Doctor of Area Studies

A Thesis Submitted for the Degree of Doctor of Area Studies

Rural Livelihood Transition in Xishuangbanna, China: Cultivation of Para Rubber and Banana and Cross-border Activities

中国・西双版納における農村の生業転換－パラゴムとバナナの栽培と跨境活動－

Le Zhang

Graduate School of Asian and African Area Studies

Kyoto University

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Abstract

Tropical China has a great advantage in terms of its climate for providing tropical products to the huge domestic market in China's temperate zone. With the rapid development of the Chinese economy, market-oriented agriculture has spread widely and rapidly in tropical China. Under this background, this study focused on the transition of rural livelihood in Xishuangbanna, tropical China. This study combined large-scale fieldwork in the boundary area of China-Laos and an in-depth analysis of two Dai villages to identify why, under what conditions and how the rural livelihood changed and examined the achievements and problems of the changes.

The rural livelihood of Xishuangbanna has been changed from self-sufficient to commercialization during the last three decades. The introduction of Household Responsibility System in the early 1980s provided villagers the right to engage in various enterprises. The most notable cases of agricultural transformation are the expansion of para rubber in upland fields and commercial banana cropping in lowland fields. With the rapid expansion of these cash crops, the role of some general enterprises in China, such as livestock raising, rice growing and off-farm activities, in villager' livelihood decline.

Rubber area has increased in the study villages as observed in other parts of Xishuangbanna, and most of which were the replacement of former lands for the collection of firewood and bamboo, and lands for subsistence upland cropping. This suggests that the land use framework of upland was not affected even by a strong demand for the expansion of highly profitable rubber garden. It is because of

step-by-step formation of forest resources administration and consequent governance, which is effectively assisted by self-management of village community.

The introduction of commercial banana cropping has caused a drastic change in the cropping pattern of lowland fields to a banana mono-culture within a short period. The banana farms in one village are mainly managed by villagers, and this change is thought to be sustained by market and institutional settings that built the necessary connections between villagers and outside the village and secured the movement of goods, information and labor. During the process, wealthier households were able to be risk takers and grew bananas earlier. The other village chose to rent out lowland fields, rather than growing banana by themselves. The distance and access of village settlement to land, and irrigation conditions caused the difference of the two villages.

The Chinese farmers have chance to extend their enterprises into Laos, and the motivation is to obtain high benefits, rather than just survival needs. Since the early 2000s, some villagers engage in cross-border rice milling and trading, while this business has been declined due to the electrical construction of Laos and implementation of strict control of Chinese Custom. The Chinese villagers have chance to invest rubber farms in Laos, and whether the villagers can organize themselves effectively often plays an important role in this cross-border investment.

Income portfolios have been transformed substantially in the late 2000s, almost villagers benefited from this livelihood transition. Although the income derived from tapping rubber was important for almost villagers, growing commercial banana cropping was more beneficial than the other crops, and mainly caused the village-level income difference. The emerging entrepreneurs who have created a

better life than others, aren't always from big families with higher education, but always look for an opportunity to challenge.

Rural livelihood transition of the study area was initiated by the government that established a market economy system in the early 1980s, and has successfully balanced economic development and forest protection. The study area shares the same institutional settings with other parts of China, but the tropical climate fosters high-return agricultural system, which is quite different from agricultural systems in other parts of China. The micro-biophysical conditions, such as irrigation systems, the distance and access of village settlement to land plots affected the adoption process of cash crops and finally differentiated the villages.

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1. Introduction

1.1 Problem statement

The concept of livelihood has rapidly gained ground as a new framework facilitating active and direct support to small-scale farmers in poor countries (Niehof, 2004). Livelihood and land use are different manifestations of social processes, and co-produced each other. However, land use and livelihood systems are often analyzed separately or with one "driving" the other (McCusker and Carr, 2006).

Montane Mainland Southeast Asian, constituting the adjoining areas of Cambodia, Laos, Myanmar, Thailand, Vietnam and Yunnan Province of China, is rich in heritage of indigenous cultures and biological diversity (Fox and Vogler, 2005). During recent decades, many parts of this region are gradually shifting from subsistence farming to commercial systems as an outcome of the transition to market economy (Xu et al., 2006; Padoch et al., 2007; Rerkasem et al., 2009). According to an estimate by Fox et al. (2012), the area of land dedicated to rubber and other diversified farming systems could more than double or triple by 2050, and largely by replacing lands now occupied by evergreen broadleaf trees and swidden-related secondary vegetation.

The farmers fail to catch up the development of China since 1997, enlarging the difference between rural and urban areas until recently. Since 1978, the Chinese government initiated open policy, and the Household Responsibility System has been adopted nationwide since 1981 (Naughton, 1993; Liu, 2007). As a result, the largest number of smallholders was created in the world (Tilt, 2008). However, the return of agriculture in China is often poor due to the low price of agricultural products and

small farm size. Under this background, farmers do not have enthusiasm on investing agricultural (Feng et al., 2005). So, Chen (2002) pointed that the largest challenge for China is to promote farmers' income.

Xishuangbanna borders Laos and Myanmar, and is an autonomous prefecture of Dai people at the southern tip of Yunnan Province, China (Fig. 1-1). This area is included in the Indo-Burma biodiversity hotspot and harbors one of the greatest diversities of species in China (Zhang and Cao, 1995; Myers et al. 2000). The ecological and socioeconomic context of Xishuangbanna is representative of other tropical regions of Southeast Asia that contain high levels of biodiversity and are threatened with deforestation (Li et al., 2007). This area was traditionally considered as a poor and backward area in China (Xu et al., 2005). In recent decades, the market-oriented agriculture has spread widely in Xishuangbanna, which has a great advantage in terms of its climate for providing tropical products to the huge domestic market in China's temperate zone (Guo et al., 2002; Li et al., 2007). So, the farmers of Xishuangbanna have received unprecedented wealth due to the rapid expansion of cash crops.

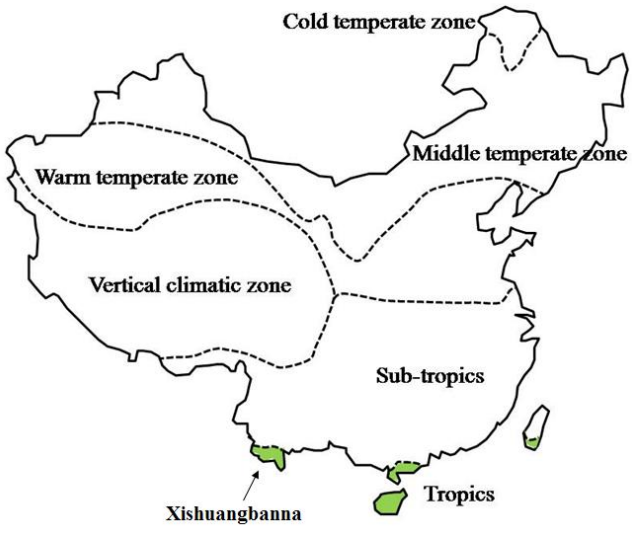

Fig.1-1 Location of Xishuangbanna in China

Whether a new technology and agricultural practice can be adopted by local farmers or not is comprehensively determined by various factors such as initial capitals, biophysical conditions and institutional settings, and the attitudes of farmers to risk (Binswanger, 1980; Rogers, 1983; Rerkasem et al., 2002; Falco and Perrings, 2005; Linquist et al., 2007). Risk interpreted as the uncertainty of outcomes is present in all agricultural decisions, as a result of price, yield and resource uncertainty (Shahabuddin et al., 1986; Hardaker, 2000). Subsistent-oriented farmers are often risk-aversion, and hesitate to adopt new practices from the larger societies that have engulfed them (Hamal and Anderson, 1982; Henrich and McElreath, 2002). However, the success of pioneers in growing cash crops can eliminate the apprehension of farmers to risk and trigger the adoption of cash cropping rapidly (Trung, 2002; Jiang et al., 2006).

1.2 Objectives of the study

Xishuangbanna, as a tropical area of China, has advantage to develop tropical agriculture, and is experiencing an unprecedented transformation of agricultural systems and rural livelihood transition. The most notable cases are the wide expansion of para rubber in upland fields and commercial banana cropping in lowland fields. Xishuangbanna is also an entrance of China into Montane Mainland Southeast Asian, and has been rapidly changed from land-locked to land-linked, and the cross-border activities have been booming in the recent decades.

Large-scale state-owned rubber farms were established before the 1980s, as dedicative government efforts of achieving rubber self-sufficiency, and the following years has been more like an era of smallholder rubber since the Household Responsibility System was introduced. Although the Chinese government issued a series of policies

for conserving forest, literatures showed that rubber plantations still expanded rapidly (Fu, et al., 2009; Xi, 2009; Ziegler et al., 2009; Fox and Castella, 2013). Li et al. (2008) noted that the increasing demand and high price of natural rubber will most likely lead to a continued expansion of rubber plantations in Xishuangbanna.

Securing forest and rural livelihood continued to be placed in a contradictory situation. It is widely recognized that the rapid expansion of para rubber has caused severe deforestation, biodiversity decline and soil erosion (Li et al., 2007; Ziegler et al., 2009). On the other side, rubber plantations have brought unprecedented wealth to farmers (Mannn, 2009). Zhou et al. (2011) noted that more than half of farmers approved that rubber cultivation caused the shortage of potable water, whereas only 5.4% of farmers agree to mitigate the situation by cutting down their rubber gardens.

About 5% of China's territory is in the tropics and subtropics where banana can be grown, and since 1993 banana imports have begun to exceed exports (Chen, 2000). During the first decades of the 21st century, the annual growth rate of banana growing area in China reached 3.8%, and banana farming has been gradually spreading from coastal areas to inland areas (Xia and Guo, 2010; Li et al., 2011). Since 2004, commercial banana was introduced into Xishuangbanna, which initiated an unprecedented cropping pattern change in lowland within a short time. However, Yang and Liang (2008) noted that almost banana farms were managed by investors from other provinces, rather than local villagers, and the local smallholders did not benefit from this transition.

The people of Xishuangbanna and northern Laos connect with each other over a long period, while the cross-border activities was interrupted due to the outbreak of

China-Vietnam war during 1979-1989 (Zhang, 1999). The cross-border activities of China and Laos have being boomed, and the border trade turnover increased from 1×10^7 to 1.5×10^8 yuan in the 1990s (SBMC, 1990, 2000). However, its impact on rural livelihood of Xishuangbanna is still unclear.

The goal of this study is to demonstrate the transition of rural livelihood by examining the linkage of local people and land use practices through large-scale fieldwork in the boundary area of China-Laos and an in-depth analysis of two Dai villages in Xishuangbanna, China. This goal can be broken down into the following three pieces.

- To identify the trend of para rubber expansion and figure out the factors that contributes to manage upland and forest resources
- To examine the adoption process of commercial banana cropping and the factors that support its rapid expansion
- To reveal the role of cross-border activities in rural livelihood

1.3 Methodology

1.3.1 Framework concepts

Livelihood

A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household (Ellis, 2000). The present study chose this definition of livelihood as the ground for rural development, and understood this definition as Fig. 1-2.

