li village, five households started to plant the rubber saplings in 2005. In 2007, the villagers told us that if a water buffalo had eaten a two-year-old rubber sapling, the planters would demand compensation of 100,000 kip (about US$ 10.4 or 1,235 YEN). The compensation for a three-year-old rubber sapling was 500,000 kip (about US$ 52) and the compensation for a four-year-old tree was 1,000,000 kip (about US$ 104). These penalties were high enough to discourage grazers from releasing their animals in the area of rubber gardens.[17)]

In addition to these local solutions, the provincial and district governments have developed several measures to resolve disputes between grazers and cultivators. On one hand, higher levels of government observed the success of local village headmen's prohibition against free grazing in populated areas and agricultural promotion zones. The Luang Nam Tha provincial government supported such regulations in the Luang Nam Tha basin around 2000.

For example, in Done Khoune village, located in the old populated area of Luang Nam Tha, the villagers had already fenced their paddy fields in the 1990s. They allowed their water buffaloes and cattle to graze freely outside of the fenced fields during the rainy season and then moved the animals into the fallow paddy fields during the post-harvest season. In addition, the provincial government gave notice of the prohibition policy and the village committee decided not to allow their animals to graze freely near the village in 2001. The government did not compensate the grazers for their loss of grazing land, but pledged to improve the traffic and educational conditions of the village in return.

Since 2005, the government of Oudomxay province has also carried out this policy in most parts of the basin and hillside areas around roads. The following case of Huay On village near Na Mo market (see Fig. 1) illustrates how this was done. Since the 1980s, both cash-cropping and commercial activities developed constantly in this area. According to the villagers, the soil of this area was fertile, so many migrants arrived to cultivate the fields and paddy, corn and rubber saplings were planted intensively by 2008. The district government and the village committee jointly prohibited the villagers from grazing their animals freely in the area since 2004 when the planting of rubber saplings started to gain momentum in the area. Since 2006, grazers had to pay 500,000 kip fine per water buffalo or cattle when it was found that animals were grazing in the prohibited area, even if they did not cause any actual damage to the crops. As a result of this regulation, the cultivators no longer need to fence their fields to keep water buffaloes and

17) The daily wage for physical labor was about 30,000 kip (about US$ 3.12, 370.4 YEN) in Xay city and Na Mo market's area in 2007. The wage was 25,000 kip in 2006. The daily wages of rice transplanting and harvesting in Na Savang village were as follows: 15,000–20,000 kip (2006), 20,000 kip (2007) and 25,000–30,000 kip (2008).

cattle out, because the grazers are responsible for the damage caused by their animals in the prohibited areas, even if the damaged fields were not fenced.

On the other hand, the local government has been advising village headmen to fix the grazing areas and encouraging grazers to graze their animals together in groups. Starting in 2000, the government has left it to each village to decide whether it will establish designated areas for grazing or not. The villages are free to determine the grazing areas in their village, but government officers have recommended that the villagers establish these grazing areas in mountainous areas far from the residential and agricultural areas, where rivers and thick forests provide a natural 'fencing' for the animals.

In the Done Khoune village case mentioned above, the villagers decided to move their 200 water buffaloes and 300 cattle to a bamboo forest located about 10 kilometers south of the village. This site was used collaboratively with two other villages for four years. In 2005, however, villagers lost access to this forest because the provincial and district governments granted a long-term lease over the area near this forest to a Chinese rubber planting company. By 2009, the village had no fixed pasture areas, thus water buffaloes started to disappear and only about 50 cattle remained.

In Huay On village, the grazers sold about half of their animals after the prohibition against free grazing. The number of water buffaloes decreased from over 100 to 62, while the cattle decreased from 80 to 40 in these five years, as well. The grazers moved most of their remaining water buffaloes into fenced pasture sites in the mountains located in other villages and entered into collaborative land use arrangements with the local villagers.

The cases of Yao Yay and a neighboring village named Lak 32 in the eastern mountainous area of Xay district, Oudomxay province (see Fig. 1) provide more detail information on the impact of these restrictions. Yao Yay is a White Hmong village that migrated from Nga district in 1973 when Route No. 1 of Oudomxay province was paved. After settling, they allowed their animals to graze around their village freely. But the grass around the village ran out by the end of the 1980s. They consequentially moved their animals to a hill area named Phu Nya Kha where *Imperata cylindrical* (L) Beauv. (*nya kha*) grass grew abundantly. Lak 32 is also a new village along Route No. 1 established in 1976. This village is composed of migrants from various ethnicities around the areas and villagers here allowed their animals to graze freely in the southern riverside areas. But grazing became difficult as the population rapidly increased and the reclamation of paddy land in the riverside areas progressed. Lak 32 villagers and Xay district government asked Yao Yay villagers for permission to let a part of the Lak 32 animals move into the Phu Nya Kha area in 2002 and as a result of this the two villages started to jointly use the pasture. However, after trouble arose between the herds of two villages in 2004, Yao Yay villagers built a fence to divide their pasture area off from Lak 32's area.

Rubber planting has also become popular among the villagers since 2006. Lak 32

grazers moved the majority of their animals into the pasture land of Phu Nya Kha. The implementation of the Forest Land Allocation Program, carried out with assistance from the Oudomxay provincial Agriculture and Forestry Division and the Xay district Agriculture and Forestry Office, helped villagers begin planting rubber saplings in 2006–07.[18] Under the leadership of the village committee, fallow forest located in the non-protected zones was allocated to villagers. However, rights to use plots of allocated land are forfeited by farmers who leave the plot fallow, which provides a strong incentive for farmers to do intensive cash crop farming or planting rubber. This also provides them with cash to pay land tax.

As water buffalo and cattle grazing increased the pressure on the pasture area in Yao Yay, villagers began to sense the coming crisis of grass shortage through the increase in water buffaloes and cattle grazing on the pasture. At the same time, it seems that Lak 32 villagers did not grasp the actual number of animals grazing in this pasture. It seems probable that, with different socio-cultural backgrounds, these villages were not able to create the type of relationship necessary for effective rules for co-management.

In contrast to these cases where villagers set out clearly defined grazing areas, Na Savang, Na Mo Tay and Done Khoune villages already mentioned above decided not to set fixed pastures. In these villages, villagers tended to select from the following options. First, some of them stayed with the animals to watch over them during the day in all seasons so that they could continue grazing in the prohibited areas. The animals were tied to the post of the owner's cottage during the night. Second, some of them tied their animals to poles in fields or forests with a rope long enough for them to graze widely during the day. The animals were then tied to the poles of the cottage during the night. This was practiced throughout the year. And third, others made an agreement to leave their female livestock with grazers of their acquaintance in the mountainous region outside of the prohibited area under the agreement in which grazers receive the first calf while owners get the second one. The grazer and the owner share the offspring equally and the mother livestock is taken back to the owner after the end of the agreement. These arrangements were used by some villagers even in villages where grazing lands have been established.

However, many of the animal owners expressed displeasure with the outcomes. With the first option, grazers complained that they do not have enough time to watch over the

18) According to Takayuki Namura, the Forest Land Allocation Program is a set of policies as follows: (1) land zoning according to both the natural conditions and the purpose of using each area, (2) specification of management rights for each plot, (3) definition of land use and appropriate land management practices for each plot. According to the Ministry of Agriculture and Forestry, one of the purposes is to make full use the latent resource and to develop cash cropping, afforestation and livestock grazing. Another purpose is to allow villages to manage the forests for conservation. This program has been in operation since the beginning of the 1990s in Luang Phabang and Sayabury provinces [Namura 2008: 206].

animals. This is especially because both household heads and spouses have experienced an increase in workload with the rapid growth of cash-cropping and other economic activities. Younger members of the family attend school, so in reality animals are cared for by young children and the elderly, who are not appropriate for following animals into the mountainous forests for grazing. This has meant that grazing areas have contracted into the smaller available areas nearer to the village.

In the first and the second arrangements, villagers have to spend time on cutting and transporting grasses which were previously eaten by water buffaloes themselves. They must cut and carry fodder for the animals during the period of August to October, when there is no rice straw available. This physical labor is often more strenuous than the new economic activities. And considering that water buffaloes need more fodder than cattle, water buffalo husbandry has become a less attractive option, as it is increasingly difficult to meet the grazing and feeding needs of the animals. Water buffalo husbandry has become such a burden that many have chosen to stop.

Table 1 shows the rapid decrease in the number of water buffaloes in Na Savang and Na Mo Tay over the period covering 2004 to 2008. In 2008, most of the members of Nam Phak River Line Group sold their water buffaloes. Na Savang villagers have continued raising cattle and pigs, which is done in small contained areas near the village, although the total number of water buffaloes and cattle have decreased significantly in the past five years. Na Mo Tay villagers now have no large domestic animals.

In the third arrangement, we witnessed several tense situations between grazers and owners. A man in Done Khoune village had 8 water buffaloes and 50 cattle in 2000. But after the loss of pasture land in 2005, he sold all of his water buffaloes and some of his cattle to traders. He left 8 cattle with his friend in a village located in the mountains and left 9 cattle with another friend in another village. The cattle with the former friend bred 6 calves but all died and the 2 female cattle also died because of the shortage of fodder grass in his friend's village, where rubber tree planting had become popular. After a year and a half, he brought his cattle back from his friend. His friend requested 700,000 kip as a fee for grazing the animals. The owner felt the fee was unreasonable but paid it nonetheless so as to avoid destroying the relationship with his friend. The cattle with the latter friend also lost weight, and two died because the water of the stream was not good for cattle. After two years, he took his female cattle back and equally divided the four new-born calves with the grazer.

This kind of conflict between grazers and cultivators is reflected within the district government as well. According to an officer of the Livestock and Fisheries Section (of the Department of Agriculture and Forestry), the policy direction of his section was in conformity with that of the Agriculture and Forestry Section's direction until 2000, as the agriculture and forestry officials appreciated livestock's production of manure for agricultural fields. However, since 2000, the two sections' directions have parted ways. The Agriculture and Forestry Section's efforts have promoted market-oriented crops that use

chemical fertilizers while excluding grazing livestock. The department supported the latter's direction because the increase in export revenues is important for the government and foreign markets hold the highest potential for exporting Lao cash crops. Compared to the cross-border trade in agricultural products, livestock trade is troublesome because of the concern for disease and parasites.

The Livestock and Fisheries Section is well aware of the possibility of meat shortages, in the near future and has been promoting local varieties of livestock since the 1990s, in an effort to increase meat supply.[19] Some farmers responded to this by leasing cattle to graze on land provided free of charge by the government while other farmers are experimenting with new hybrid fodder grasses in or around their pasture areas.[20] These innovations indicated farmers' adaptive capacity, but despite advances in management practices farmers still face serious constraints in accessing sufficient areas of land.[21]

In the rural areas, the villagers have taken up the shift to market-oriented agriculture with great enthusiasm, and their limited labor resources are increasingly dedicated to cash cropping work and small-scale trading. There are wide-spread perceptions that water buffalo husbandry with the tasks of feeding and careful control is not a good use of precious time, and many have begun to sell off their herd. Villagers who liquidate their herd often purchase hand tractors.[22] According to these people, the people dealing in the water buffalo trade tend to act as mediators between the villagers and the shops in the

---

19) The Livestock section started to encourage villagers to graze Lao native cattle varieties instead of water buffaloes since the end of the 1990s because of the following points: (1) water buffaloes are not suitable for group farming on a large scale. (2) The breeding of cattle is faster and more productive than water buffalo. (3) Water buffalo meat poses a higher risk of parasitic disease than beef. (4) Beef is more preferential than water buffalo meat by the consumers in central Laos and foreign countries. (5) It is difficult for the villagers to graze foreign hybrid cattle in the natural environment of northern Laos.

20) Various breeds of grass such as *Panicum maximum* (*kinni*), Paspalum, Stylosanthes guianensis have been introduced by Centro Internacional de Agricultura Tropical (CIAT) in Luang Phabang province since the middle of the 1990s. The project was also started in Oudomxay province in 2001. But according to the officer, the grass planting did not become popular among the villagers because they tended to suspect the grass made the soil poor.