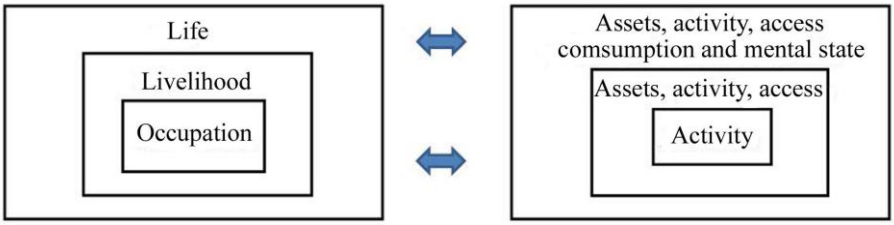

Fig.1-2 Meaning of livelihood in this study

Land category

In Dai, “Na” means “lowland fields”, which can be irrigated and drained, and “Hai” means upland fields that can not be irrigated (Fig. 1-3). “Guang” means mountain and is a part of “Hai”. Villagers traditionally use lowland fields as paddy, and they usually treat upland fields identically, regardless of mountain or not.

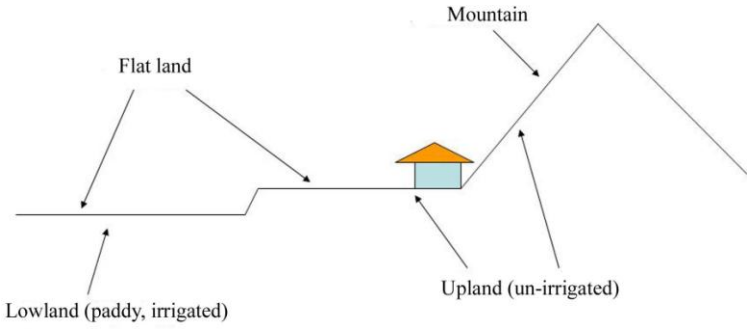

Fig.1-3 Understanding of land in Xishuangbanna

1.3.2 Selection of study site

Xishuangbanna consists of three counties (Mengla, Menghai and Jinghong). Mengla County borders Laos and Myanmar, and has the longest border line among the three counties. Cash crops expanded rapidly in this County.

Mengla County

Mengla, meaning a place that teems with tea in Dai language, is a county of Xishuangbanna Dai Autonomous Prefecture, Yunnan Province, China (Fig. 1-4). It has an area of 7,081 km^2 (101°50'E, 21°09'N), and borders Laos and Myanmar with 741 km boundary line (the boundary line of Laos and China is 678 km). The distance from the county capital to Kunming (the provincial capital) and Jinghong (the prefecture capital) is 631 and 136 km, respectively. Five roads connect this county with Laos and Myanmar, and three of which reach three provinces of northern Laos respectively. Mengla County is the channel of China to the Mainland Southeast Asia, and is often considered as the portal of the Greater Mekong Sub-region in China.

Mengla County has a tropical climate with the average annual precipitation of 1,420 mm, and the annual mean temperature is 22.5 °C. The rainy season is from mid-May to the end of October, and other months are the dry season. 80% of rainfall occurs during the period between June and September. The sunshine duration reaches 1,867 hours (SBMC 2010). This area descends from northeast to southwest, and the altitude ranges from 480 m to 2,023 m with an average 1,100 m. The mountainous area and dense tropical rainforest account for 95.6% and 43% of the total area, respectively, of the total area of Mengla. It has 1,303 km^2 of natural reserve, occupying 18.4% of the total area (SBMC 2010).

Mengla County is the home of 223,269 persons, including Dai (27%), Hani (25%), Han (25%), Yi (11%), Yao (8%) and other 21 ethnic groups in 2010, and rural population accounted for 67% of the total population (SBMC 2010).

The transportation between Jinghong and Mengla was rapidly improved during the last two decades. Until the end of 1980s, it took two days by bus. After the road was improved in the 1990s, it became one day travel, and in 2007 when a new road was completed as a part of Kunming-Bangkok highway, it was shortened to three hours. Road network in the county has been greatly improved since 2005. Until 2010, all 52 administrative villages were connected by blacktop, and 99.8% of natural villages were connected by road.

During 2005-2010, the GDP of Mengla County increased from 1.9×10^9 to 3.9×10^9 yuan, and the total amount of cross-border trade increased from 1.5×10^8 to 7.9×10^8 dollars. The GDP of agricultural sector accounted for 41 % of the total GDP in 2010, and the main agricultural products include rice, rubber, tea, banana and sugarcane (SBMC 2010). This county is abundant of rock salt, gold and silver.

The area of rubber plantations of Mengla County was only 11,500 ha in 1980, and increased to 65,600 ha in 2000, and to 123,500 ha in 2010 and the area of commercial banana cropping of Mengla County was only 1,113 ha in 2005, and increased to 5,240 ha in 2010 (SBMC, 1980, 2000, 2005, 2010).

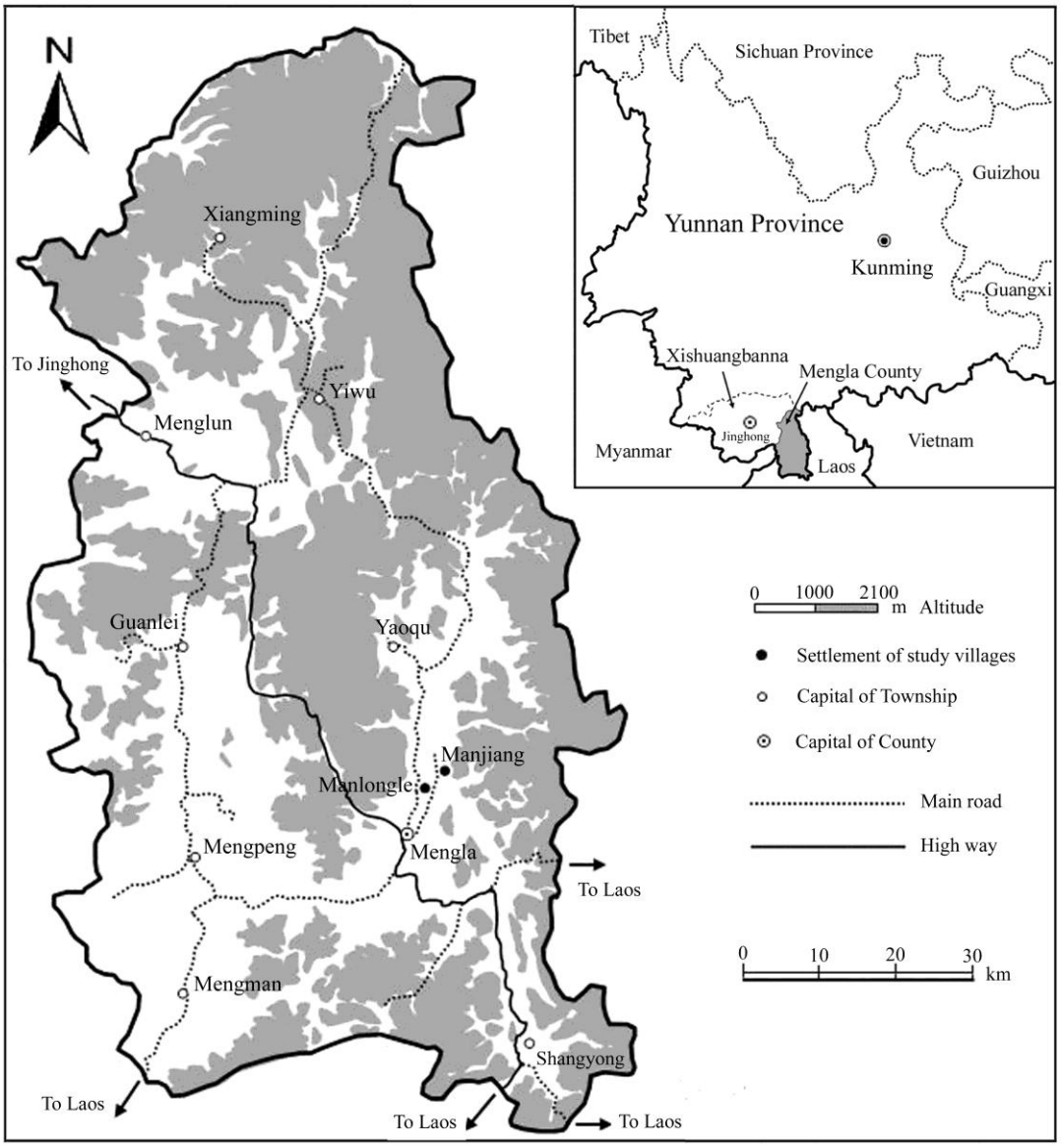

Fig.1-4 Location of study site in Xishuangbanna, southwestern China

I selected two Dai villages, Manlongle and Manjiang, for the present study (Fig. 1-4). These villages are neighbors with 2 km distance between residential areas, but have different biophysical and traffic conditions particularly. The land plots of Manjiang are located close to the residential area without being separated by mountain or river, and their distribution is spatially concentrated. So the villagers are easy to manage their upland fields. Inversely, the land plots of Manlongle are spatially dispersed, and some plots are located far away or separated by river from the residential area. So the villagers are not convenient to manage all the upland fields. Manjiang mainly grew banana by villagers, and Manlongle is the neighbor of Manjiang and a typical village that rented out their lowland fields to Han businessmen. In order to figure out the influence of biophysical and traffic conditions and the factor that differentiated villager's behavior, I chose these villages.

Manjiang, meaning a village at the opposite side of a river in Dai language, was established in 1914 after 29 villagers (7 households) of Manlongle went cross Nanla River and settled down the current place. Since 2005, it has been inhabited by 100 Dai households. The distance of village settlement to the county capital is about 12 km, and the road connecting the village with the county capital was constructed in 1973, and improved to be blacktop in 2007. This village covers the area of 345 ha with an elevation ranging between 650 and 1,280 m.

Manlongle, meaning a big village at the upper stream in Dai language, was established in 1879 when 9 households moved from Laos to the current place. Since 2001, 76 Dai households inhabit in this village. The village is located about 10 km north of the county capital. The motorable road connecting the village with the county

capital was constructed in 1978, and improved to be blacktop in 2011. The total area of this village is about 212 ha with an elevation ranging between 640 and 750 m.

1.3.3 Flow chart of this study

Data source include household interview, government yearbook and field survey. In June 2010, a field work was conducted in Vientiane and Luang Namtha Province of Laos, covering observation of cropping pattern and interviewing with Han businessmen and Lao farmers. Four-round field surveys in September-October 2010, January-February 2011, July-August 2011 and February-March 2012 were conducted in Mengla County, covering observation of land use and cropping pattern, interviews with local Han businessmen, farmers and labors from other prefectures, and totally, I visited 17 village in this County. At the in-depth study villages (Manlongle Village and Manjiang Village), I interviewed all present and former members of village committees. Semi-structured interviews were conducted with household heads (either male or female) of both villages. The questionnaire survey covered demographic information (birth, death, health, education and marriage), land information (size, quality, acquisition, cropping pattern and renting), livelihood (land farming, livestock breeding and off-farm activities), and access to the acquisition of technology, labor and credit. The contents of the government yearbook covers the demographic, livelihood and land information, and the data recorded the village-level information as early as 1980. Meanwhile, I also observed the irrigation system, soil characteristics, land use and cropping patterns of both villages.