21) For example, a Tai Lue farmer from Hat Pang village, Phak Ou district, Luang Phabang province has rented 12 hectares of land from the government and started to grow varieties of fodder grass provided by the government since 2002 (see Fig. 1). He was the only innovator in his village. His trials were successful and he had a number of well developed livestock. But shortly after that, he found that the fodder grass supply was insufficient and he could not find new land to expand his pasture. In 2006, most of the surrounding lands were converted to rubber tree plantation. So, he started to graze goats in his pasture, leaving his cattle and water buffaloes to his friends who lived in the mountainous region. According to him, the government has promoted the rubber planting rather than livestock husbandry.

22) Villagers of Na Savang and Na Mo Tay sold a full-aged water buffalo for 3,500,000–4,000,000 kip and purchased hand tractors for 8,000,000–12,000,000 kip in 2005–07. The hand tractors they preferred to purchase had Thai-made bodies and China-made engines. According to the village-head man of Na Savang, there were 60–70 hand tractors in the village in 2006.

municipal areas of Xay or Luang Nam Tha.

In summary, it has become increasingly difficult for villagers to continue keeping water buffaloes by either grazing freely in fallow fields or other ways. This is particularly so in villages located near roads with no fixed pasture areas. Local authorities have tightened regulations over land use in order to reduce livestock-agriculture conflicts, but priority is given to market-oriented agricultural development over the customary rights of grazers and potential for livestock development.

The land zoning policy has functioned to encourage and legitimize a restructuring of land use from water buffalo grazing based on customary land use management toward cash cropping by farmers who assert their exclusive rights on the land in which they have invested their money and labor intensively.

The decline of water buffalo grazing indicates the break-up of customary mutual agreement systems within a process shifting from previously diverse production systems to a more simplified cash-cropping one proceeded by both rural villagers and governments orientating toward a market economy and international trade in the current land-linked conditions.

In the following section, we turn to the local traders who deal in fresh buffalo meat, to highlight how the development of these distribution mechanisms is another incentive that pushes villagers to sell off their water buffalo herds.

VI　Trade in Water Buffalo and Changing Life-style

The Lao government's policy on commercial trading has changed drastically in the past 40 years. In the early years of the socialist regime, the government dealt directly in the trade of livestock, though after a few years, state companies took over this role from the state, even if policy still formally recognized the government as having the central role. Since the beginning of the 1990s, private traders have reassumed an officially recognized role in the trade of livestock in Laos. After the open door policy was adopted, the number of traders rapidly increased in both urban and rural areas. Meanwhile, many state companies ceased their activities.

The rural villagers of northern Laos are able to choose where and to whom they sell their livestock, based on the consideration of price differences between traders in surrounding towns and cities. For example, Na Savang villagers have sold their water buffaloes and cattle to traders from an adjacent village named Khwang Kham, Huay On and the municipal area of Xay district (Xay city). Traders also come from Luang Nam Tha province and villages on the other side of the Lao-China national border. The following discussion introduces the role of traders from Huay On, Xay city and China.

VI. 1 *Huay On Village and Na Mo Market*

A few Huay On villagers started to sell water buffalo meat at Na Mo market in 1990. In 2004, there were three co-business groups (*ju*) of the traders. The groups increased to five in 2008. Each group was also a formally authorized unit (*nuay*) under an obligation to pay taxes with each group composed of four or five small traders. Many of them were part-time traders who also engaged in paddy cultivation. The members of a group pooled their capital in order to purchase water buffaloes or cattle.

Huay On is located near Na Mo market along Route No. 1 which connects Xay city with Luang Nam Tha and Bo Ten (Fig. 1). The market is developing into a new trade center for Na Mo district. A small shop belonging to the district government was established in the early 1980s, and Na Mo market was formed later throughout the 1980s and 1990s.[23] Huay On was composed of 40 Khmu families in 1980, and increased to 296 (1,492 persons) in 2008. Huay On and two neighboring villages have become a relatively densely populated area over the past 30 years. Some of the villagers have engaged in small-scale trading at the market, while cash-cropping spread throughout this area, as described above.

There are five groups selling water buffalo meat or beef at Na Mo market.[24] The groups use a five-day rotational system whereby on a group's designated day, a water buffalo or cattle is slaughtered in the slaughter house at two o'clock in the morning, and the meat is sold at the morning market from five o'clock. During the four interim off-days, members of the group visit villages in Na Mo to purchase animals for the next market day. According to one of the traders, none of the group members has a car or motorbike, so they have to walk or take a mini-bus to their destination and bring the purchased animals home with them on foot. In 2008, he told us that water buffaloes and cattle have become fewer in villages near traffic roads, so he had to spend longer time than before to approach their owners in the distant mountainous areas from roads.

In 2008, the local demand for water buffalo meat and beef was not very high. But the emergence of the sellers itself shows that the local inhabitants have begun to purchase meat even on regular days, outside of their festival-days. This may be partially explained by the fact that it has become difficult for the people living in the densely populated areas to catch fish or insects in the surrounding environments. The local people indicated that fish in the Nam Xae River have decreased because of over-fishing and water pollution. They now purchase fish and meat from traders, though some people maintain fish ponds for self-consumption.

Besides selling at Na Mo Market, each group of local traders also sold water buffaloes

---

23) Besides small stands, there were about 60 shops, including clothing stores, daily necessities' shops, pharmacies and restaurants in Na Mo market area in 2006.

24) Some traders of Nam Xae village have taken charge of the sale of pork at Na Mo market since the middle of the 1990s. Most of the Nam Xae villagers are White Tai.

and cattle to traders in Xay city which is 52 kilometers east from Na Mo Market. In contrast to Huay On traders, the traders from Xay City transport the livestock they purchase in pickup tracks. They also use mobile phones to communicate with their business counterparts.

VI. 2　*Xay City and the Traders*

Xay city is the center of trade and transportation in Oudomxay province. There were only several Lue villages in the basin before the 1960s, but migrants from various ethnic groups started arriving from the surrounding mountainous areas in Oudomxay and other provinces in 1975 when the Lao P. D. R. was established. The total population increased to about 15,500 by 2008. Through a rapid development process, many of the swamps and forests have been reclaimed, so water buffaloes and cattle have decreased in the city area.

Until the 1980s, water buffaloes were sold officially by the state company of the province. The purchase clerk was a black Tai man, who walked to villages in and around the Xay basin in order to purchase water buffaloes. When the clerk was able to procure water buffaloes, the company slaughtered a few head each day. When he procured no water buffaloes, there was no more meat available yet, according to ex-workers, the inhabitants had few complaints about this because local people purchased meat in few amounts at that time.

In the first half of the 1990s, three Khmu men built a private slaughter house and started to deal in buffalo meat. Twelve Khmu traders who used the slaughter house formed an authorized unit. In 2000, a black Tai family from Luang Phabang built another slaughter house in the army station and formed another unit.[25] The two units dealt in both water buffaloes and cattle. But the former were more frequently slaughtered, because northern Lao local people preferred buffalo meat to beef. In 2003, an average of four to five buffaloes would be slaughtered on any ordinary day.[26]

This number increased to six or seven head in 2008. The two units slaughtered more than 12 head on each of the four big festival days in 2008.[27]

In the case of the Khmu traders' unit in 2003, each trader brought water buffaloes or cattle to the private slaughter house on the determined day of a twelve-day rotation. After the slaughter, he sent the fresh meat to saleswomen. There were two units of saleswomen handling the retail supply of water buffalo meat and beef from this slaughter

25）In 2004, this unit had moved to the suburban area and a friend of the family took over the slaughter house at an army station between 2004 and 2007. During this period there were three units in the city.

26）When traders had no water buffaloes, cattle were slaughtered in their place. According to the head of the slaughter house, seven cattle need to be slaughtered to get the same amount of three full-aged male buffaloes' meat.

27）The four big festival days are New Year's Day, the Fifth Month Full Moon Festival Day and the day preceding the Beginning and End of Buddhist Lent.

house. Each unit was composed of 17 saleswomen and sold the meat retail every other day at either Nong Maeng Da market or Nong Leng-Ban Thin market in the city.[28] The saleswomen were paid in piece rate.[29] Traders also sold the skin to seven local food producers who processed it into *nang phon* (fried buffalo skin) and *nang yam* (dried buffalo skin). During the off-days, throughout the year, traders visited rural areas to purchase their stock.

In addition to the trade in Xay district, some traders of two units also dealt in the inter-district trade formally through contracts with other districts. They sometimes resold cattle out to traders from Vientiane. They were not, however, able to deal in inter-provincial trade since around 2006, as will be described below.

VI. 3 *Unauthorized Traders and Markets in Neighboring Countries*

The above mentioned cases are authorized by the government but it is very difficult to get an accurate volume of livestock trade, because quite a few unauthorized traders are operating in northern Laos. For example, villagers in the Nam Pak River basin told us unauthorized traders came from the Chinese side of the border area at night. According to the villagers, some of the traders resell the purchased animals to Thailand.

The livestock trade tends to be heavily influenced by cross-border markets. According to a Huay On villager, in 2008, unauthorized traders offered higher price than most of the traders of Huay On and Xay city for water buffaloes and cattle. He told us that Huay On traders offered 6,400,000 kip (about US$ 736) for a large male water buffalo aged 10, while unauthorized traders offered more than 8,000,000 kip (about US$ 920) for an animal of the same size in 2008, because the latter could sell water buffaloes to traders in the Chinese urban markets at higher prices than the local markets of Laos. The price of water buffalo meat was 30 yuan (about 37,500 kip, US$ 4.3) per kilogram at Meng La City markets in Yunnan province of China, while the price was 25,000 kip (about US$ 2.9) at Na Mo market and 27,000 kip (about US$ 3.1) at Nong Maeng Da market in Xay city in 2008.

These traders supply livestock to markets in the densely populated urban areas of northern Laos and markets across the border in China. This is largely driven by the increasing demand for meat in both places.

According to a head-manager on food control at the industry and commercial department of Oudomxay province, the consumption of water buffalo meat in the province has been increasing by about 20 percent each year since 2000. The emergence of the densely populated areas appears to have driven up domestic demand. As mentioned

---

28) The retail price of water buffalo meat or beef per kilogram was 19,000 kip at the city markets in 2004. It increased to 25,000 kip in 2007. The daily wage was about 30,000 kip in the city in 2007. The prices were also influenced by the exchange rate between the kip and the U. S. dollar.

29) According to the contracts made with the saleswomen in 2008, they received one thousand kip per kilogram sold.

already, even rural lifestyles have been subject to influence from the urbanization processes. However, the lifestyle of urban residents has changed even more drastically. Customary livelihoods based on semi-subsistence and self-sufficient rural culture cannot be sustained for a number of reasons as follows: (1) They do not have enough land for agriculture and fallow lands for getting plants easily; (2) Water resources have been declining because of the reclamation, over-fishing or pollution of rivers and ponds near populated areas; (3) They do not have enough time for fishing, hunting and gathering, for they have become busy with either trading or wage labor. Many of them have come to believe that it is better to go into non-farming economic activities, including trade in livestock, so that they can purchase meat from merchants at the market, rather than spend time catching fish and collecting edible plants in the fields and streams.

But it must also be pointed out that the sustainability of the current trade in water buffalo may be doubtful. According to traders who deal in livestock in Xay city and Huay On village, their business reached its peak around 2005. However, since 2007, it has become increasingly difficult to purchase water buffaloes and cattle at reasonable prices from rural villagers, because of the marked decrease in water buffalo in villages near traffic roads, while the buyers have increased. The government of Oudomxay province has been trying to strengthen restrictions on the export of water buffaloes and cattle in order to ensure a reliable supply of the meat to the provincial market and to control the market price of the meat. In fact, the export of water buffalo meat from Oudomxay province to Thailand was formally stopped in 2001. Oudomxay province also stopped renewing contracts with other provinces on the number of exportable water buffaloes and cattle in 2006 and 2007. These restrictions seem relatively successful in relieving meat shortages, but a number of the traders, grazers and officers were all pessimistic about the future prospects of water buffaloes. The major concern is that water buffaloes will disappear completely from northern Laos in the near future.

VII　Conclusions

In this paper, firstly, we began by describing how rural villagers in northern Laos graze water buffaloes. Our conclusions show that villagers are practicing a more subsistence-oriented, diversified livelihood strategy, including such activities as paddy planting, swidden cultivation, fishing, hunting, gathering and livestock. Within this subsistence-orientated context, grazing activities have been relatively successful.

The fallow in forests and fallow paddy fields are a kind of common resource shared among grazers, including people from neighboring villages. Mutually understood agreements were made on the selection of grazing points where cultivators are, in principle, tolerant of using fallow land for grazing. However, latent tension between grazers and cultivators became a real conflict, as fallow lands suitable for grazing diminished. This

conflict has been exacerbated by the rising popularity of market-oriented agriculture. With the introduction of rubber planting and struggles over land use we can also see the re-conceptualization of land ownership taking place.

Implementation of land zoning served to bolster the government's policy of promoting market-oriented agriculture. At the same time, land zoning increased tensions regarding access to common resource fallow fields, over which grazers did not have formal land use rights. To compensate for the loss of access to grazing land in areas designated as agricultural development land, local governments advised the grazers to establish fixed pastures in mountainous areas far from the agricultural development zone. However, the villagers have experienced problems with this shift. In many cases, it is difficult to find suitable sites large enough for grazing their animals in collaborative arrangements. Even in the cases where villages were able to establish grazing areas, these were used by the grazers whose home villages, ethnic identities or economical interests were different each other. New rules for managing these shared but limited resources have been slow to develop. Furthermore, with exposure to the penetration of the market economy, many villagers have decided to use their precious labor resources for commercially-oriented agriculture and wage labor, rather than water buffalo husbandry. As a result of the ban on free grazing, and the surrounding circumstances described here, many villagers stopped water buffalo husbandry and sold off buffaloes in urban markets.

While the number of water buffaloes in rural areas declined rapidly, the demand for meat among the urban population grew. Markets provide easy access to fresh meat if there is a reliable supply. But the continuing decrease in water buffalo husbandry means that urban consumers may not be able to purchase what they need in the near future.[30] Alternatively, meat prices may rise if traders must rely on supply from more distant sources.

It seems to be a natural phenomenon that people pursue convenience, safety and prosperity through the adoption of urbanized and modern lifestyles. The market economy linked to neighboring countries' markets brings opportunities to realize new lifestyles. However, these opportunities are accompanied by risks, as many of the new trends are seen to be unsustainable. The spread of cash cropping and rubber plantation appears to homogenize the production systems of rural villagers in our study areas. But there is a strong element of uncertainty with the new cash crops that are dependent upon foreign markets. The future demand for these products cannot be predicted, and lifestyles that are intimately linked to the production and trade of cash crops can become unstable. This suggests that there may be an increase in the vulnerability of people's

30) It is noticeable that pig and fish farms have been growing in number and size in Xay city and its suburban areas since around 2007. Hybrid pigs provided by Thai and China merchants are bred in these farms.

livelihood.

Livestock, such as the water buffalo presented here, has been a beneficial and fungible asset for villagers. From our analysis we conclude that livestock husbandry is not only an important source of alternative or supplementary income, but forms a safety-net which can act as a buffer for rural people to weather some of the shocks of the market transition.

People in this area have also faced dilemmas whereby their pursuit of short-time cash income has been accompanied by the risk of the break-up of their traditional local communities and customary common resource management systems. We have identified the conflicts mentioned in this paper as a sign of this occuring. It is an urgent issue to re-construct mutual agreement systems for people who have various economical interests to manage their common resources.

The impacts of land zoning and cash-crop booms on the rural economic balance and people's livelihood stability need to be studied carefully. As Namura [2008: 227] pointed out, balancing the tensions between land use zoning, which tries to simplify the human landscape, and customary natural resource management, which tends to be based on diversity and complexity, is a key challenge to contemporary rural society. Adjustments between these two seemingly opposed systems should take place through processes such as the exchange of information, perspectives and options between livestock grazers, crop cultivators and local government officials. These exchanges form an essential foundation upon which trust, and understanding can be built, and eventually lead to effective and locally appropriate rules and regulations to guide resource management. Within this, another challenge is to provide innovative support to enable livestock grazers, both those who establish fixed grazing areas and those who graze their animals freely in the mountainous areas, to adjust their systems in the face of rapid socio-economic change.

Acknowledgement

We are grateful to have participated in the research project entitled "A Transdisciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005" which was organized by Prof. Tomoya Akimichi, Research Institute for Humanity and Nature (RIHN). The project was supported by the Ministry of Education, Science and Culture of Japan. We sincerely thank Prof. Yasuyuki Kono, Kyoto University, leader of the forestry and agriculture group. We acknowledge with many thanks the assistance from Mr. Souriyanh Sisangrat (IDC), Mr. Souligneth Phompharchanh (ex-researcher, Institute for Cultural Research, Ministry of Information and Culture, Laos), Mr. Phuwan Duangdala and Dr. Nathan Badenoch (Northern Agriculture and Forestry Research Center, Laos).

References

Chazée, Laurent. 2002. *The People of Laos: Rural and Ethnic Diversities*. Bangkok: White Lotus.
Izikowitz, K. 2001 *Lamet: Hill Peasants in French Indochina*. Bangkok: White Lotus.
Kotegawa, Takashi. 2005. *Field Map on Na Savang (Ay) Village*. Forestry and Agriculture Group's

Data Base in the research project entitled "A Transdisciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005." (http: //www.creas.kyoto-u.ac.jp/fawg/) Accessed 12 July 2006.

Matsuura, Miki. 2004. *Basic Statistics on Na Savang (Ay) Village*. Forestry and Agriculture Group's Data Base in the research project entitled "A Transdisciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005." (http: //www.cseas.kyoto-u.ac.jp/fawg/) Accessed 4 August 2005.

Ministry of Agriculture and Forestry (MAF). 2008. *Agricultural Statistics Year Book 2007*. Vientiane.

Namura, Takayuki. 2008. *Tochi Shinrin Bunpaijigyo o Meguru Mondai* [Problems on the Land Forest Allocation Programme]. In *Laos Nosanson Chiiki Kenkyu* [Lao Rural Area Studies], edited by Yokoyama, Satoshi and Ochiai, Yukino. Tokyo: Mekong Press.

National Statistical Center (NSC). 2000. *Phon Khongkan Samluat Sathiti Kasikam, 1998/99, Khwaeng Oudomxay* [Research Report on Agricultural Statistics of Oudomxay Province in 1998/ 99]. Vientiane.

————. 2005. *Statistics 1975–2005*. Vientiane.

————. 2007. *Statistical Year Book 2006*. Vientiane.

Simana, S. 1998. *Kmhmu' Livelihood: Farming the Forest.* Institute for Cultural Research. Vientiane: Ministry of Information and Culture.

Sprenger, G. 2005. The Way of the Buffalo: Trade and Sacrifice in Northern Laos. *Ethnology* 44(4): 291–312.

Takai, Yasuhiro. 2005, Luang Phabang no Ushi Suigyu Niku Ryutsu to Kuro Tai Raijumin [Black Tai Migrants and Distribution of Water Buffalo' Meat and Beef in Luang Phabang]. In *Higashi Azia no Kazoku Chiiki Ethnicity: Kiso to Dotai* [Family, Locality and Ethnicity in East Asia: Traditional Base and Present Dynamics], edited by Kitahara, Atsushi. Tokyo: Toshindo Press.

United Nations Development Programme. 1996. *Socio-Economic Profile of Oudomsay Province.* Vientiane: Rural Development Programme Formulation, UNDP.

Wijeyewardene, G. 1968. Address, Abuse and Animal Categories in Northern Thailand. *Man (n.s.)* 3 (1): 76–93.

Yokoyama, Satoshi. 2004. Forest, Ethnicity and Settlement in the Mountainous Areas of Northern Laos. *Tonan Ajia Kenkyu* [Southeast Asian Studies] 42(2): 132–156.

Yokoyama, Satoshi; and Ochiai, Yukino, eds. 2008. *Laos Nosanson Chiiki Kenkyu* [Lao Rural Area Studies]. Tokyo: Mekong Press.

Southeast Asian Studies, Vol. 47, No. 4, March 2010

Water, Livelihood and Health in Attapeu Province in Lao PDR

Midorikawa Yutaka[1], Midorikawa Kaoru[2], Bounphenh Sangsomsack[3]
Traykhouane Phoutavan[4], Kampheng Chomlasak[4], Watanabe Toru[5]
Nanthasane Vannavong[6], Habe Shigehisa[7], Nakatsu Masami[8]
Kosaka Yasuyuki[9], Kongsap Akkhavong[10], Boungnong Boupha[10]
Michel Strobel[11] and Nakamura Satoshi[8]

Abstract

This paper presents the results of an investigation on water-borne infectious disease conducted among the people of Attapeu province from 2003 to 2008. Regardless of the last cholera epidemic in Attapeu province, Lao PDR in the year 1999, the local peoples' awareness of cholera was remarkably low, as demonstrated by the knowledge survey on diarrheal diseases performed in the province in 2006. In the case study material, derived from continuous field observations on malaria among permanent residents in relocated villages in Sanxay district from 2004 to 2008, the infection rate among febrile cases was as high as 45% in the early resettlement period, while it was proved that the rate fell later to 1.9–14%. Judging from the environmental condition of this settlement area, this paper makes clear the persistent threat of malaria. Furthermore, among the villagers, hookworm infection was highly prevalent. However, liver fluke infections were scarce and no ascariasis was found from parasitic stool examination in 2007. Water quality analysis of the water sources resulted in remarkably safe water from tube wells from 2003 to 2008.

Keywords: Laos, Attapeu, relocation, ethnic minority, cholera, malaria, intestinal parasite.

1）翠川　裕，Suzuka University of Medical Science, Mie, Japan
2）翠川　薫，School of Medicine, Mie University, Mie, Japan
3）Department of Provincial Health Services, Attapeu, Lao PDR
4）Centre for Laboratory and Epidemiology, Vientiane, Lao PDR
5）渡部　徹，College of Engineering, Drexel University, Philadelphia, PA USA
6）College of Nursing, Ministry of Health, Champasack, Lao PDR
7）波部重久，School of Medicine, Fukuoka University, Fukuoka, Japan
8）中津雅美；中村　哲，Research Institute, International Medical Centre of Japan, Tokyo, Japan
Corresponding author's e-mail: (Nakamura Satoshi) snakamura@ri.imcj.go.jp
9）小坂康之，Research Institute for Humanity and Nature, Kyoto, Japan
10）National Institute of Public Health, Vientiane, Lao PDR
11）French Institute for Tropical Medicine, Vientiane, Lao PDR

I Introduction

I–1. *Water-borne and Food-borne Infections in Lao PDR*

Lao PDR accomplished rapid economic development in the past two decades after the *Chinthanakaan mai* policy of 1986, with accompanying improvements of the health condition of the people [Nakamura and Iwasa 2008: 230]. However, water-borne and food-borne diseases, including severe diarrheal diseases such as cholera, dysentery and intestinal parasitic infections are still the most common threatening people in Lao PDR. According to government statistics, the major causes of death in 1995 (100,000 pairs of population) were malaria (7.62), ARI (Acute Respiratory Infections including pneumonia) caused by bacterial and/or viral pathogens (3.03) and diarrhea, including dysentery (1.69), meningitis (1.45) and tuberculosis (0.57), among others [Disease Statistics 1995: iii]. These trends show no change in the year 2005 [United Nations Country Team 2007: 29–30]. Hence, the water-borne infections like diarrhea and malaria are the most common causes of death. Water-borne disease is an illness caused by direct contact with water or aquatic vectors, containing causative microbes. In particular, water-borne disease is functionally common to food-borne infectious disease, for the causative microbe is taken orally. Infective diarrhea, for example, which is focused on food-borne viral, bacterial and/or protozoan agents, is seldom studied in Lao PDR and as such, research on food-borne diarrhea and food hygiene/sanitation has only just started in Laos [Agriculture and Rural Development Department & Rural Development & Natural Resources East Asia and Pacific Region 2006: 11–12]. Also, not many studies have been performed on bacterial diarrhea agents through field surveys in this country. However, some hospital-based or limited local diarrhea survey results are available. As a typical example of pathogen research in this country, there is the case report of the epidemic of cholera in 1993–96 [Midorikawa *et al*. 1996: 724–727] and a review of a severe diarrhea and cholera epidemic in 1998–2002 [Nakamura and Iwasa 2008: 229–246]. As for the causes of these epidemics, only *Vibrio cholerae* O1 Ogawa strains have been reported till the present [Midorikawa *et al*. 1996: 724–727; Phantouamath *et al*. 2001: 95–99]. Common bacterial diarrhea agents identified are enteropathogenic *E. coli, Shigella* spp., *V. parahaemolyticus, Campylobacter* spp. and *Salmonella* Thyphi in Vientiane Capital [Yamashiro *et al*. 1998: 2195–2199; Phethsouvanh *et al*. 1999: 319–323; Phethsouvanh *et al*. 2006: 978–985]. Other infective diarrhea microbes related to parasitic helminthes such as roundworms, hookworms, tapeworms and liver flukes have been widely identified in the country [Phommasack *et al*. 2008: 1201–1206]. Some minor protozoan diarrhea agents such as *Entamoeba* spp. and *Giardia intestinalis* [Phetsouvanh *et al*. 1999: 319–323], as well as *Cryptosporidium* spp. and *Cyclospora* sp. have also been detected in Vientiane Capital [Takemasa *et al*. 2004: 7–12; Kimura *et al*. 2005: 1371–1376]. Regarding diarrheal virus identification, only Rotavirus in