In order to collect accurate data, the survey paid particular attention to balance the recall period and memory accuracy of farmers. Therefore, highly disaggregated data was collected firstly, and then aggregated by analysis. For achieving greater accuracy,

I just analyzed long-term village-level livelihood transition by means of government yearbook, and then selected some answerable questions that did not require detailed memory for obtaining information of Manlongle Village and Manjiang Village.

The remainder of this thesis is organized as follows (Fig. 1-5).

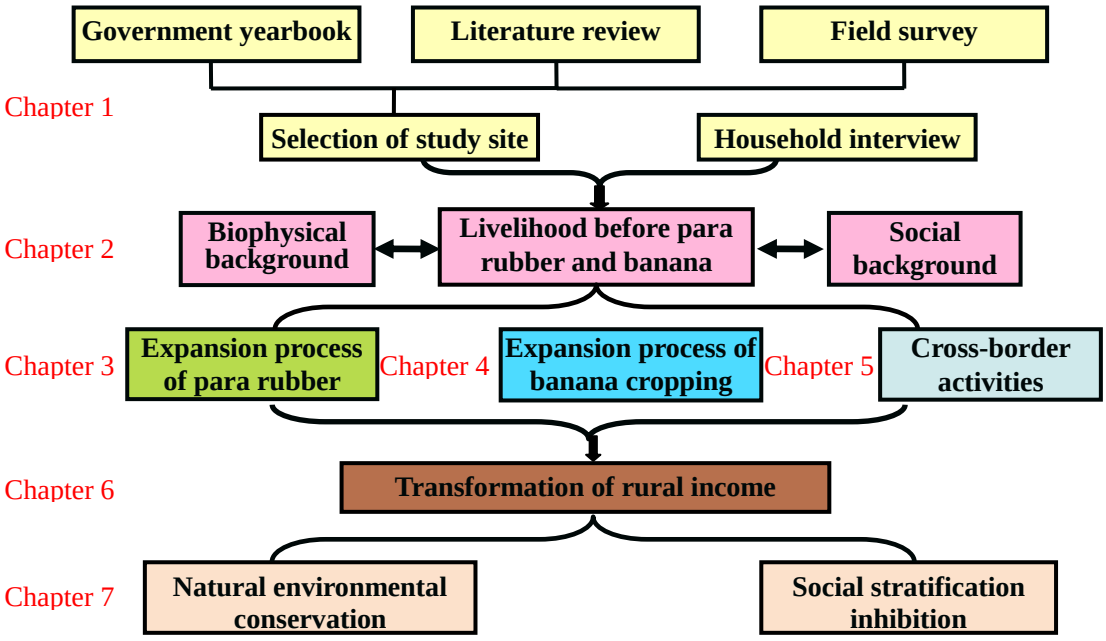

Fig.1-5 Flow chart of the present study

In Chapter two, social and natural information of the study area was introduced. More importantly, exemplified by two villages, this chapter demonstrated the transformation of lowland farming, upland farming, livestock breeding and off-farm activities, and checked out the key changes in rural livelihood in the past three decades.

In Chapter three, the process of land use changes of uplands, specifically land acquisition and rubber expansion process during the last three decades was studied.

The target of this chapter was to figure out mechanism that contributes to manage upland and forest resources reasonably.

In Chapter four, the adoption process of commercial cropping of banana from the viewpoints of land arrangement and technology diffusion was examined. This chapter aimed to determine the factors of rapid expansion of banana cultivation by paying attention to farm economy and land conditions.

In Chapter five, the situation of cross-border activities was introduced. More importantly, this chapter examined the constraints that common villagers have to face.

In Chapter six, the outcome of rural livelihood transition was summarized from the viewpoint of rural income. This chapter examined transformation of rural income at both village and household-level.

The last chapter concluded rural livelihood transition of the study area and discussed the mechanisms behind this change.

2. Livelihood before para rubber and banana

Historically, farmers of Xishuangbanna engage in paddy farming in the valley bottoms and shifting cultivation in the hills. During the last three decades, the rural livelihood of the study area experienced a rapid transition from self-sufficient to market-oriented.

2.1 Lowland farming

In collective period, villagers gained labor points through collective work, and they could exchange their labor points for grain and money (Fig. 2-1). As requested, villagers need to work 8 hours, and as return, they obtained 8 labor points. Generally, each people could get about 250 kg of rice per year. There were 4 positions in the study villages: technician, tractor driver, breeding man and cultivating person. Although they had different work, they got the same labor points per day.

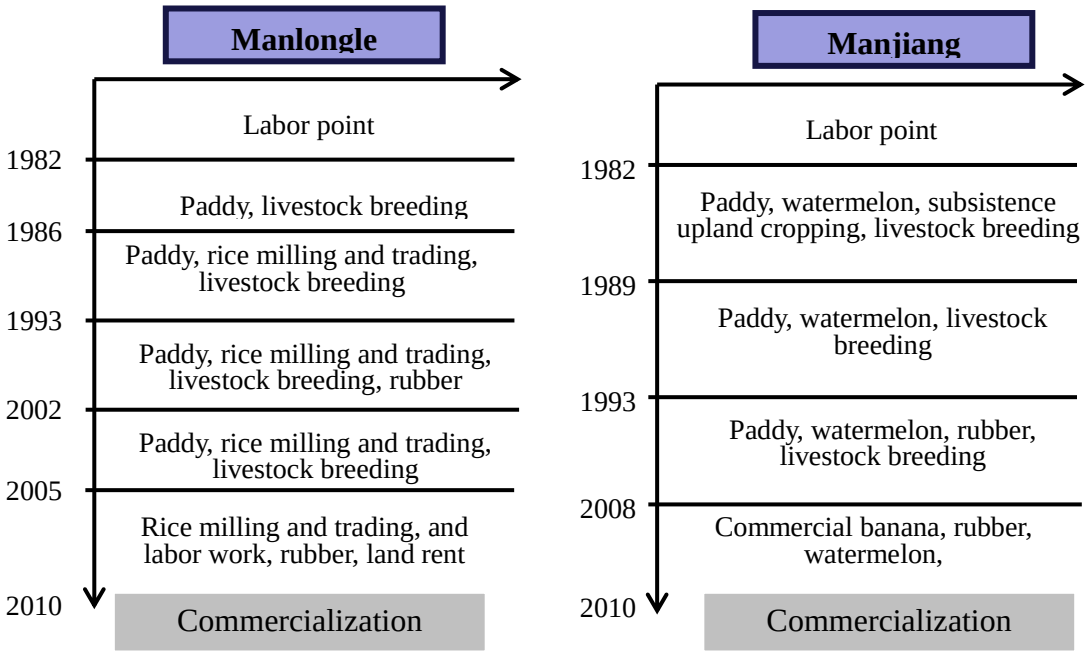

Fig.2-1 livelihood transition of Manlongle Village and Manjiang Village

Villagers acquired lowland fields mainly through the official allocation procedures (Fig. 2-2). At the end of 1982, Household Responsibility System was implemented. 52 ha of lowland fields were allocated to the villagers of Manjiang, and each villager got 0.12 ha, while each villager obtained 0.09 ha when these lowland fields were reallocated in 2000. Additionally, lowland fields jumped from about 60% to 80% of lowland just after the introduction of Household Responsibility System by reclaiming former bush and grass land, and 13 ha of lowland fields which accounted for 20% of the total area was not involved in the reallocation. Meanwhile, each villager of Manlongle got 0.15 ha, and totally 55.6 ha of lowland fields were allocated to the villagers in the early 1980s. Only 0.09 ha of lowland fields which accounted for 0.16 % of the total area was reclaimed spontaneously by Manlongle villagers. Since the early 1980s, the lowland-upland border in land use has never changed.

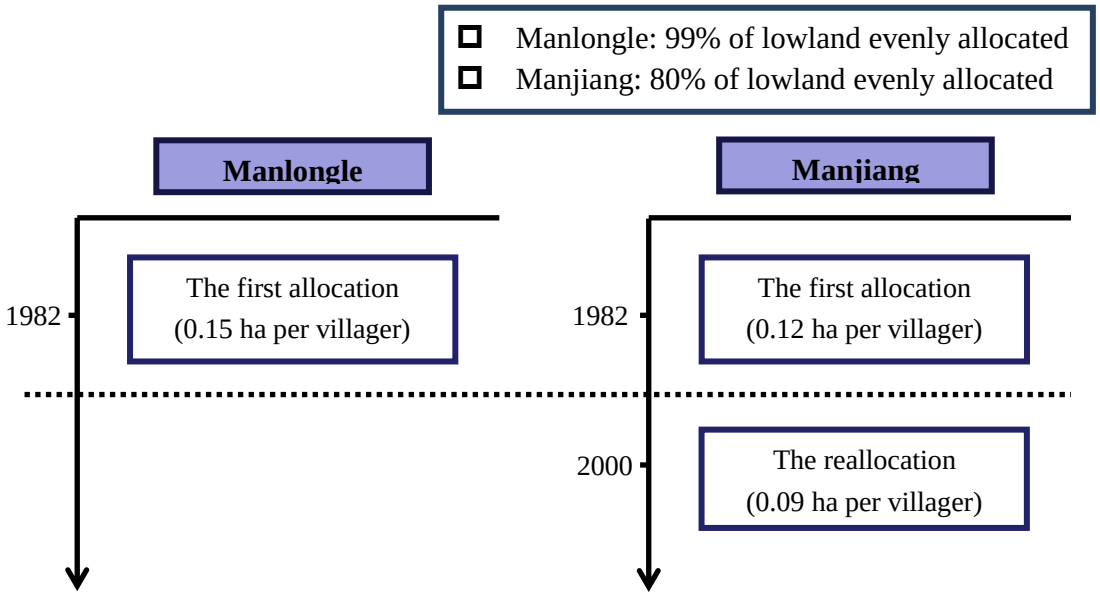

Fig.2-2 Lowland allocation of Manlongle and Manjiang Villages

During the collective period, villagers grew paddy in the rainy season, and grew maize, paddy and vegetables in the dry season. Villagers transplanted rice seedling on around 20th, June, and harvested at the end of October, and traditionally, they grew glutinous and indigenous rice (villagers called it *Boluoai*). In 1982, Administration of Agricultural Scientific Research (AASR) of Mengla County tentatively cultivated 0.13 ha of hybrid rice in Manjiang, initiating the expansion process of hybrid rice in both villages. As the elder villagers said, the yield of indigenous rice *Boluoai* was about 4,000 kg/ha, but the yield of hybrid rice was about 6,500 kg/ha.

Irrigation, drainage and transportation conditions affected changes in cropping pattern during the last three decades. The Manjiang successful adopted watermelon cropping, but the Manlongle failed to grow watermelon due to poor irrigation and traffic conditions (Fig. 2-1 and 2-3). This differentiated the pathway of lowland farming between the two villages in the following two decades.

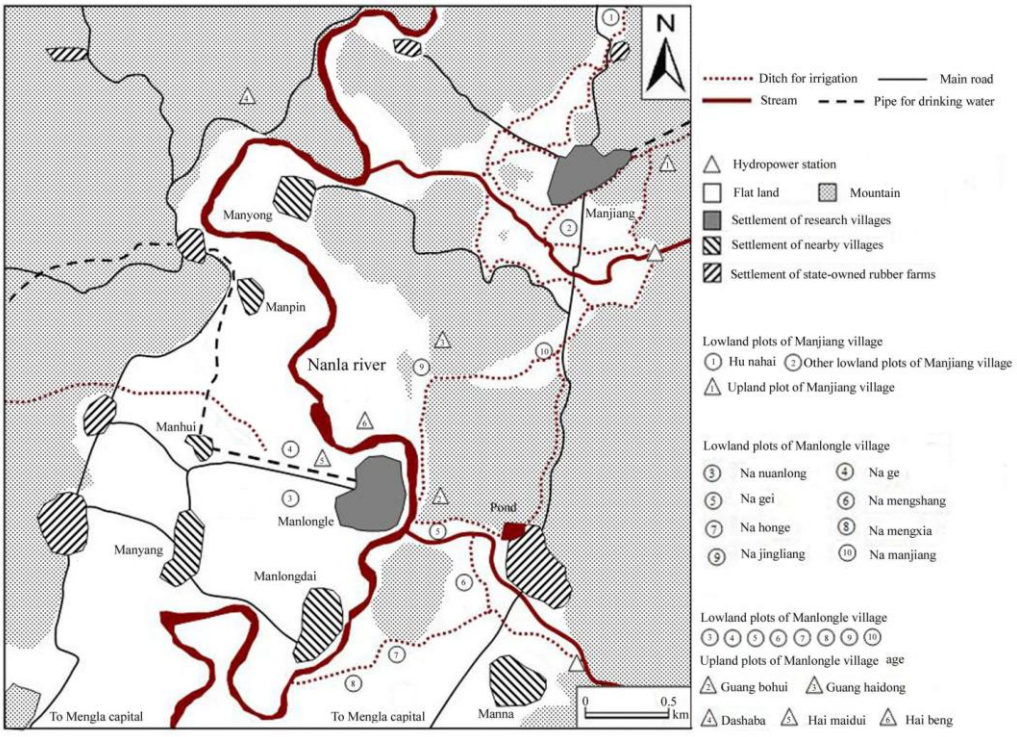

Fig.2-3 Geographical background of Manlongle Village and Manjiang Village

Manjiang is located at a foot of high mountains and river flow is available all through a year, and the lowland fields of this village have good conditions in terms of transportation and irrigation (Fig. 2-3). In 1981, the local government introduced watermelon farming into this village. This changed dry season crop from maize, rice, vegetables and fallow to watermelon. Villagers cultivated watermelon at the beginning of December, and they harvested from 12th to 16th, March next year. New techniques of watermelon growing were gradually introduced. In 1987, villagers adopted film-mulching techniques, which greatly lightened the villager's workload. In 1998, a grafting technique (tissues from watermelon are inserted into those of calabash) was introduced, and watermelons could then be cultivated continuously in the same plot in dry season for more than 3 years. Owing to these techniques, the double cropping of paddy in the rainy season (from June to October) and watermelon in the dry season (from December to March of the following year) was stabilized at Manjiang. Since the late 1980s, the villagers started to rent lowland fields from other villages for growing watermelon in the dry season, and the area of renting-in lowland fields reached 76 ha in 2007.

Lowland fields of Manlongle Village are divided into 8 blocks (Fig. 2-3 and 2-4). Two blocks, Na Nuanlong and Na Ge, are located close to the settlement and irrigated by the Huibengxin irrigation system. The remaining six blocks are located at the opposite side of Nanla River, of which Na Mengshang, Na Honge and Na Mengxia are irrigated by Mengluan irrigation system, and Na Jingliang and Na Manjiang are irrigated by the Nam Wa irrigation system. Na Gei is located at the downstream of the Nam Wa irrigation system and fed by a pond (Table 2-1).

Table 2-1 Attributes of Manlongle lowlands in the early 2000s

Name of lowland	Area (ha)	Number of land holding household	Location	Field conditions				Land classification in 1982	Dominant cropping pattern before the introduction of banana	
				Access to road	Irrigation		Drainage			
					water source	water availability in the dry season	water quality		Rainy season	Dry season
Na Nuanlong	19.9	40	close to settlement	good	Huibengxin	no	good	good	average and bad	paddy	maize
Na Ge	2.6	4	close to settlement	good	Huibengxin	no	good	poor	bad	paddy	fallow
Na Mengshang	5.3	13	opposite side of the river	good	Mengluan	yes	warm and slightly salty	good	good and average	paddy	paddy
Na Honge	1.7	5	opposite side of the river	good	Mengluan	yes	warm and slightly salty	poor	bad	paddy	paddy
Na Mengxia	12.3	25	opposite side of the river	good	Mengluan	yes	warm and slightly salty	good	good and average	paddy	paddy
Na Gei	1.1	3	opposite side of the river	good	Nam Wa (pond-fed)	yes	salty	good	good	paddy	paddy
Na Jingliang	3	7	opposite side of the river	poor	Nam Wa	yes	good	good	good	paddy	paddy
Na Manjiang	9.8	18	opposite side of the river and hill	good	Nam Wa	yes	good	good	good	paddy	watermelon
Total	55.7	115									

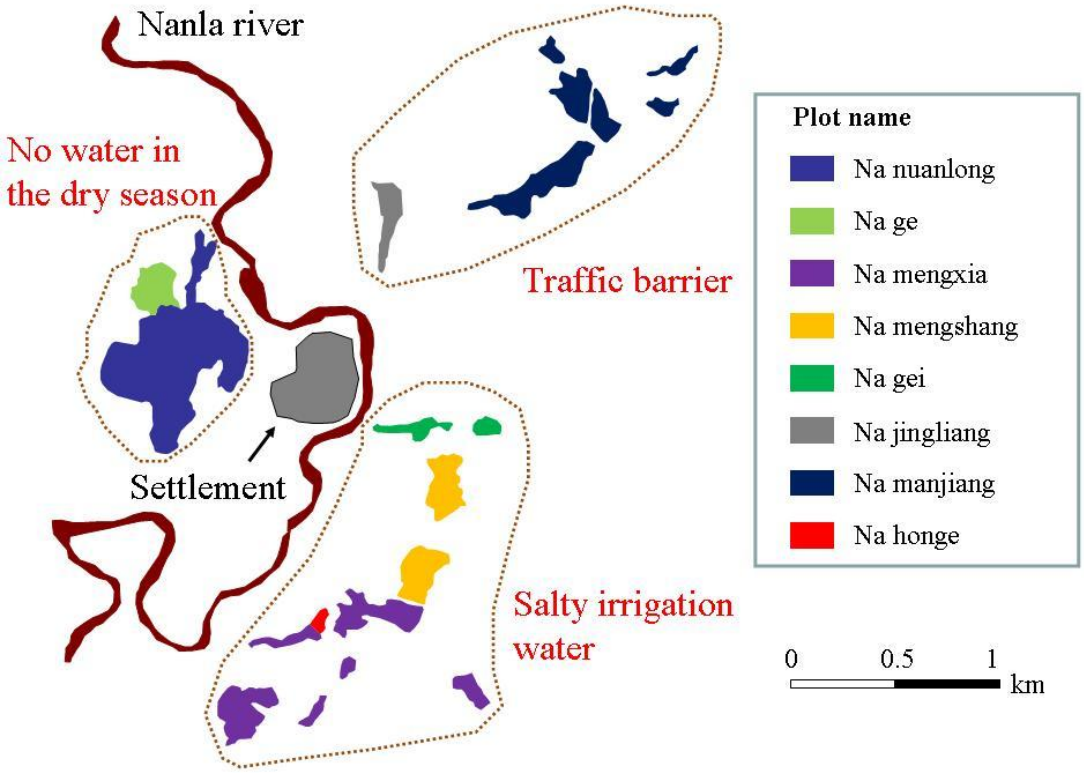

Fig.2-4 Irrigation and traffic conditions of lowland fields in Manlongle

Lowland fields of Manlongle were classified in terms of their productivity when they were allocated to the villagers in 1982. The classification depended mainly on the irrigation and drainage conditions. Three blocks irrigated by Nam Wa were classified as good, reflecting sufficient water supply. Three blocks irrigated by Mengluan were classified as good and average, while Na Honge was classified as bad due to its ill drainage. Two blocks of Huibengxin were average and bad because of insufficient water supply (Table 2-1).

The Manlongle villagers failed to adopt watermelon farming in the early 1980s due to the poor conditions of irrigation and transportation. Most of all the lowland was single cropped with rainy season paddy under the collective farming system. The

introduction of the Household Responsibility System inspired villagers to initiate dry season cropping. In 1983, several villagers of Manlongle tried to grow watermelon at Na Nuanlong and Na Ge but failed it since irrigation water was not available in the dry season. In 1985, a businessman from Anhui province rent land in Na Mengshang, Na Honge and Na Mengxia to grow watermelon. But more than one-third of the seedlings died before blossom because the water of Mengluan was too warm due to small runoff and long-distance transportation and slightly salty. In 1986, a Manjiang villager rent land of Na Gei to grow watermelon but finally failed it because the pond water was salty. Na Jingliang and Na Manjiang had good water condition to grow watermelon, but the road condition from the settlement to these blocks was poor and tractors could not access the fields. Hence villagers gave up growing watermelon at Na Jingliang and rent out Na Manjiang to the Manjiang villagers because the access from Manjiang was good.

In 2005, a Han businessman from Sichuan province expressed his wish to rent a lowland plot named Na Nuanlong (19.9 ha) for growing banana, and after negotiation, all villagers involved agreed to rent out their lowland fields to the Han businessman, initiating the process of renting out lowland fields at this village.

Banana was also not commercially grown at Manjiang until 2007. A local rubber middleman set up a banana farm at a neighboring village in 2007. At the time of harvest in February 2008, the villagers noticed that banana farming was much more profitable than their existing cropping pattern (paddy and watermelon), and this triggered an expansion in commercial banana cropping.

2.2 Upland farming

Traditionally, the villagers planted *Cassia siamea* for firewood and bamboo for construction material in the upland fields where near the village settlement and the villagers had the customary right to these upland fields even in the collective period. At the same time, the villagers also cultivated various crops such as maize, upland rice, peanut and vegetables in the upland fields. The villagers of Manjiang conducted shifting cultivation in the nearby mountain. There is no big mountain nearby the settlement of Manlongle Village, so the villagers did not have the experience of swidden agriculture in the collective period. During 1982-1985, the villagers succeed the land use right of these upland fields which they formerly utilized and some new upland fields that they had never touched in history. The government encouraged villagers to plant rubber by providing subsidy of 750 Yuan/ha in 1985. This triggered an expansion of rubber plantation. With the rise of rubber price, the villagers gradually converted the cropping pattern of upland fields from maize, rice, cotton, vegetables, firewood, bamboo and forest into a rubber mono-culture during the last three decades.