Vientiane, [Yamashiro *et al*. 1998: 2195–2199; Phethsouvanh *et al*. 1999: 319–323; Phantouamath *et al*. 2004: 203–204] and Norovirus in Champasack [Watanabe *et al*. 2006] have been reported. Hepatitis A and E viruses have also been reported in Vientiane Capital [Bounlu *et al*. 1998: 717–721]. Moreover, others like *Leptospira* spp. [Suzuki *et al*. 1997: 436–437; Laras *et al*. 2002: 278–286; Kawaguchi *et al*. 2008: 957–961] and *Schistosoma mekongi* are known important water-borne microbes in Lao PDR [Matsuda and Kirinoki 2005: 143–156; Nakamura 2007: 217–227]. In addition to these studies, in the Mekong watershed in Indo-China the research on the infection risk analysis of water supply systems [Watanabe *et al*. 2006: 18–21] and the model study on local water risk analysis using GIS [Miura *et al*. 2007: 611–616] has proved to be useful.

The water-borne factor is also related to mosquito-borne infections like malaria and dengue fever, because the vectors originated from a water environment. Therefore as mentioned above, malarial death is common in Laos even today and remote rural populations living in or near forests or hilly areas alongside streams are at a particularly high risk [United Nations Country Team. 2007: 29].

I–2. *Background of Diseases, Control and Prevention*

The key background factors of such outbreaks of infectious diseases are malnutrition, especially among children, and insufficient clean water supply. Although many cases of malnutrition are observed in rural areas, the actual conditions of specific areas are not readily grasped, except in the case of a few in-depth studies [Kachondham and Dhanamitta 1992.: 79–87; Boupha *et al*. 2003: 1–67; Miyoshi *et al*. 2005: 887–890]. On the other hand, it is commonly understood that maintenance of a clean water supply or sewer treatment is indispensable in controlling water-borne infections. As in Japan, jurisdiction over the water supply system of Lao PDR is divided between the Ministry of Public Works and Transport (MPWT) and the Ministry of Health (MOH). The former is responsible mainly for supplying drinking water through a piped water system in urban areas, and the latter for constructing tube-wells in rural areas. The Water and Water Resources Law was enacted in 1996 to ensure the maintenance of water quality. The drinking water quality standard in the health sector was enacted as law within the government in 2005, which required that *E. coli* is not detected in drinking water [Anonymous 2005: 7]. However, the efficacy of this microbiological standard is questionable, as access to safe water in rural areas was found to be only 35% in research on national health knowledge and attitudes towards drinking water [Steering Committee for Census of Population and Housing 2005: 118–119], and is not always reliable in the capital city either [Nakamura 2006: 37–41].

In 1978 to 1980, the Lao government carried out a campaign for the “three hygienes” (*sam sa-at*), promoting awareness of water, foods, and clothes in the prevention of water-food-borne infections among rural people [Boupa and Dalaloy 1997: 19]. This is a core idea of Primary Health Care (PHC) which will be mentioned later. The government

finally specified the responsibilities for the nation's health in the Constitution enacted in 1992, and further enacted the Hygiene, Prevention and Health Promotion Law in 2001, and the Law on Health Care in 2005. As for national food hygiene, the Law on Food was enacted in 2004, and related regulations on bottled drinking water standards were brought into force by the Ministry of Health in 2005. These laws are currently available to view on the internet website of the Embassy of Japan in the Lao PDR.

As such in Lao PDR, the implementation of health policies has been guided by a five-year health plan whereby the control policy corresponding to diseases in urban areas is hospital-based treatment. In rural areas, these policies are implemented by the PHC system together with primary medical treatment administered by Village Health Volunteers (VHV) and a public health campaign to prevent diseases [Anonymous 2000: 37–43]. The definition of PHC is that it "encompasses primary care, disease prevention, health promotion, population health (similar to public health), and community development within a holistic framework, with the aim of providing essential community-focused health care" [Shoultz and Hatcher 1997: 23–26]. In Lao PDR, the government defined a public access range to PHC, which implies the least accessibility of the rural people to health facilities such as a dispensary at the village. This zoning is overlapped with *khet* or *koumban* (village cluster), which will be mentioned later.

On the other hand, these infections are closely related to poverty and the Poverty Reduction Strategy Paper (PRSP), supported by the IMF-World Bank, lays out an approach to improving health conditions through economic stimulus. In this strategy, the government specified 72 poor districts – including the 47 poorest ones — as a priority poverty reduction area. In addition to this, the National Growth and Poverty Eradication Strategy (NGPES) program included provisions for promoting health [Government of Lao PDR 2004]. In this strategy, agricultural and forestry, education, health, and transportation infrastructure are stated as priority sectors. The basic policies, priority issues, and projects aimed at eradicating poverty by the year 2010 are also described. NGPES is regarded as the core of the poverty reduction policy in the 6 th National Socio-Economic Development Plan (NSEDP: 2006–10), which was approved by the government in 2006. It is also specified that the *koumban* should provide health care and PHC in mountainous resettlement areas that are home to ethnic minority groups [Evrard and Goudineau 2004: 945–946]. Moreover, water sanitation is a health sector priority in the strategy.

I–3. *Resettlement and Health of Mountain Ethnic Minorities*

Although the economy of Laos is developing quickly and living conditions and the livelihood of the people are also improving, the situation of the public health services in the mountainous poverty area mentioned is still not sufficiently improved. In many cases, health problems, such as increased mortality rates due to diarrhea, malaria, or intestinal parasites have been reported as an element of the process of resettling mountain ethnic minorities in Laos. Some important surveys were carried out to investigate

the general background and the food situation in these resettlement schemes [Ducourtieux 2004: 27–30]. According to Goudineau's report on resettlement in the 1990s, the relocation policy was originally based on the national policy to eliminate production of opium by ethnic minorities and to increase the convenience and effectiveness of minority groups' access to public services. The justification for resettlement was then changed to environmental protection, and more specifically the prohibition of swidden agriculture [Goudineau 1997. Vol. 1 : 29–36]. Even after the year 2000, reports also told about the case of the Akha, for example, in the northern part of the country, where the incidence of vector-borne fever and other infectious diseases had increased at their new villages. [Lyttleton *et al*. 2004: 62–66; Gonzales *et al*. 2005: 33]. In the results of investigations in 12 villages sampled from Luang Phabang, Saravane and Attapeu provinces, the major diseases were diarrhea and malaria. The studies showed that these diseases were still a threat to the people in the area [Sanogo and Vikan 2006: 14–15]. Furthermore, according to the Participatory Poverty Assessment (PPA) report of the UNDP, dysentery and malaria are still the major health issues in the villages surveyed for the previous PPA in 2000 [Chamberlain 2007: 54, 64].

II　Objectives

In 2003 we started a health development study in collaboration with the Lao National Institute of Public Health, Ministry of Health to assess the risk of diseases in rural areas of the country. Before this, we had been investigating the situation of food-water-borne diseases in an area of Vientiane Capital where cholera had once occurred in 1999 [Nakamura and Marui 2000].

Regarding cholera, in the southern provinces, although the causative vibrios were not fully identified, an immunization program with a Vietnamese oral vaccine was conducted for the first time in Laos in some limited areas in Sekong and Attapeu provinces during 1995–96 [Nakamura and Iwasa 2008: 242]. Following this, however, 932 cases of another outbreak of cholera occurred in 2000 in all the districts of Attapeu province except Sanxay [Songsomsack and The Secretary's Team 2000: 2]. Therefore, we decided to investigate water-borne diseases in the province, where health care conditions are quite different from urban areas like Vientiane.

Our study aims to support the provincial health administration activities technically through improving recognition of, and ways of coping with, water-borne diseases among the local residents after an epidemic. Furthermore, support is provided through long-term observational studies to analyse health conditions related to water supply and water quality, including parasitic infections in the relocation area of Sanxay district, Attapeu province (Fig. 1), where the cholera vaccine had been administrated. The people moved from a hilly environment to the present lowland environment several years ago

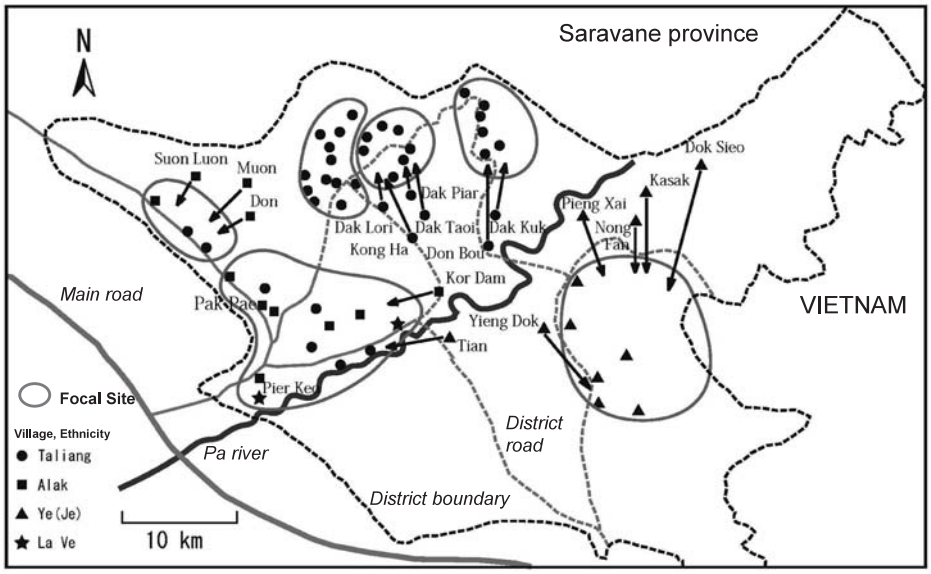


Fig. 1 Relocation for Forming Focal Sites in Sanxay District in Attapeu
Note: Modification of the local administration map, 2001

and supposed to experience health risk at the initial stage of resettlement. Hence, we selected an investigation site in which both the infections and poverty overlap as an area.

Most data in previous reports was obtained by cross-sectional investigation in the northern part of the country, and there is little sustained field research on infectious diseases in the southern part of the country. The results of continued investigation on malaria and water-borne diseases in Attapeu province are presented in this article.

III Methods

III–1. *Study Area*

Attapeu province, the southernmost province in Lao PDR, has five districts: Samarkhixay, Sanamxay, Sanxay, Saysetha and Puvong, comprised of 208 villages with a total population of 91,259 (2000). According to the latest national census, the estimated crude death rate of the province was one of the highest (14.2 per 1,000 persons), comparable to Oudomxay (14.9) and Sekong (14.4) provinces [Steering Committee for Census of Population and Housing 2005: 107–111]. Several villages in the province (excluding Saysetha district) were selected for administering of a diarrhea knowledge survey.

Ban Pak Pae (Pak Pae village) in Sanxay district (Fig. 1) was selected as the site for a case study. The village was relocated in 2001 from its original mountain slope location to the present village site. The villagers are all from the Alak ethnic minority, numbering

128 people and 32 households residing in 29 houses in 2003. The known age group structure is shown in Fig. 2. Their ancestors originated in Sekong province. About 80% of the people were given oral cholera vaccines during 1995–96 [Nakamura *et al*. 2004: 217–218]. Their mean annual income was 896,416 kip, with a range of 0–5,800,000 kip.