2.3 Livestock breeding

In the collective period, villagers collectively raised buffalo and pigs, and villagers just could sell the collective livestock to the Supply and Marketing Center. Villagers were allowed to raise a limited amount of livestock by themselves, but if villagers want to eat their livestock, they had to sell half of it to the Supply and Marketing Center with one-third price.

Livestock breeding was boomed by the implementation of Household Responsibility

System in 1982 (Fig. 2-1). Traditionally, the villagers raised cattle mainly for plowing power. Since the implementation of Household Responsibility System, the villagers had great enthusiasm to raise livestock. For instance, the number of cattle increased from 128 to 216, and the number of pigs increased from 152 to 370 at Manjiang during 1981-1985 (SBMC 1981, 1985). As the villagers said, livestock breeding played an important role in their livelihood over a long time, especially in the early 1980s. Since the early 1990s, tractors were introduced, so cattle gradually lost the role of plowing power, and raising cattle is just for getting cash income.

Livestock breeding declined in both villages with the expansion of banana and rubber farming in the late 2000s (Fig. 2-1, 2-5 and 2-6). Actually, raising cattle was a very hard work because they need to stay in the field everyday even it rains. Therefore, some villagers immediately gave it up when they started to grow banana or get part-time labor opportunity, and only those elder villagers who had difficulties in growing banana or searching job have to persist in raising cattle. Additionally, the available grazing land was greatly reduced due to the renewal of elder rubber tree in nearby state-owned rubber farms. Therefore, cattle breeding declined rapidly. With the expansion of commercial banana cropping, the villagers started to give up paddy farming because they thought purchasing rice chaff and maize to feed pigs was too risky. As a result, the number of pigs and households raising pigs decreased sharply.

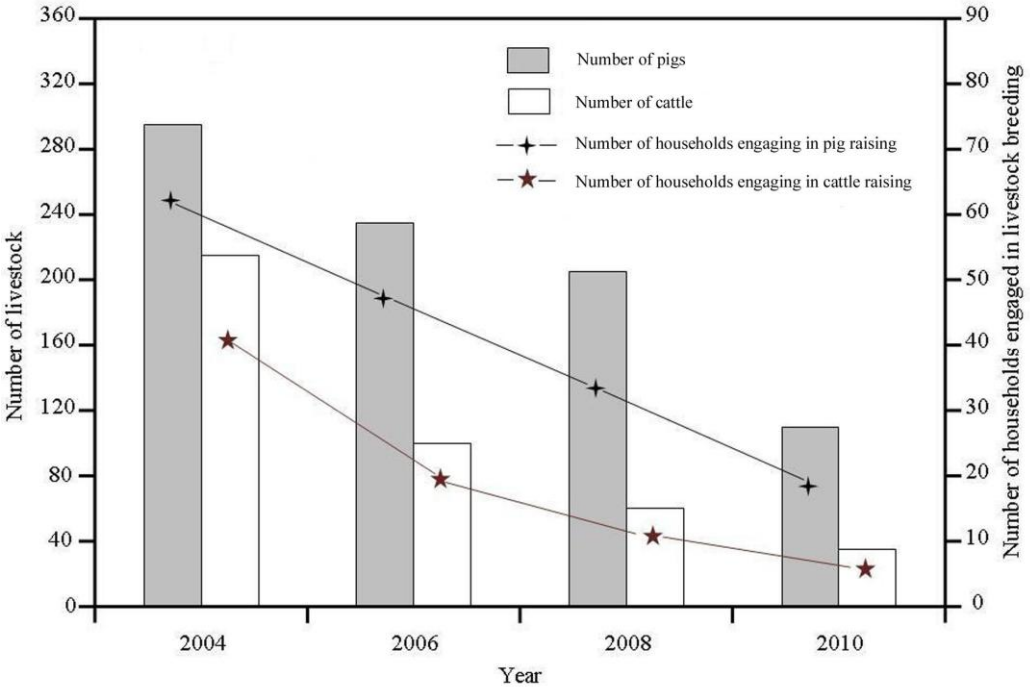

Fig.2-5 Decline of livestock breeding at Manlongle Village during 2004-2010
Data source: author's fieldwork

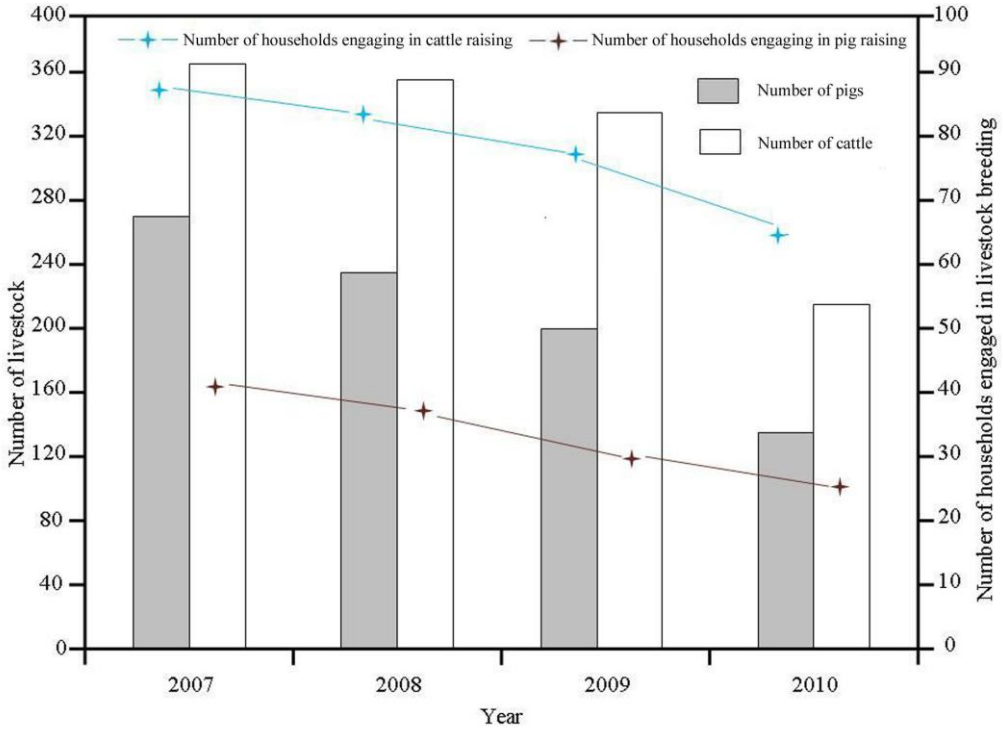

Fig.2-6 Decline of livestock breeding at Manjiang Village during 2007-2010
Data source: author's fieldwork

2.4 Off-farm activities

In the collective period, any kind of off-farm activities (i.e. self-employment in commerce, wage-paying activities and other services) were not allowed. Since the implementation of Household Responsibility System, the villagers have rights to engage in off-farm activities. In the past three decades, the content of off-farm activities at both villages has been diversified.

At Manjiang, there were 4 households engaging in trading rubber in 1985, which was probably the earliest off-farm activity at this village. In 2000, some villagers noticed that some Han businessmen purchased a Chinese medicine (*Fructus Amomi*), therefore, they started to buy *Fructus Amomi* from other villages and sold out to the Han businessmen. In the early 2000s, the elder villagers started to make stools (a type of seat without back and arm rests) for sale. Until 2010, there were 47 households engaging in various off-farm activities, including trading timber (1 household), rubber (3 households) and *Fructus Amomi* (16 households), making stools (29 households), operating restaurants (3 households) and being the middleman of banana trading (6 households). Among them, 10 households engaged in 2 or 3 kinds of off-farm activities.

At Manlongle, the villagers started to engage in off-farm activities since the late 1980s, and 50 households, out of 76, engaged in one or more kinds of off-farm activities, covering rice milling and trading, operating restaurants (shops), labor work until 2010 (Fig. 2-1 and 2-7). As the most important off-farm activities, rice milling and trading (villagers bought rice from other villages, and after milling, sold out at local market or other domestic market via Han businessmen) experienced three stages:

Development period (1986-2002), Climax period (2003-2005) and Decline period (2006-present). In 1986, three pioneering households bought tractors for trading rice assisted by micro credit using their livestock as collateral from a local bank, Rural Credit Cooperatives of Yunnan, and this triggered an expansion of this business at Manlongle Village. However, the number of households engaged in rice milling and trading gradually decreased from 30 to 16 due to the rapid expansion of commercial banana cropping and rubber plantations during 2004-2010. This was because it became difficult to purchase rice in Mengla County, which was especially fatal to those villagers trading rice by tractors with a loading of 1.5 tons. They nearly benefited nothing if they went far away for purchasing rice. Additionally, the situation was worsened by a severe competition with Han businessmen.

Three factors constrained villagers to engage in rice milling and trading. First, education experiences, 25 households said that their education experiences were too poor to handle this business; second, insufficient labor forces, a buying-reselling cycle of trading rice requires two main labor forces (generally couples) go outside for 2-3 days even longer, 13 households said that they did not have reliable member in their family to care about kids, elder or unhealthy family members; third, poor economic condition, 11 households said that they did not have enough money to invest.

There were 4 restaurants and 2 shops at Manlongle Village in 2010, while no household operated a restaurant or shop in 2004. These changes was thought to be caused by the expansion of cash crops (especially rubber and bananas), which rapidly promoted local consumptive capacity.

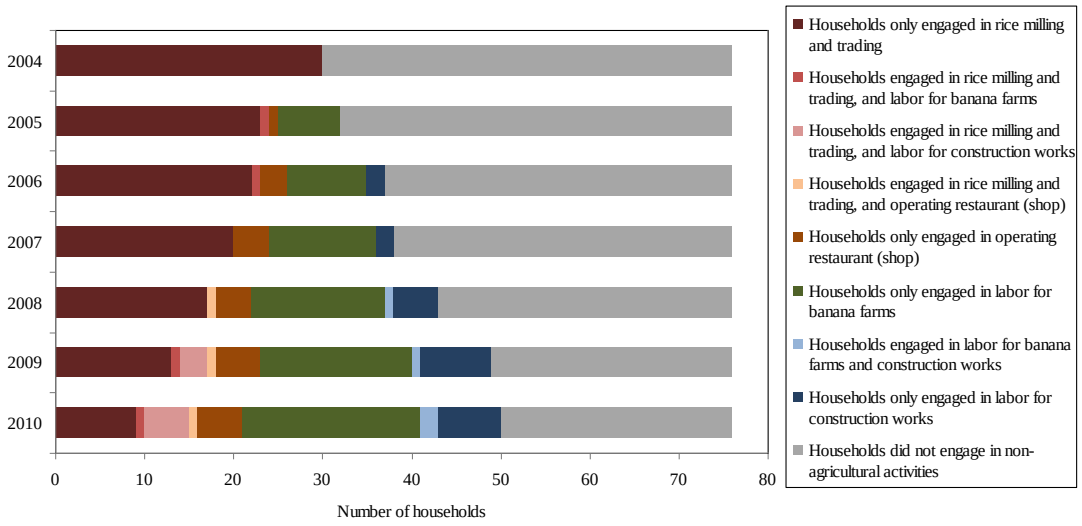

Fig.2-7 Changes in off-farm activities of Manlongle Village during 2004-2010
Data source: author's fieldwork

The number of households engaged in labor work increased rapidly during 2004-2010. In 2004, no villager engaged in labor work. Since 2005, the expansion of banana farms had brought part-time job opportunity as agricultural labor, and until 2010, 24 villagers were employed as part-time labor by Han businessmen who managed banana farms. Additionally, with the rapid development of local economy, local people were able to improve their housing conditions, get part-time job opportunity as construction labor. 14 villagers engaged in construction work in 2010.

3. Expansion process of para rubber

3.1 Introduction

In response to military needs initiated by the Korean War, large-scale state-owned rubber farms were established as dedicative government efforts of achieving rubber self-sufficiency in the early 1950s (Mann, 2009). Before the 1980s, rubber boom was mainly sustained by the state-owned rubber farm, while the following years has been more like an era of smallholder rubber since the Household Responsibility System was introduced in the early 1980s (Chapman, 1991). Although Chinese government issued a series of policies for conserving forest, literatures showed that rubber plantations still expanded rapidly (Fu, et al., 2009). Li et al. (2008) noted that the increasing demand and high price of natural rubber will most likely lead to a continuous expansion of rubber plantations in Xishuangbanna.

This chapter aimed to figure out mechanism that contributes to manage upland and forest resources reasonably. The area of smallholder rubber in Mengla County was only 607 ha in 1980 and increased to 31,020 ha in 2000 and 72,600 ha in 2010 (SBMC, 1980, 2000, 2010). Even though two selected villages followed the similar trend of expansion during the last three decades, I concluded that the expansion process of smallholder rubber almost ceased in the study villages, on the contrary to the past studies.

3.2 Policies and programs on upland management

Government policies/programs have played crucial roles in upland management since the establishment of People's Republic of China in 1949 in general and after the

introduction of the so-called “Three Clarification Policy” in the early 1980s in particular. This section reviews these policies and programs to clarify the changes in institutional setting of upland management.

The government of Yunnan Province approved the establishment of Xishuangbanna Nature Reserve for protecting tropical forest ecosystems in 1958. The State Council issued “Three Clarifications Policy” that aimed at demarcating the areas of state-owned forest, natural reserve and each village with an emphasis on mountainous areas in 1982 in order to provide the physical basis for the government to strictly conserve state-owned forest (Yin et al., 2001; Zeng et al., 2001). 241,776 ha of tropical forest, accounting for 12.3% of the total area of Xishuangbanna, was demarcated as nature reserve by 1983 where farming was strictly forbidden (Ou et al., 1997; Zeng et al., 2001; Yang et al., 2002).The area has been well conserved since then. In 1986, the Xishuangbanna Nature Reserve was promoted to be a national-level natural reserve (Yang et al., 2006).

For historical and ethnic reasons, the Yunnan government formulated a policy called “Liangshanyidi” in 1983. This promoted upland farming and protected swidden agriculture (Guo et al., 2001). The customary use of village lands including community forests and swidden lands were untouched and the villagers maintained free access to these lands (Yin et al., 2001). “Three Clarification Policy” and “Liangshanyidi”, however, weakened the control of government on upland, and caused large-scale clearance of tropical forest by local people (Xu et al., 1999; Yang et al., 2006). This movement is mitigated through the introduction of the Household Responsibility System in 1984 which promoted the transfer of land use right of mountainous fields officially from the state and customarily from the village authority

to individuals. Under this reform, freehold plots and collective swidden fields were leased or contracted to households (Zeng et al., 2001).

In 1987, the State Council issued “An instruction on strengthening the management of community forest and prohibiting deforestation in southern China”. This instruction officially approved community forest as the property of village and, instead, forbad logging and allocating it to households (Xu et al., 2006). Staff of local government visited the study villages in 1988 and declared to prohibit deforestation. However, logging in swidden-related secondary vegetation and old-growth trees of fallow lands were exempted. Additionally, villagers are allowed to collect timber from community forest for building house until now.

In 1998, the Natural Forest Protection Project was implemented in Xishuangbanna. This project clarified the boundary of farmland and forest land, and strictly forbad any deforestation of forest land. In this context, villagers rushed to clear large area of regenerating trees in fallow lands to demonstrate them to be farmland. Therefore, this project caused clearance of young forests in a short term, while it effectively contributed forest conservation in the long term.

In 2002, the Green for Grain Project was implemented in Xishuangbanna, aiming at recovering forest. The government promoted villagers to convert farmland to tree plantation of economic trees such as tea, rubber and bamboo as well as non-economic trees, of which *Anthocephalus chinensis* was the popular choice. The annual subsidy to tree plantation was 300 kg of rice or 260 yuan per mu (0.067 ha). Villagers were subsidized for 5 years in case of economic trees and for 8 years in case of non-economic tree. Since the amount of subsidy was as high as the return of growing

maize or rice in upland fields, this project provided a significant incentive to farmers. In Xishuangbanna, 18,133 ha of mountainous farmland have been converted and reforested during the period between 2002 and 2012 (Tian, 2012).

The cadastral office of Mengla County improved the accuracy of land mapping by means of GPS measurement in 2007 and 2008 for strict conservation of tropical forest and mitigation of land-related conflicts. In 2011, for the sake of improving the environment, the Committee of Xishuangbanna People's Congress required that para rubber located in the watershed with slope above 25° should be converted to forest.

These clearly reflects the step-by-step process of institutional and technical evolution of upland management, and the last three decades are classified into three periods, the initial, transition and strict control periods, from this viewpoint (Table 3-1). The policy target of the initial period was to clarify the area where the government and village should be responsible for and to register the body who possessed land use right. Substantial forest conservation in the village land was initiated in the transition period. The government intervened in customary use of village land in exchange with the endorsement of the villages' right on community forest. Then, in the strict control period, the government took determined steps for conserving forest resources.

Table 3-1 Changes in institutional setting of upland management

Period	Year	Policy target	Major policies/programs
Initial period	Between 1982 and 1987	To differentiate state- and village-managed lands	Three Clarification Policy
Transition period	Between 1987 and 1998	To intervene in customary forest management and to loosely control logging	Instruction on community forest and deforestation
Strict control period	After 1998	To strictly control logging and to promote reforestation	Natural Forest Protection Project; Green for Grain Project

3.3 Smallholder rubber growing

3.3.1 Expansion of rubber

The government set up a program to promote rubber planting in 1985. This program encouraged villagers to open forests and to plant rubber. It provided a subsidy of 750 yuan/ha for planting rubber which could cover the cost of rubber seedlings, 450 yuan/ha at that time. The government also requested state-owned rubber farms to dispatch staff for teaching rubber growing technique to the villagers.

Forest governance of the government was still in the initial period, and the customary management was fully effective at the village level. The villagers collectively agreed to allocate 12.4 ha and 46.5 ha of land to households in Manlongle and Manjiang, respectively, and planted rubber in 1985 (Fig. 3-1 and 3-2).

Tapping of rubber started in 1993 in both villages. The price of rubber at that time was comparatively high, 6 to 8 yuan/kg (Fig. 3-3). Villagers recognized the promising profitability of rubber. Forest governance of the government was in the transition period and the villages could open forest to plant rubber if they got the in-advance permission from the government, and actually they did it in 1996 in both villages.

In December, 1999, serious cold weather hit the study area and young rubber trees were suffered from frost. 90% of rubber trees in Manjiang were killed, while it was around 30% in Manlongle. This difference reflects the elevation of rubber planting area, about 790-1,020 m above sea level in Manjiang and 680-750 m in Manglongle. The recovery from frost damage took 5 years in Manjiang because villagers doubted feasibility of rubber growing and hesitated to invest in replanting. But villagers

replanted rubber trees within a year in Manlongle.

Even in the strict control period in the 2000s, rubber area gradually increased in both villages and reached around 120 ha in Manlong and 155 ha in Manjiang by 2010. These findings may suggest that changes in institutional setting did not have crucial impacts and profitability and risk evaluation of rubber growing were more influential on rubber expansion process. Affected by the Asian financial crisis, the rubber price was quite low during 1997-2001, therefore, the Manlongle villagers in 2001 collectively rented out the rubber trees planted in 1985 (the lease was 24 years). However, the rubber price increased rapidly during 2005-2006, and in fact, all the villagers feel regretful to rent out their rubber gardens. Therefore, no Manlongle villager chose to rent out rubber trees when the rubber price slumped during 2008-2009.