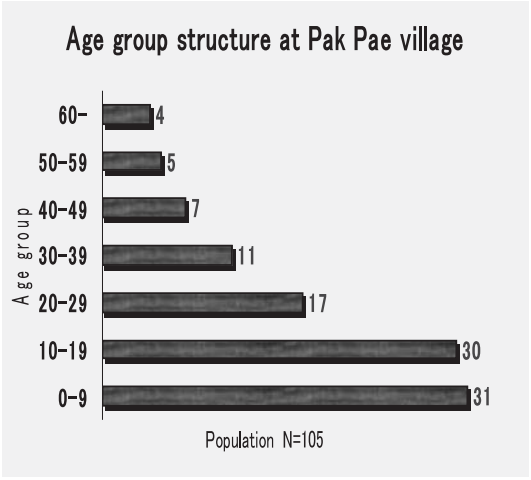


Fig. 2　Sanxay District, Attapeu Province in 2003

The largest change in livelihoods was the shift from upland swidden cultivation to unfamiliar lowland paddy cultivation. In the paddy fields developed around the new village, there is an increased risk of mosquito populations which transmit malaria and/or Japanese encephalitis. On the positive side, the benefits of their new lifestyle include enhanced education for their children and increased access to medical services. However, villagers have to pay expenses associated with medical treatment. Therefore, people find themselves selling valuable livestock to obtain cash for medical service payments. Moreover, some comparatively rich people bought hand-tractors for paddy cultivation, but faced problems in purchasing fuel to run their new machinery. The village was merged with two neighboring villages and renamed Ban Phuxay (total population *ca*. 700) after 2007. However, in this paper, we will continue to use the original name.

Health personnel, such as health volunteers, and health kits have been available in the expanded village since 2007. Pak Pae villagers utilize two water sources for drinking water and daily use water. One is the Pa river water located 40 m near of the village, and the other is two shared tube-wells with hand pumps managed by villagers in the village. These wells were both 20 m in depth and were installed by AusAID in 2001. Villagers did not own private water sources like wells or ponds. The district hospital is located about 4 km southeast of the village. Nutritional status measured by BMI among 40 adult villagers sampled in Ban Phuxay indicated that almost half of the people are underweight (48%), while no cases of obesity were observed (unpublished observation in 2004 and 2008). The daily meals in this area consist of steamed rice and fermented fish sauce only.

IV Study Methods

IV–1. *Diarrhea Awareness and Practices among Residents of Attapeu Province*

This investigation was conducted through an interview survey of households using a questionnaire in 35 villages from four districts: Sanxay, Sanamxay, Samarkhyxay and Phouvong, in February and March in 2006. These villages include: 7 villages of Dapokmam, Hindam, Hindan, Somboun, Souksavong, Then, Vanaxay in Sanxay district, 13 villages named Bok, Caoomphoy, Tatphyla, Hatuhao, Khang, Lanhum, Monang, Sapouan, Saysy, Smongtay, Somsanouk, Somsaypay, Thasengchanh in Sanamxay district, 10 villages of Isok, Khang, Samarkhy, Sekhamane, Somsanouk, Somsouk, Tha, Thahin, That, Xaysomboune in Samarkhy Xay district, the capital area of the province, and 5 villages of Lagnaoneumay, Naxeuak, Phomseat, Vangngong, and Vangnhay in Phouvong district. The population of these villages ranged between 300 and 1,100. The structured questionnaire included items such as diarrhea episodes of the past four weeks; knowledge of common names of different diarrhea, dysentery, and cholera diseases; knowledge of how to cope with diseases using medicines or medicinal plants; consulting traditional healers; seeking local medicinal plants; and actual prescription knowledge of the medicinal plants (See Appendix).

IV–2. *Household Health Survey in Pak Pae Village*

Questionnaire surveys were conducted at Pak Pea resettlement village in 2003 and in 2004 (See Appendix). For the household head or housewife, we asked through a structured questionnaire about occupation, animal husbandry, annual income, water sources and utilization, type of toilet used, ownership of electric goods and mosquito nets, annual illness episodes (especially febrile and diarrheal episodes) and their management in the last two years up to December 2003. These investigations were performed after full informed and voluntary consent was obtained. In 2004, a questionnaire survey on diarrhea and on fever/ malaria was conducted.

IV–3. *Water Quality Analysis in the Village*

Water quality, specifically bacterial contamination of water sources, was measured with the test-paper method [Midoriawa and Itokawa 1987: 740–746; Furusawa *et al.* 2008: 65–74]. The paper was immediately submerged into the water sample (Sun Chemical Co. Ltd.), and the *E. coli* colonies were numbered at 36℃ after 24 hours. This count was the indicator of bacterial contamination, where no *E. coli* per 100 ml of water was the criterion for safe drinking water, as defined in the Lao standards [Anonymous 2005: 7]. The survey was conducted yearly from 2003 to 2008.

Microbial water analysis of the Pa river water was conducted in December 2007,

looking for contamination of *Entamoeba* spp. *Vibrio cholerae*, and norovirus. Forty liters of the sample water from the river was 1 : 400 concentrated using activated Diethylaminoethyl cellulose (DEAE) particle adsorption to detect the objective DNA sequences of pathogens using Polymerase chain reaction (PCR) method [Troll *et al*. 1997; Phetsouvanh *et al*. 2008; Yano *et al*. 1993: 295–298].

V Observation of Parasitic Infections in the Village

V–1. *Malaria*

When we visited the village in December 2003 there were many cases and fatalities from an unknown febrile disease suspected to be a malarial infection. Study of malarial infection rates and the number of malarial patients was started from December 2004. The study was conducted yearly during the dry season, until March 2008. Malaria parasites were examined with Giemsa stain of blood smears [Midorikawa and Hapue 1997: 31–35], PCR method [Arai *et al*. 1994: 617–626], and OptiMAL-IT(DiaMed)kits using 10 μl of blood collected from the finger tip. Samples were collected by medical officers. Only those patients who agreed to be diagnosed were involved in the study. The number of villagers participating was 27 people in 2004, 59 in 2005, 63 in 2006 and 47 in 2008.

V–2. *Intestinal Parasitic Infection*

In December 2006, a total of 120 plastic bags were distributed to people who had remained at Pak Pea village. Stool examination using a routine formalin-detergent technique [Waikagul *et al*. 1997: 5–11] was also used to collect enteric parasites and eggs. For the stool sample collection, we distributed plastic bags to the people under the full given conditions of informed consent. Analysis of the samples was performed at a laboratory at the provincial hospital.

VI Results

VI–1. *Diarrhea Awareness and Practices*

The results of the questionnaire survey are shown in Table 1. Among 60 people interviewed, there was 1 case of diarrhea in the past 4 weeks. Although all the interviewees knew about common diarrhea and dysentery, with the exception of Xaysomboune and Sekhamane in Samarkhy Xay, all of them did not know the name of cholera and its characteristics. On the other hand, 80% of the residents knew some medicinal herbs to be used in case of dysentery or common diarrhea. The most commonly cited medicinal plant was Guava (*Psidium guajava* Linne). Of them, 70% used the plants as herbal tea (Fig. 3 A). Consulting a traditional healer at the time of diarrhea was rare, only occurring in 4 cases (7%).

Table 1 Knowledge of Diarrhea Diseases and Treatment Using Medicinal Plants in Attapeu, Lao PDR

District	Sampled Village	Sampled HH	Knowledge on (%)			Medicinal Plants Usage on (%)		
			Diarrhea	Dysentery	Cholera	Diarrhea	Dysentery	Cholera
Phouvong	5	14	100	100	0*	92.9	92.9	0**
Samarkhy Xay	10	15	100	100	13.3	66.7	66.7	0***
Sanamxay	13	15	100	100	0	66.7	73.3	0
Sanxay	7	16	100	100	0	100	100	0†
Total	35	60	100	100	3.3	81.6	83.3	0

Note: *N= 12, **N= 10, ***N= 14, †N= 15

A. Guava as Medicinal Tea

B. A Plant (*Azadirachta indica*) for Malaria Treatment

Fig. 3 Medicinal Plants for Prevention of Diarrhea and Malaria Treatment

VI–2. *Household Health Survey at Pak Pae Village in 2003*

Among the 24 households cooperating in the survey (75%), the main drinking water sources were well water (23 cases) and river water (1 case), as shown in Table 2. The practice of boiling water for drinking took place in 20 cases (83.3%), and there was toilet ownership in 3 cases (12.5%), while most of the people defecated on the ground in the forest. All the houses had tin roofs and walls made of bamboo. Personal property included a radio in 3 cases but no television set. Mosquito net ownership was found in 18 cases (75%). Animal husbandry included 28 buffaloes, 34 pigs, 101 chickens, and 31 ducks in 2003. With regard to eating habits and food supply, the people traditionally took meals twice daily, once each in the morning and the evening. Rice was the staple food, obtained from individual paddy fields. There was no rice surplus. Additional cultivation of maize was evidenced before the relocation. Cash income was made by the gathering and selling of rattan from the forest: a bunch of 100 pieces of small-diameter, about 20 kg in weight, could be sold for 20 to 30 US dollars in Vientiane. The actual selling price to traders at the village was 30,000 Kip per bunch. One man also earned wages by fishing, which was conducted on week-long trips.

Table 2 Results of Household Interview Survey on Selected Items at Pak Pae Village, Sanxay District, Attapeu in 2003

Item Interviewed	Number
Population	128
House	29
Family	32
Number of the house head/wife interviewed	24
Occupation: farmer	24
Mean annual income (Kip)	896,416
Animal husbandry: Buffaloes (population)	28
Animal husbandry: Pigs (population)	34
Animal husbandry: Chicken (population)	101
Animal husbandry: Ducks (population)	31
Drinking water source: Tube well	23
Drinking water source: The Pa river	1
Drinking water practice: drinking water after boiling	20 *
Drinking water practice: drinking raw water	4
Ownership of toilet	3
Ownership of radio	3
Ownership of television	0
Ownership of mosquito net	18
Number of smoking habit (population)	48
Awareness of drug abuse	23

Note: * In some cases some did drink raw water or river water but boiled the water before drinking

Table 3 Disease Episodes from Interviews at Pak Pae Village in 3 Years from 2002 to 2004

Disease	2002	2003	2004
Malaria/Fever	16 (36)	15 (36)	26 (75)
Diarrhea	10 (29)	7 (16)	18 (43)
Dysentery	9 (27)	4 (7)	NA
Helminthes	3 (13)	1 (5)	NA
ARI	5 (6)	1 (2)	NA
Measles	3 (9)	0	NA
Others	1 (1)	3 (4)	NA

Note: NA: not asked
Number in parenthesis is total case of episode

The disease episodes reported during the year 2002 were as follows (Table 3): fever was experienced in 16 households (66.7%) accounting for a total of 36 cases, of which only three were referred to the district hospital, and at least 1 case was consulted by health personnel. In the same year, 9 cases of measles were observed from 3 households (12.5%). Diarrhea was experienced in 10 households (41.7%); among 29 cases, one consulted health personnel. The households experiencing dysentery totaled 9 (37.5%), with only one case out of an estimated 27 consulting a health worker. The known helminthes

infection was 3 households (12.5%), which included 13 cases. There were at least 6 cases of ARI in 5 households (20.8%). Others reported problems included injury, where only 1 household was concerned.

For the following year 2003, the reported cases were as follows: households experiencing cases of fever (suspected to be malarial) numbered 15 (62.5%). Four out of an estimated 36 cases were referred to the district hospital and at least one case consulted a health worker. There were 7 (29.2%) households experiencing diarrhea and among these, 16 cases consulted a health worker; 4 (17%) households experienced dysentery, and 1 among 7 estimated cases consulted a health worker, whereas only one household was aware of helminthes infection, with 5 cases in the family. There were 2 cases of ARI from the same household (4.2%); 3 households including 4 cases reported injury, two of which were referred to the district hospital. In the year 2004, about 18 (66%) of the interviewees experienced diarrhea and the total cases of diarrhea including the village members was 43 cases.

VI–3. *Microbial Contamination of the Drinking Water Sources*

No *E. coli* contamination was confirmed at the two shared tube-wells with hand pumps managed in the village in the annual surveys administered since December 2003. Before the resettlement, the people were using river water boiled at the mountainside village. People used to drink tea from guava leaves and medicinal wood tip for diarrhea prevention. However, they usually drank unboiled water in the fields at that time. The Pa river water contained 1,700 coliform bacteria per 100 ml, indicating that the water was not suitable for drinking. However, no norovirus or *Entoamoeba* species was detected, although the river might contain non-O1 non-139 *Vibrio cholerae* related strains which have a common DNA sequence with V. *cholerae* O21, which was confirmed by the PCR.

VI–4. *Infectious Diseases in the Resettlement Village*

VI–4–1. *Fever and Malaria*

In December 2004, interviews and blood collection were performed by 27 village health volunteers to detect malarial infections in 16 households. The age range of the sample was 13–70. The number of unknown febrile episodes among interviewees and among their family members was 26 (96%) and 75 cases, respectively. At least two malaria cases were detected on site by microscopy. However, 13 out of 27 persons (44.8%) were infected with *Plasmodium falciparum*, later confirmed by PCR. In 2005, only one falciparum malaria case among 59 displaced people was confirmed (1.9%) with a rapid test kit. In 2006, a total of 63 displaced people were examined for malaria by rapid test; 9 cases (14%) had falciparum malaria or mixed infection from *P. falciparum* plus *P. vivax* (vivax malaria). These cases were all in children under 15 years old. Among the cases, three were severe cases sent to the district hospital immediately. Another one was an adult vivax malaria case. In 2008, 3 falciparum malaria cases (6.4%) among 47 consulting cases

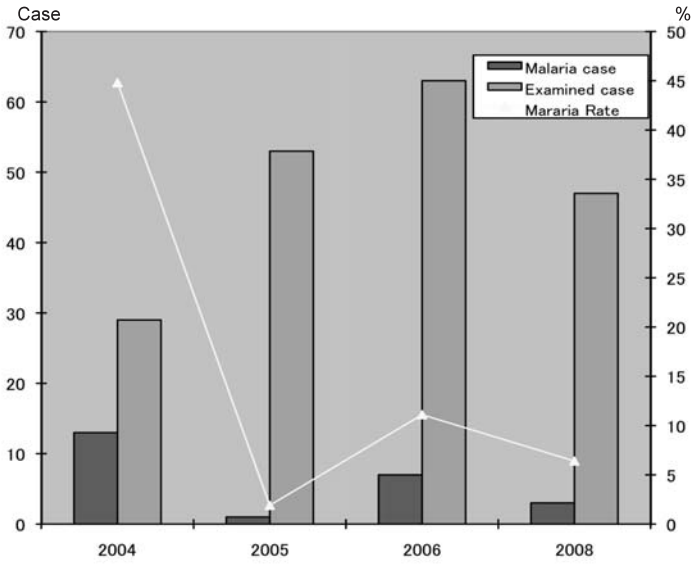


Fig. 4　Malaria Infection per Year from 2004 to 2008 at Pak Pae Village, Sanxay, Attapeu

were confirmed. The decreasing incidence tendency of malaria is shown in Fig. 4.

VI–4–2. *Intestinal Parasites*

A total of 79 samples were recovered. Within the sample, 44 samples contained some sputa or blank. Therefore, 35 out of the 10 households' stool samples (29%) were recovered. As for the results, 29 hookworm infections, 16 *Trichuris trichiura* infections, and 2 liver fluke (*Opisthorchis viverrini*) infections were confirmed (Table 4). The averages of the number of eggs in each 1 g (EPG) were 623, 99 and 49, respectively. In terms of age distribution, 30% of the infections were in children aged 15 years or less. However, this finding was influenced by the age structure bias of the sample (Table 5). Moreover, although 40%, of cases had heavy infection, especially for hookworm and *T. trichiura*, there was no gender difference in case repartition. Concerning protozoan

Table 4　Results of Intestinal Parasite Infections at Pak Pae Village in Sanxay, Attapeu in 2007

Egg of Parasite*	Case	Per cent Rate	Mean EPG**
Hookworm	29	82.9	623.1
Trichuris trichiura	16	45.7	99.7
Opisthorchis viverrini.	2	5.7	49.7

Note: * Modified Formalin-detergent method [Waikagul *et al.* 1997]
** Egg per 1 g

Table 5 Parasitic Infections by Age-group at Pak Pae Village in 2007

	< 5	6–15	16 <	Total	
No parasite	3		3	6	(17.1)
Hw	3	2	8	10	(28.6)
Hw＋T		2	9	14	(40)
Hw＋T＋others		1	1	2	(5.7)
Hw＋others		1	2 *	3	(8.6)
Total	6	6	23	35	(100)

Note: Hw: Hookworm, T: *Trichuris trichiura*
* A case of *Giardia intestinalis* infection and an *Entamoeba* sp. infection case were included.

infection, a *Entamoeba* sp. case and a *Giardia intestinalis* case were confirmed, both in adult males.

VII Discussion

It is surprising that, according to our results on awareness of diarrheal diseases, the local people were apparently not aware of cholera. This is despite the fact that provincial health staff had provided health education for prevention of cholera during every diarrhea epidemic in the region since 1996 [Songsomsack and the secretary's team 2000: 2]. A report of the cholera education team told that they provided interventions at 68 villages (24.3%) in the 5 districts from 1999 to 2000 (Report of cholera education in Attapeu province 1999–2000) when the last cholera outbreak occurred in the region. The report also revealed that an insufficient budget for local government resulted in both short time and low motivation among the work team as well as a lack of the relevant education materials. Furthermore, the same report pointed out that few participants were attending the intervention sessions because of their work in the rice fields. In 1997 and afterwards, the Lao government stopped using the term "cholera," in order to protect the country's trade profits on trade except for the 2000 epidemic [Nakamura and Iwasa 2008: 242].

In relation to water safety among the studied village population, most people prefer to use the safe (pathogenic bacteria-free) tube well water, and only one case reported drinking non-boiled river water. It is not clear why tube well water was not used in the latter case. The river water PCR revealed that it might contain a *V. cholerae* O 21 related strain [Nakatsu *et al.* 2008]; this means that the water source will bear a risk of vibrio infection [Phetsouvanh *et al.* 2008]. Although most of the villagers were using clean well water for drinking, there were many diarrhea episodes annually. It should be noted that the causes were chronic malnutrition among the people, food contamination due to

unclean food handling, or polluted teacups and/or cookware usage, among others.

We do not have comprehensive data on malaria infection from 2002–03 after the Alak people relocated from the mountain area to the plain area. However, in Sanxay district, the rate of malaria infection is comparatively high within the province [Phetsouvanh *et al*. 2004: 547–551]. However, we observed a large number of fever cases. It can be estimated that the remarkable spread of malaria began among these people immediately after migration and persisted until 2004. At the beginning of these malaria outbreaks, people could not cope with the disease. Instead of using medicine for malaria such as chloroquine or quinine, people in Pak Pae village tried to collect and use grass and herbal teas that were not effective at that time. The use of traditional treatments can be summarized as: (1) The villagers thought that those grass and herbal tea were effective for malarial parasites. (2) They had no idea of anti-malarial medicines such as chloroquine. (3) In fact, even if they had the knowledge, medicines such as chloroquine and quinine were too expensive for them to buy. The medicinal herbs that they used as a malaria treatment were sold on the Attapeu market in 2004 disappeared from the market after 2005 (Fig. 3 B). This means that migrating people in Pak Pae village had learned better methods and used effective anti-malarial medicine. For the prevention of malaria, the focal site including Pak Pae village is located along with Pa River, which flows throughout the dry season. This means that the malaria vectors can breed there year-round. As an example, the malaria infection rate in Pier Keo village (La Ve ethnic group), located 7 km from Pak Pae, was as high as 40%, and the vector mosquito has been identified as *Anopheles dirus* [Sidavon *et al*. 2004: 309–315]. Recently, it has been shown that ordinary mosquito nets do not prevent malarial infection, because even though the distribution of nets has been completed, people are still being bitten by mosquitoes [Vythilingam *et al*. 2005: 833–839]. Moreover, it is pointed out that their house structure is not what can fully prevent invasion of mosquitoes either. In addition, concerning falciparum malaria, although drug resistance is a little lower in the southern part as compared with northern Laos, the genotype variation analysis showed that chloroquine-resistant mutagenicity was about 100% in Attapeu and the adjacent provinces of Sekong and Champasack, thus a combination of medicine other than chloroquine is needed for medical treatment in the near-future [Mayxay *et al*. 2007: 36–43]. For these reasons, the risk of malaria infection from the vectors in this area is considered high, even in the future. Hence, systematic and immediate countermeasures, such as easier access to therapeutic facilities, and the improvement of housing are essential.

NGPES specifies that intestinal parasitic infections may still be a threat to people in relocated communities [Government of Lao PDR 2004: 89]. The sample size in our investigations at Pak Pae village was small, and thus sufficient conclusions cannot be drawn. However, the rate and intensity of hookworm infection was demonstrated to be very high. Interestingly, no *Ascaris lumbricoides* infection case was found despite the fact that it is very common in both urban and rural settings in Laos [Phathammavong *et al*.

2007: 689–694; Erlanger *et al*. 2008: 223–242]; the liver fluke infection rate was also very low. This may be explained by the fact that the people's resettlement time from the mountains to lowlands was short and eating habits did not change. There are still significant differences with lowland diets; for example, relocated uplanders do not eat raw foods, such as fish.

VIII Conclusions

Our continuous and cross-sectional studies in the resettlement village clearly demonstrate that febrile diseases, especially malaria, are still a threat to the people, and control measures are needed in the area. If the conditions of one's living environment change, the kind of infections acquired will change and countermeasures towards them must change as well. Migration into areas where the health service system is not well developed raises the risk of infectious disease, as shown in the research site. There should be a simultaneous effort to increase government-led countermeasures and awareness-raising. These public health measures will have a high impact on local peoples' nutrition conditions, which is a critical part of poverty eradication, and thus should be coordinated closely with these socio-economic development strategies locally.

The cases of diseases demonstrated in this study are similar to those previously performed in Lao PDR. [Ducourtieux 2004: 27–30; Gonzales *et al*. 2005: 33; Sanogo and Vikan 2006: 14–15; Lyttleton *et al*. 2004: 62–66], and are closely related to agricultural subsistence problems. In particular, people's nutrition status is the most important factor for the prevention of communicable diseases. Although technical guidance, particularly in connection with rice production, is not described in the NGPES, it is thought that a stable supply of rice and its surplus are especially important for health promotion in the area. Hence, further investigation should be performed, with special emphasis on anemia and nutritional status, and put in relation to communicable diseases including intestinal parasitic infections. A major implication of this study is that the local government should continue to grasp disease structure to increase health care services, and especially in the resettlement areas, it is necessary to consider the public health service program corresponding to inevitable change of the living environment.

Acknowledgements

We thank the technical staff and directors of both Sanxay district hospital and the provincial hospital of Attapeu and Dr. Boupha Thongmalayvong of the National Institute of Public Health for sample collection and technical help of the surveys. Thanks are due to Professor Tatsuo Omura of Tohoku University, Professors Tomoya Akimichi and Kazuhiko Moji of the Research Institute for Humanity and Nature, Dr. Phengta Vongphrachanh of the National Centre for Laboratory and Epidemiology, and Dr. Kinjiro Miyakawa, former Professor of Kagawa University, for their support. We also wish to thank Dr. Nathan Badenoch for providing information on resettlement. The study

was supported in part by grant in aid under the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan (No. 17590530), by the Research Institute for Humanity and Nature, MEXT in the project entitled "A Trans-Disciplinary Study on the Regional Eco-History in Tropical Monsoon Asia: 1945–2005," and by MEXT in the project entitled "Sustainable Co-existence of Humans, Nature and The Earth" under Research Revolution 2002.

References

Agriculture and Rural Development Department & Rural Development & Natural Resources East Asia and Pacific Region. 2006. *Lao People's Democratic Republic Sanitary and Phytosanitary Standards Management, Action Plan for Capacity Building*. The World Bank. Washington D. C.: 97 p. (http: //siteresources.worldbank.org/EXTBNPP/Resources/TF 053504 Laos.pdf)

Anonymous. 2000. *Health Strategy up to the Year 2020, A Discussion Paper Prepared for the Donor Round Table Meeting*, pp. 37–43. Ministry of Health, Vientiane, Lao PDR.

————. 2005. *Drinking Water Quality Standards*. Ministry of Health, Vientiane, Lao PDR. (http: //www.health.gov.la/doc/waterstandard.pdf)

Arai, M.; Mizukoshi, C.; Kubochi, F.; Kakutani, T.; and Wataya, Y. 1994. Detection of Plasmodium falciparum in Human Blood by a Nested Polymerase Chain Reaction. *Am J Trop Med*. 51(5): 617–626.