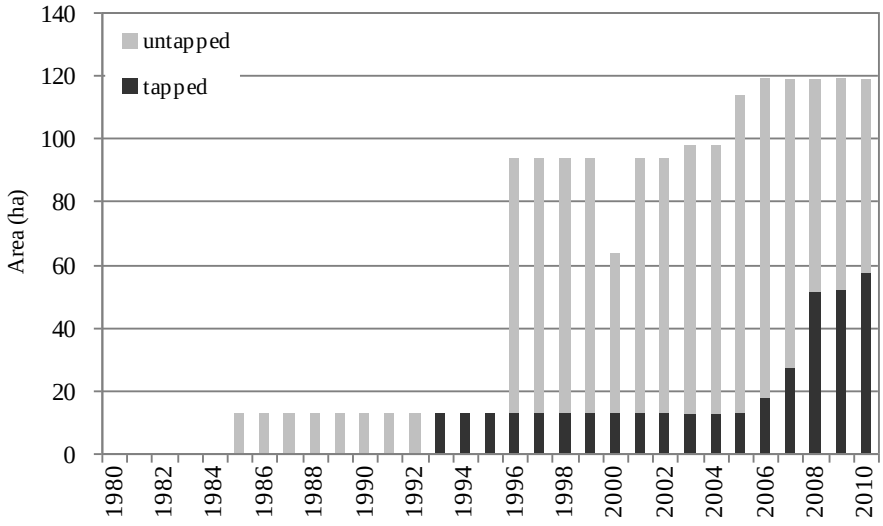

Fig.3-1 Rubber expansion in Manlongle village
Data source: author's fieldwork

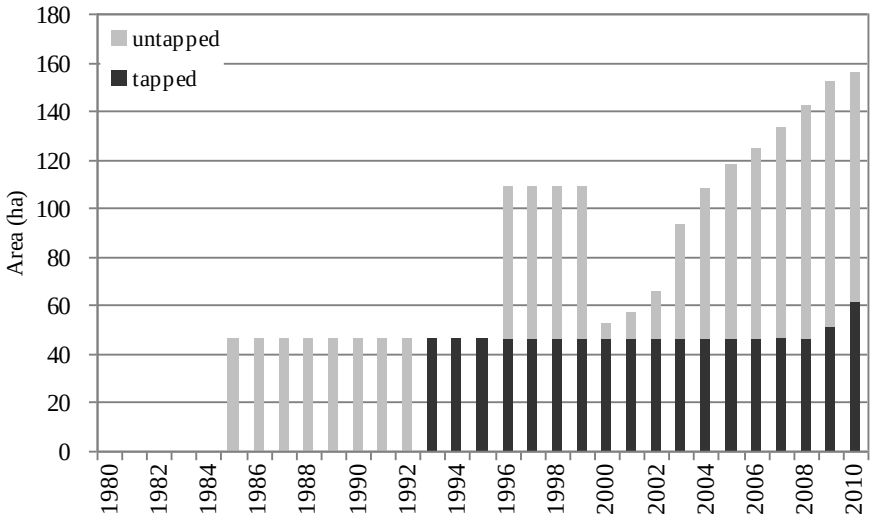

Fig.3-2 Rubber expansion in Manjiang village
Data source: author's fieldwork

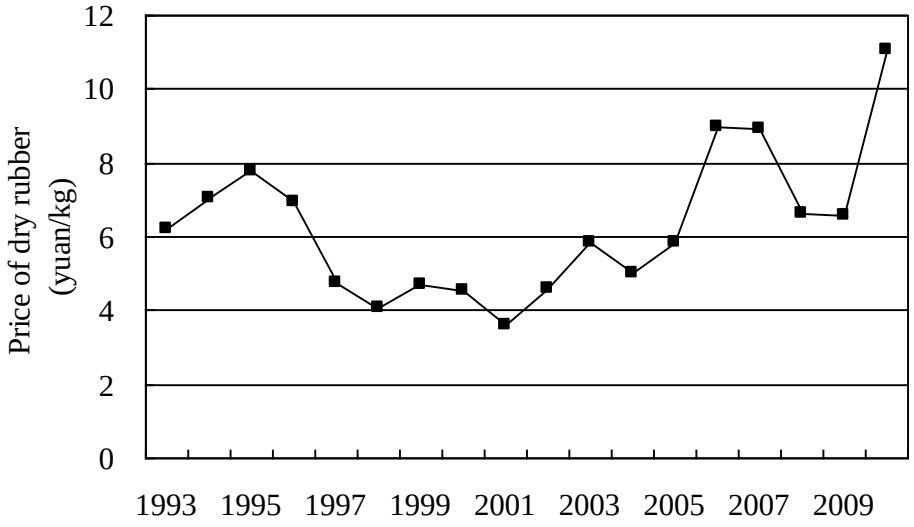

Fig.3-3 Price of dry rubber during 1993-2010
Data source: Statistic Bureau of Mengla County (constant prices)

3.3.2 Economy of rubber growing

Almost all households of the study villages hold rubber gardens except for two households. Their family members are only elders and cannot tap rubber by themselves. So they sold their gardens to their neighbors.

Farm size shows a normal distribution with the average of 1.6 ha per household in both villages (Fig. 3-4). The farm size of 85% of the total households ranges between 0.5 ha and 2.5 ha. Only 6 households hold rubber garden larger than 3 ha. One person can tap 100 to 150 trees per hour, and they were able to continuously work 6 hours (generally, from 3 am to 9 am). Tree density is 450 trees per ha. At present, tapping is usually every 2 days, so if they tap half every day, the tapping area can be twice. Therefore, logically, one person can manage 3 to 4 ha of rubber gardens.

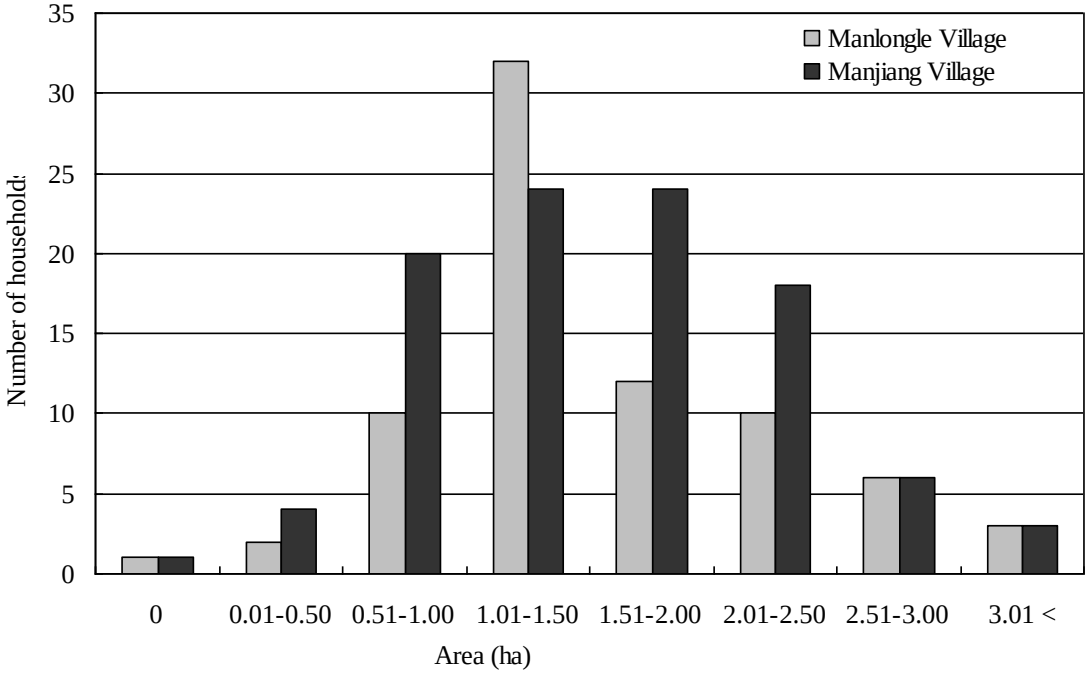

Fig.3-4 Distribution of rubber holding size in the study villages
Data source: author's fieldwork

The income from rubber occupies an important part of household income (Table 3-2). At Manlongle, tapping rubber is the second important income source for the low income households, while it is the most important income source for the middle and high income households in 2010. At Manjiang, tapping rubber is the second important income source for all income-level groups in 2010. In Mengla, Manjiang is famous

for growing watermelon since the 1980s and is the only village growing banana by villagers since 2008. Therefore, the role of rubber in the livelihood of Manlongle is more representative in this County.

Table 3-2 Average household income of different income level households in 2010 (Unit: 10^3 yuan)

	Tapping Rubber	Lowland farming	Other enterprises	Total	Percentage of income from tapping rubber
Manlongle					
Low income (25 HHs)	7.8 (1.2) [a]	0.5 (0.3) [a]	12.5 (1.1) [a]	20.8 (1.8) [a]	37.5%
Middle income (26 HHs)	22.8 (1.0) [b]	0.0 (0.0) [a]	17.8 (1.0) [b]	40.6 (0.6) [b]	56.2%
High income (25 HHs)	36.3 (3.1) [c]	0.9 (0.5) [a]	26.7 (2.5) [c]	64.2 (3.1) [c]	56.5%
Pan-households (76 HHs)	22.3 (1.8)	0.4 (0.2)	19.0 (1.2)	41.8 (2.4)	53.3%
Manjiang					
Low income (33 HHs)	11.8 (1.5) [a]	19.6 (2.2) [a]	4.2 (0.6) [a]	35.6 (1.9) [a]	33.1%
Middle income (34 HHs)	20.2 (2.2) [b]	50.9 (3.4) [b]	7.9 (1.8) [ab]	79.0 (2.6) [b]	25.6%
High income (33 HHs)	30.9 (3.6) [c]	117.0 (11.1) [c]	14.4 (4.0) [b]	162.3 (12.8) [c]	19.0%
Pan-households (100 HHs)	21.0 (1.7)	62.3 (5.6)	8.9 (1.5)	92.2 (6.8)	22.8%

Within each part of the table, columns with different letters were found to be significantly different by the LSD test (P = 0.05) following one-way ANOVA (SPSS 11.5). Data in bracket are SE

Lowland farming accounts for the largest part of household income at Manjiang. Especially, the annual return of commercial banana cropping is about 7,000 yuan/mu that is nearly 3 times higher than that of rubber gardens. Therefore, the role of rubber in the livelihood of Manjiang is limited. However, since rubber trees can be tapped for 20 to 30 years continuously once planted and its price is rather stable compared to those of commercial crops such as watermelon and banana, villagers suppose that rubber is most reliable income source even in Manjiang.

3.4 Changes in upland use

Both study villages have several upland plots. This section examines the changing process of land use at the plot level to clarify the relations between customary and

government-initiated institutions, and land use in general and rubber expansion in particular.

3.4.1 Upland plots of the study villages

Manlongle has 152.6 ha of upland consisting of six upland plots, of which two plots are located close to the settlement, two plots located at the opposite side of the river, and the others are located 4 km far from the settlement (Fig. 3-5; Table 3-4). Before the 1980s, Plot A, adjacent to the settlement, was used for the collection of firewood and bamboo. Plots B and C were upland fields for subsistence cropping. Plots D and E were not recognized as the village land. Plot D was used for shifting cultivation by Hani people who lived in nearby area. These plots were allocated to Manlongle under the Three Clarifications Policy in the early 1980s. Plot F, nearby the settlement, is the holy hill of village.

Manjiang has 268.8 ha of upland consisting of a big upland area called Namwa and scattered uplands nearby the settlements (Fig. 3-6; Table 3-5). These uplands were grouped into seven plots, of which Plots A, B, C and G are scattered around the settlement and Plots D, E and F are located in the slope land of Namwa. Plot A, adjacent to the settlement, had been used for the collection of firewood and bamboo, Plots B, C, D and part of Plot E were used for subsistence cropping including shifting cultivation, and Plot F was forest before the 1980s. Plot G is the holy hill of village.