Bounlu, K.; Insisiengmay, S.; Vanthanouvong, K.; Saykham; Widjaja, S.; Iinuma, K.; Matsubayashi, K.; Laras, K.; Putri, M. P.; Endy, T. P.; Vaughn, D. W.; Raengsakulrach, B.; Hyams, K. C.; Hayden, M.; Scheffel, C.; and Corwin, A. L. 1998. Acute Jaundice in Vientiane, Lao People's Democratic Republic. *Clinical Infectious Diseases* 27: 717–721.

Boupha, B.; and Dalaloy, P. M. 1997. *Country Report on Health Transition and Health Sector Reform in Lao PDR*, p. 19. Ministry of Health, Vientiane, Lao PDR.

Boupha, B.; Akkhavong, K.; Soukaloun, D.; Houamboun, K; Kounnavong, S.; Outhensackda, S.; Chanthapadith, C.; and Ouipoulikoun, S. 2003. *Child Health and Nutrition Research: An Assessment of Research Priorities and Research Institutions in Lao PDR*, pp. 1–67 Ministry of Health, Vientiane, Lao PDR.

Chamberlain, J. R. 2007. *Participatory Poverty Assessment (2006), Lao People's Democratic Republic*, pp. 54, 64. TA 4521, Asian Development Bank.

Disease Statistics. 1995. *Statistic & Planning Division, Ministry of Health*, p. iii. Vientiane, Lao P. D. R. (in Lao)

Ducourtieux, O. 2004. *Shifting Cultivation and Poverty Eradication: A Complex Issue*. Paper presented at the Conference on Poverty Reduction and Shifting Cultivation Stabilization in the Uplands of Lao PDR, Luang Prabang, 27–30 January 2004. NAFRI and Lao-Swedish Uplands Agriculture & Forestry Research Programme.

Embassy of Japan in the Lao PDR. http: //www.la.emb-japan.go.jp/jp/laos/laolaws.htm

Erlanger, T. E.; Sayasone, S.; Krieger, G. R.; Kaul, S.; Sananikhom, P.; Tanner, M.; Odermatt, P.; and Utzinger, J. 2008. Baseline Health Situation of Communities Affected by the Nam Theun 2 Hydroelectric Project in Central Lao PDR and Indicators for Monitoring. *Int J Env Health Res* 18 (3): 223–242.

Evrard, O.; and Goudineau, Y. 2004. Planned Resettlement, Unexpected Migrations and Cultural Trauma in Laos. *Development and Change* 35(5): 937–962.

Furusawa, T.; Maki, N.; and Suzuki, S. 2008. Bacterial Contamination of Drinking Water and Nutritional Quality of Diet in the Areas of the Western Solomon Islands Devastated by the April 2, 2007 Earthquake/tsunami. *Trop Med Health* 36(2): 65–74.

Gonzales, G. E.; Diaz-Boreal; and Cottavoz, P. 2005. *Lao PDR: Is Resettlement a Solution for Human Development?* Action Contre La Faim. 33 pp. Vientiane.

Goudineau, Y., ed. 1997. *Resettlement and Social Characteristics of New Villages. Basic Needs for*

Resettled Communities in the Lao PDR. An Orstom Survey, Vol. 1. Supported by UNDP and UNESCO, Vientiane, Lao PDR.

Government of Lao PDR. 2004. National Growth and Poverty Eradication Strategy. http: //www.poweringprogress.org/ngpes/images/NGPES %20 document_new.pdf: 156 p.

Kachondham, Y.; and Dhanamitta, S. 1992. A New Horizon: Addressing Food and Nutrition Problems in the Lao People's Democratic Republic. *Food and Nutrition Bulletin* 14: 79–87.

Kawaguchi, L.; Sengkeopraseuth, B.; Tsuyuoka, R.; Koizumi, N.; Akashi, H.; Vongphrachanh, P.; Watanabe, H.; and Aoyama, A. 2008. Seroprevalence of Leptospirosis and Risk Factor Analysis in Flood-prone Rural Areas in Lao PDR. *Am J Trop Med Hyg*. 78(6): 957–961

Kimura, K.; Rai, S. K.; Rai, G.; Insisiengmay, S.; Kawabata, M.; Karanis, P.; and Uga, S. 2005. Study on Cyclospora cayetanensis Associated with Diarrheal Disease in Nepal and Lao PDR. *Southeast Asian J Trop Med Public Health* 36(6): 1371–1376.

Laras, K.; Ca, B. V.; Bounlu, K.; Nguyen, T. K.; Olson, J. G.; Thongchanh, S.; Tran, N. V.; Hoang, K. L.; Punjabi, N.; Ha, B. K.; Ung, S., Insisiengmay, S.; Watts, D. M.; Beecham, H. J.; and Corwin, A. L. 2002. The Importance of Leptospirosis in Southeast Asia. *Am J Trop Med Hyg*. 67(3): 278–286.

Lyttleton, C.; Cohen, P.; Rattanavong, H.; Thongkhamhane, B., and Sisaengrat, S. 2004. *Watermelons, Bars and Trucks: Dangerous Intersections in Northwest Lao PDR*. An Ethnographic Study of Social Change and Health Vulnerability along the Road through Muang Sing and Muang Long. Macquarie University 118 p

Matsuda, H.; and Kirinoki, M. 2005. Mekon Juketsu Kyuchu-sho [Schistosomiasis Mekongi]. In *Juketsu Kyuchu-sho to Miyairi Keinosuke: Miyairigai Hakken kara 90 nen*, edited by Miyairi Keinosuke Kinen-shi Hensan Iinkai, pp. 143–156. Fukuoka: Kyushu University Press.

Mayxay, M.; Nair, S.; Sudimack, D.; Imwong, M.; Tanomsing, N.; Pongvongsa, T.; Phompida, S.; Phetsouvanh, R.; White, N. J.; Anderson, T. J. C.; and Newton, P. N. 2007. Combined Molecular and Clinical Assessment of *Plasmodium falciparum* Antimalarial Drug Resistance in the Lao People's Democratic Republic (Laos). *Am. J. Trop. Med. Hyg*. 77(1): 36–43.

Midorikawa Y; and Haque, Q. M. 1997. 15-Deoxyspergualin, an Immunosuppressive Agent, Used in Organ Transplantation Showed Suppressive Effects on Malarial Parasites. *Chemotherapy* 43: 31–35.

Midorikawa, Y.; and Itokawa, Y. 1987. Bacteriological Study in a Rural Village in Northeast Thailand. *Jpn. J. Hyg*. 42: 740–746.

Midorikawa, Y.; Nakamura, S.; Iwade, Y.; Sugiyama, A.; Sisavath, L.; and Phakhounthong, R. 1996. Bacterial Diarrhea in Laos, a Region where Cholera was Endemic. *Southeast Asian J Trop Med Public Health* 27(4): 724–727.

Miura, T; Watanabe, T.; Nakamura, S; and Omura, T. 2007. GIS o mochi-ita Mekong Ryu-iki ni okeru Inryo-sui Ki-in Geri-sho Risuku Hyoka. [Risk Evaluation of Infectious Diarrhea in the Water Utilization in the Mekong Watershed with a GIS-based model.] *Journal of Japan Society on Water Environment* [Mizu-kankyou Gakkai-shi] 30(11): 611–616.

Miyoshi, M.; Phommasack, B.; Nakamura, S.; and Kuroiwa, C. 2005. Nutritional Status of Children in Rural Lao PDR: Who Are the Most Vulnerable? *European Journal of Clinical Nutrition* 59: 887–890.

Nakamura, S. 2006. Seizon-kagaku ni Omou [Thinking of the Seizon Kagaku] *Seizon Kagaku* 17(1): 37–41

————. 2007. Mekon Ryuiki no Fudo-Byo: Raosu no Mekon Juketsu Kyuchu-sho. [Schistosomiasis Mekongi Endemic in the Mekong Watershed: Present Situation of the Schistosomiasis in Lao PDR.]. *Modan-media* [Modern Media] 53(8): 217–227.

Nakamura, S.; and Iwasa, M. 2008. Kindai-iryo no Shinto to Rekishi [Permeation and History of Modern Medicine in Laos]. In *Ronshu Monsun Ajia no Seitaishi* [Collected Papers on Eco-history of Monsoon Asia], Vol. 2, edited by Christian Daniels, pp. 229–246. Tokyo: Kobundo.

Nakamura, S.; Midorikawa, Y.; and Boupha, B. 2004. *Raosu ni okeru Korera Ryuko to sono Wakuchin Hyoka eno Kokoromi* [Cholera Epidemic and Evaluation of its Vaccine Trial in Lao PDR.]. Nihon

Hyoka Gakkai Shunki Dai Ikkai Zenkoku Taikai Yoshi Shu [Proceedings of 1st Spring Conference of the Japan Evaluation Society]: 217–218.

Nakamura, S.; and Marui, E. 2000. Korera Taisaku no Tsujite Mita Raosu no Kansen-sho Yobogyosei no Ichi Sokumen. [An Aspect of Health Administration on Epidemic Control in Laos: Case Study of Cholera Epidemics in Remote Area and Central Area] *Ryukyu Medical Journal* [Ryukyu-Igakukai Zasshi] 19(3): 155–158.

Nakatsu, M.; Nakamura, S.; Newton, PN.; Phetsouvanh, R.; Arakawa, E.; Davong, V.; Vongsouvath, M.; Lattana, O.; and Moore, CE. 2008. *Vibrio cholerae* O21 ompW gene for outer membrane protein W, complete cds. *DNA Data Bank of Japan (DDBJ).* http: //www.ddbj.nig.ac.jp/ddbjnew/pub-j.html

Phantouamath, B.; Sithivong, N.; Sisavath, L.; Munnalath, K.; Khampheng, C.; Insisiengmay, S.; Higa, N.; Kakinohana, S.; and Iwanaga, M. 2001. Transition of Drug Susceptibilities of Vibrio Cholerae O1 in Lao People's Democratic Republic. *Southeast Asian J Trop Med Public Health* 32(1): 95–99.

Phantouamath, B.; Sithivong, N.; Sisavath, L.; Mounnalath, K.; Chomlasak, K.; Insisiengmay, S.; Yamashiro, T.; and Iwanaga, M. 2004. Detection Rates of Rotavirus Antigen from Diarrheal Patients in Lao People's Democratic Republic. *Tropical Medicine and Health* 32: 203–204.

Phathammavong, O.; Moazzam, A.; Xaysomphoo, D.; Phengsavanh, A.; and Kuroiwa, C. 2007. Parasitic Infestation and Nutritional Status Among Schoolchildren in Vientiane, Lao PDR. *J Paediatrics & Child Health* 43(10): 689–694.

Phetsouvanh, R.; Midorikawa, Y.; and Nakamura, S. 1999. The Seasonal Variation in the Microbial Agents Implicated in the Etiology of Diarrheal Diseases among Children in Lao People's Democratic Republic. *Southeast Asian J Trop Med Public Health* 30(2): 319–323.

Phetsouvanh, R.; Nakatsu, M.; Arakawa, E.; Davong, V.; Vongsouvath, M.; Lattana, O, Moore, C. E.; Nakamura, S.; and Newton, P. N. 2008. Fatal Bacteremia due to Immotile Vibrio Cholerae Serogroup O21 in Vientiane, Laos – a case report. *Annals of Clinical Microbiology and Antimicrobials* 7(10): http: //www.ann-clinmicrob.com/content/pdf/ 1476–0711–7–10.pdf

Phetsouvanh, R.; Phongmany, S.; Soukaloun, D.; Rasachak, B.; Soukhaseum, V.; Soukhaseum, S.; Frichithavong, K.; Khounnorath, S.; Pengdee, B.; Phiasakha, K.; Chu, V.; Luangxay, K.; Rattanavong, S.; Sisouk, K.; Keolouangkot, V.; Mayxay, M.; Ramsay, A.; Blacksell, S. D.; Campbell, J.; Martinez-Aussel, B.; Heuanvongsy, M.; Bounxouei, B.; Thammavong, C.; Syhavong, B.; Strobel, M.; Peacock, S. J.; White, N. J.; and Newton, P. N. 2006. Causes of Community-acquired Bacteremia and Patterns of Antimicrobial Resistance in Vientiane, Laos. *Am J Trop Med Hyg*. 75(5): 978–985.

Phetsouvanh, R.; Vythilingam, I.; Sidavong, B.; Lokman, Hakim S.; Chan, ST.; and Phompida, S. 2004. Endemic Malaria in Four Villages in Attapeu province, Lao PDR. *Southeast J Trop Med Public Health* 35(3): 547–551.

Phommasack, B.; Saklokham, K; Chanthavisouk, C.; Nakhonesid-Fish, V.; Strandgaard, H.; Montresord, A.; Shueye, D. A.; and Ehrenberge, J. 2008. *Coverage and Costs of a School Deworming Programme in 2007 Targeting All Primary Schools in Lao PDR* 102(12): 1201–1206.

Sangsomsack, B.; and The Secretary's Team. 2000. *Report of Cholera Education at Attapeu Province* 1999–2000: 1–4.

Sanogo, I.; and Vikan, S. T. 2006. *Rapid Qualitative Livelihoods Assessment in Savannakhet, Attapeu and Luang Prabang Provinces for Preparation of New Lao PDR PRRO*. Final Report. Vientiane. World Food Programme.

Shoultz, J.; and Hatcher, P. 1997. Looking Beyond Primary Care to Primary Health Care: An Approach to Community-based Action. *Nursing Outlook* 45: 23–26.

Sidavong, B.; Vythilingam, I.; Phetsouvanh, R.; Chan, ST.; Phonemixay, T.; Lokman, Hakim S.; and Phompida, S. 2004. Malaria Transmission by *Anopheles Dirus* in Attapeu Province, Lao PDR. *Southeast Asian J Trop Med Public Health* 35(2): 309–315.

Steering Committee for Census of Population and Housing. 2005. *Results from the Population and Housing Census 2005*, Vientiane, Lao P. D. R. 151 p.

Suzuki, K.; Nakamura, S.; and Watanabe, H. 1997. A Fatal Case of *Leptospira autumnalis* Infection in Lao PDR. *Southeast Asian J Trop Med Public Health* 28(2): 436–437.

Takemasa, K.; Kimura, K.; May, S. I.; Rai, S. K.; Ohyama, F.; Wu, Z.; Kimura, D.; and Uga, S. 2004. Epidemiological Survey of Intestinal Parasitic Infections of Diarrhoeal Patients in Nepal and Lao PDR. *Nepal Med Coll J*. 6(1): 7–12.

Troll, H.; Marti, H.; and Weiss, N. 1997. Simple Differential Detection of *Entamoeba histolytica* and *Entamoeba dispar* in Fresh Stool Specimens by Sodium Acetate-acetic acid-formalin concentration and PCR. *J Clin Microbiol* 35(7): 1701–175.

United Nations Country Team. 2007. *United Nations Common Country Assessment for Lao PDR 2006*. pp. 29–30. UNDP in Lao P. D. R. Vientiane, Lao P. D. R.

Vythilingam, I.; Sidavong, B. l.; Chan, S. T.; Ponemixay, T.; Vanisaveth, V.; Sisoulad, P.; Phetsouvanh, R.; and Hakim, L. 2005. Epidemiology of Malaria in Attapeu Province, Lao PDR in Relation to Entomological Parameters. *Trans Royal Trop Med Hygiene* 98: 833–839.

Waikagul, J.; Anantaphruti, M. T.; Nuantanong, S.; and Sanguankait, S. 1997. *Evaluation of the Modified Formalin Detergent Technique for Detection of Intestinal Parasites*. Collected Papers on the Control of Soil-transmitted Helminthiases. Vol. 4. Tokyo: APCO.

Watanabe, T.; Miura, T.; Sasaki, T.; Nakamura, S; and Omura, T. 2006. Mekong Ryu-iki ni okeru Mizu-kyokyu Sisutemu ni Chakumoku shita Suikei-kansensho no Risuku-hyoka. [Risk Evaluation of Infectious Diseases Associated with Drinking Water Based on Water Supply System] *Environmental Engineering Research* [Kankyo-Kogaku Kenkyu Ronbun-shu] 43: 245–254.

Yamashiro, T.; Nakasone, N.; Higa, N.; Iwanaga, M.; Insisiengmay, S.; Phounane, T.; Munnalath, K.; Sithivong, N.; Sisavath, L.; Phanthauamath, B.; Chomlasak, K.; Sisulath, P.; and Vongsanith, P. 1998. Etiological Study of Diarrheal Patients in Vientiane, Lao People's Democratic Republic. *J Clin Microbiol*. 36(8): 2195–2199.

Yano, K.; Yoshida, Y.; Shinkai, T.; and Kaneko, M. 1993. A Practical Method for the Concentration of Viruses from Water Using Fibriform Cellulose and Organic Coagulant. Wat. *Sci. Tech*. 27(3–4): 295–298.

Appendix

Questionnaire items for diarrhea survey in Attapeu province, February-March, 2006

1. Name of village, district, and date of interview;
2. Total population, and number of households;
3. Name of interviewee, age and sex;
4. Have knowledge on: common diarrhea, dysentery, cholera;
5. Know some plant remedies for: common diarrhea, dysentery, cholera;
6. If positive response to 5: self treatment with plants for diarrhea; usages with help of medicine man; knows where to collect medicinal plants; know how to prepare plant remedies;
7. Diarrhea episode in the preceding 4 weeks;

Baseline data survey items on Ban Pak Pae, Sanxay district, Attapeu province, December, 2003

1. Village: , House number: , Answered by: , Name of enumerator: , Date of interview: ,
2. Household information: Number, Name, Sex, Age Relation, Occupation, Schooling, Place of living;
3. Animal husbandry: Number of: Oxen Cow, Buffalo, Pig, Goat, Sheep, Chicken, Duck, Goose, other;
4. Household income in the last year (Kip): Regular income/Salary, Wage labor, Selling crop, Selling animal, Remittance, other, Total income;
5. Loans;
6. Water resource; Availability, drinking practice, utilization purposes, taste, and volume: Tube well, Dug well, Tap water, Fountain, River, Pond, Weir, Rain water, Tank, Bottled, other;
7. Ownership of the wells;
8. Toilet: No toilet, Outside on ground, River/Canal, Bore hole/Pit, Latrine with water, Flush toilet, other;
9. Housing: Traditional style house made of: Bamboo wall, Wood, Bamboo and wood wall, Wood and cement/block; completely block build house;
10. Possessions: Radio, Television, Refrigerator, Tape-recorder, Bicycle, Motorbike, Thak-Thak, Jambo, Tuk-Tuk, Automobile;
11. Disposition of daily wastes/garbage: Fixed place, Routine collection, Scatter around the house, other;
12. Disease and consultation: Number of disease cases in your family if you aware at present year (2003) and in the last year (2002). And with whom she/he consulted the case.; Disease: Common cold/ARI, TB, Malaria/fever, Diarrhea, Dysentery, Helminthes, Tetanus, Dengue, Polio, Measles, Diabetes, Cancer, Animal bite, Accidental Wound, other
13. Usage of bed net; Smoking habit: Information awareness on drug abuse.

Questionnaire items for diarrhea and fever/malaria survey at Pak Pae village, Sanxay district, Attapeu province in December 2004

1. Date of interview, Name of surveyor, Interviewee: name, age, sex, Number of the household;
2. Experience of the cholera vaccine during 1995–96;
3. Interviewee's episode on severe diarrhea and/or abdominal pain in the year;
4. The family members' episode on severe diarrhea and/or abdominal pain in the year;
5. If replied to 4, check the number of people with the episode;
6. Interviewee's episode on fever and/or malaria in the year;
7. The family members' episode on fever and/or malaria in the year;
8. If replied to 7, check the number of people with the episode.

東南アジア研究 47 巻総索引

Index to Southeast Asian Studies Vol. 47

47巻3号

Land Use Changes in the Uplands of Southeast Asia: Proximate and Distant Causes

47巻4号

Agency, Opportunity and Risk: Commercialization and Human-nature Relationships in Laos

『東南アジア研究』投稿規定

1） 投稿の内容は，東南アジア地域研究に寄与するものとする。
2） 投稿原稿は，レフェリー制度を通じて選定のうえ編集される。投稿原稿は原則として返却しない。
3） 原則として使用言語は日本語，英語のいずれかとする。特殊な文字ならびに記号の使用については編集室に相談のこと。邦文の場合には常用漢字，現代かなづかいを用いることを原則とする。使用言語にかかわらず 8 つ以内のキーワード（邦文の場合は日英併記）と 200 語程度の英文要旨を付するものとする。
投稿原稿の長さの目安は，注，引用文献を含め，邦文の場合は 400 字詰め原稿用紙計算で 50 枚以内，英文の場合は 10,000 語以内を原則とする。なお，上記には図・表・写真を含めないが，特に多数の場合は編集室に相談のこと。
書評は，邦文の場合は約 4,000 字，英文の場合は約 1,200 語で執筆するものとする。
4） 投稿原稿は電子文書とし，e-mail または郵送で受け付ける。郵送の場合は，電子媒体（フロッピーディスク，MO ディスクまたは CDR）に印刷した原稿を添付すること。
図は，そのまま印刷可能なものに限る。コンピュータで図表を作成した場合は，別ファイルとすること。写真，付図，付表などには希望の挿入箇所，大きさを指定するものとする。
5） 掲載された論文等の著作権は原則として京都大学東南アジア研究所に帰属する。
6） 稿料の支払い，掲載料の徴収は行わない。ただし別刷りを 30 部贈呈する。なお，それ以外にもあらかじめ注文があれば実費で製作する。
7） 参考文献表記法が研究所ホームページ (http://www.cseas.kyoto-u.ac.jp) に掲げてあるので，投稿希望者は参照されたい。郵送を希望する場合は，編集室に請求のこと。
8） 投稿に関する連絡先は次の通り。
〒606–8501　京都市左京区吉田下阿達町 46
京都大学東南アジア研究所編集室
Tel.＋81–75–753–7344
Fax.＋81–75–753–7356
e-mail : editorial@cseas.kyoto-u.ac.jp

Notice to Contributors

1） *Southeast Asian Studies* publishes the results of academic research contributing to the development of area studies of Southeast Asia.
2） All manuscripts submitted for publication are accepted or rejected based on the recommendations of our referees. Submitted manuscripts will not be returned to the author.
3） Manuscripts may be written in either Japanese or English. Before submitting manuscripts in other languages, please consult the Editorial Office. Manuscripts in English should not exceed 10,000 words (excluding figures, charts, maps, and tables). An English abstract of about 200 words and a list of no more than 8 keywords should be appended to each manuscript. Book reviews should be limited to about 1,200 words. Contributors should consult the Editorial Office if their manuscripts include special letters or symbols or a large number of figures, charts, or other material that may require special attention in the production process.
4） Manuscripts must be submitted in an electronic format either by e-mail or by regular mail. Figures, charts and maps should be provided in a camera-ready format. The author should clearly indicate where to place all the figures, tables, and other material in the manuscript.
5） Copyright of all manuscripts published in *Southeast Asian Studies* will be assigned to the Center for Southeast Asian Studies, Kyoto University.
6） Authors will not be charged or remunerated for publication of manuscripts. Thirty reprints will be provided free of charge; additional copies can be ordered at cost price.
7） Guidelines on the bibliographic format to be employed for references can be found on the center's homepage (www.cseas.kyoto-u.ac.jp) or can be requested from the Editorial Office.
8） Manuscripts and editorial communications should be sent to the Editorial Office, Center for Southeast Asian Studies, Kyoto University, 46 Shimoadachi-cho, Yoshida, Sakyo-ku, Kyoto 606–8501, Japan.
Tel. ＋81–75–753–7344
Fax ＋81–75–753–7356
e-mail: editorial@cseas.kyoto-u.ac.jp

東南アジア研究 47 巻 4 号　　平成 22 年 3 月 31 日　発行

編集・発行者　京都大学東南アジア研究所
〒606–8501　京都市左京区吉田下阿達町 46
印　　刷　明文舎印刷株式会社
〒601–8316　京都市南区吉祥院池ノ内町 10

京都大学東南アジア研究所
CSEAS, Kyoto University, Kyoto Japan

47巻4号 2010/3

Agency, Opportunity and Risk: Commercialization and Human-nature Relationships in Laos