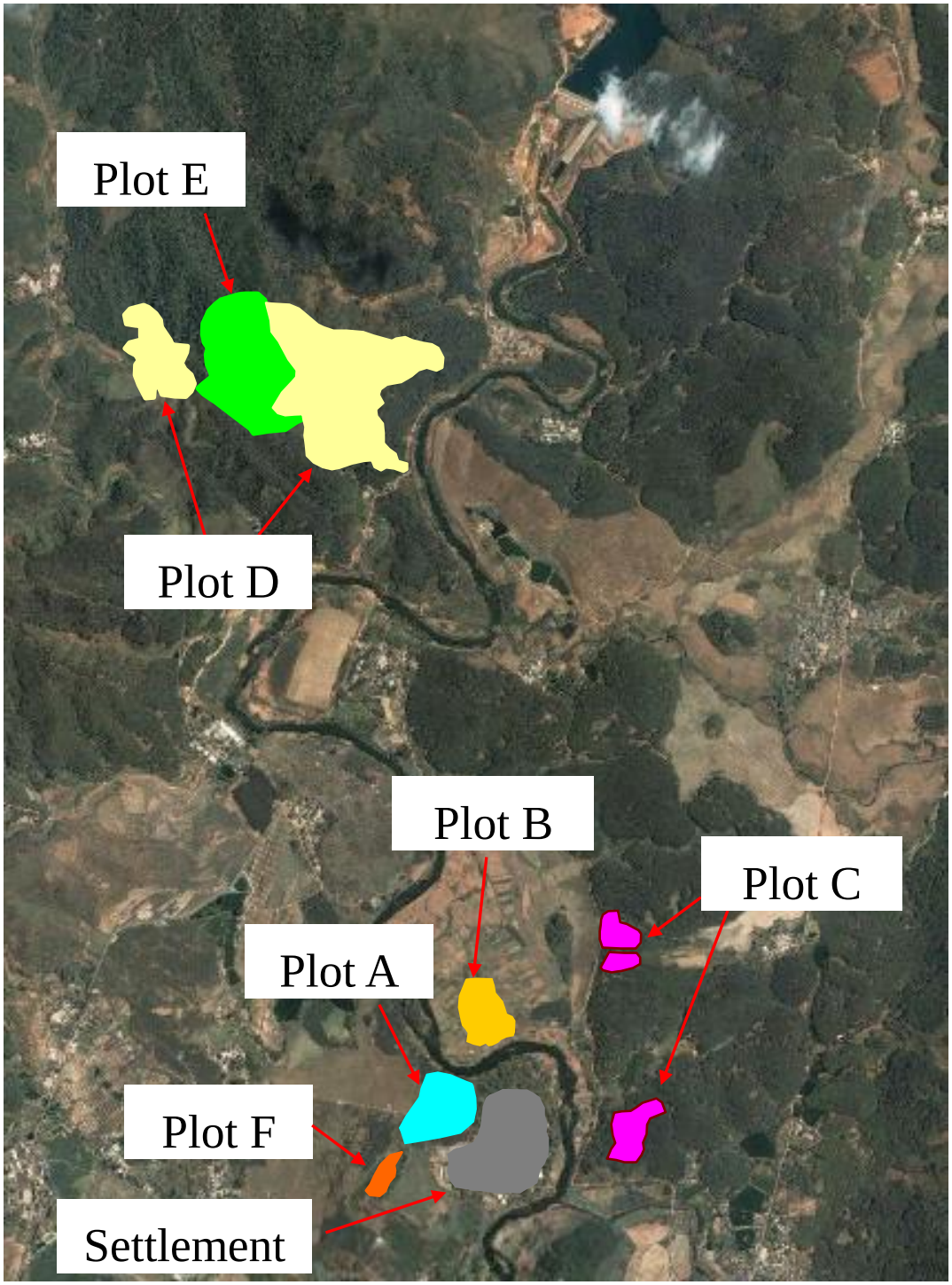

Fig.3-5 Spatial distribution of upland plots of Manlongle Village
(The background map was downloaded from Google Earth)

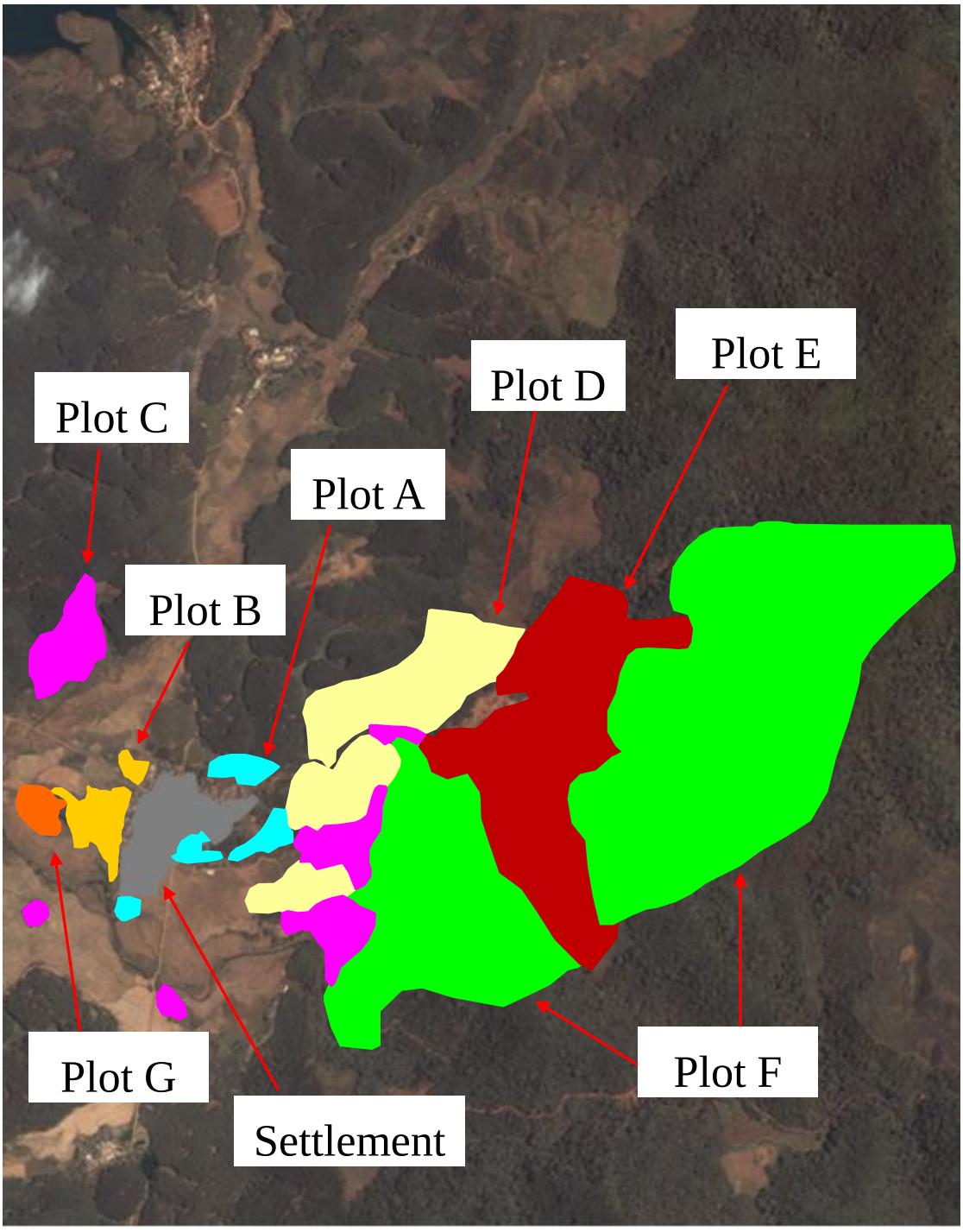

Fig.3-6 Spatial distribution of upland plots of Manjiang Village
(The background map was downloaded from Google Earth)

Table 3-3 Upland plots of Manlongle Village

Plot	A	B	C	D	E	F
Name (local)	Hai Maidui	Hai Beng	Guang Haidong and Guang Bohui	Da Shaba	Bamai Neman	Nong
Distance from the settlement (km)	0.1	0.2	0.2 - 0.7	4	4	0.2
Area (ha)	13.3	12.0	12.4	80.9	32.0	2
Land use before 1980	Firewood and bamboo	Subsistence Cropping	Subsistence cropping	Shifting cultivation by Hani (63.9 ha) and deep forest (17.0 ha)	Deep forest	Deep forest
Land allocation	Individual reclamation before 1982, land use right endorsed in 1982	Equal allocation in 1982 (0.03 ha per person)	Equal allocation in 1985 (0.2 ha per household)	Equal allocation in 1996 (0.2 ha per person)	Not allocated	Not allocated

Table 3-4 Upland plots of Manjiang Village

Plot	A	B	C	D	E	F	G
Location	Scatted around the settlement	Scattered around the settlement	Scattered around the settlement	Guang Namwa	Guang Namwa	Bamai Neman	Holy hill
Distance from the settlement (km)	0.1-0.2	0.1	0.3-0.7	0.1-1.3	0.7-1.6	0.6 - 3.2	0.3
Area (ha)	11.7	12.8	22.3	46.5	62.3	110.0	3.2
Land use before 1980	Firewood and bamboo	Subsistence Cropping	Subsistence cropping (Shifting Cultivation 17.2 ha)	Subsistence cropping (Shifting Cultivation 44.9 ha)	Subsistence cropping (Shifting cultivation)	Forest	Forest
Land allocation	Individual reclamation before 1982, land use right endorsed in 1982	Individual reclamation before 1982, land use right endorsed in 1982	Group-level allocation in 1985	Group-level allocation in 1985	Equal allocation in 1996 (0.1 ha per person)	Not allocated	Not allocated

3.4.2 The initial period

Traditionally, the villagers planted *Cassia siamea* for firewood and bamboo for construction material in uplands nearby the settlement. These are Plot A of Manlongle and Plots A of Manjiang (Fig. 3-7, 3-8, 3-9 and 3-10).

Upland cropping has supplemented lowland paddy growing in daily food production. Plots B and C in Manlongle and Plots B, C, D and E in Manjiang, located a little bit far from the settlement, were the place where villagers grew upland rice, maize, vegetables and other food crops mainly by shifting cultivation. The farming was individual practice, rather than collective. These lands were also equally allocated to each household during the initial period.

Behinds these plots, there was forest. In Manjiang, it is Plot F. Although Manlongle did not have such forest, it got Plots D and E under the Three Clarification Policy. These are formerly used by Hani people and Manlongle villagers had never used it.

The villagers collectively decided upland use in the initial period, even though the Household Responsibility System has been implemented. When rubber came, both villages selected to plant rubber by converting a part of upland cropping area. After collective negotiation, the Manglongle selected Plot C which was fallow in 1983 and 1984, and the Manjiang selected Plot D where they mainly practiced shifting cultivation. In both villages, the villagers equally allocated these plots to each household and planted rubber. This caused slight changes in upland use of both villages (Fig. 3-7, 3-8, 3-9 and 3-10).

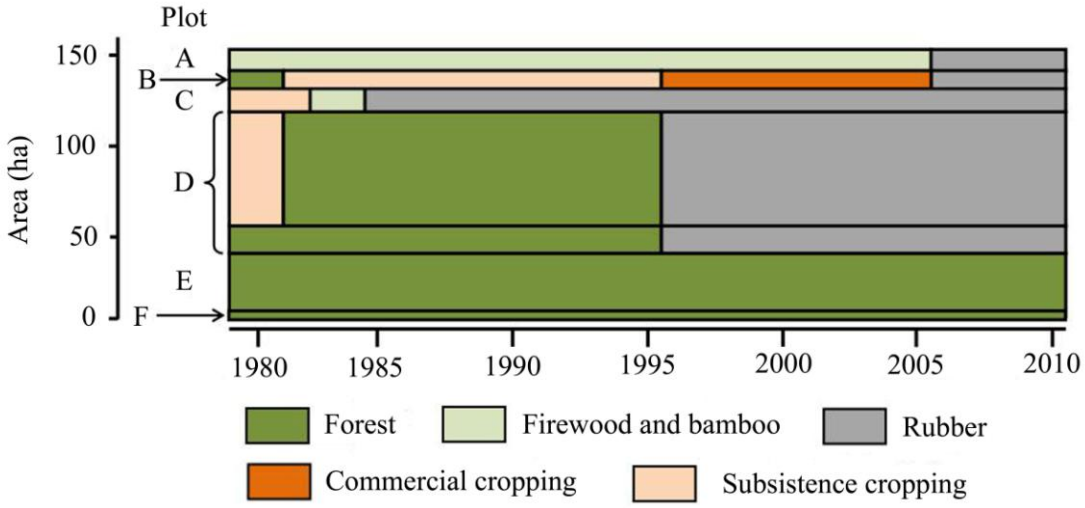

Fig.3-7 Changes in upland use in Manlongle

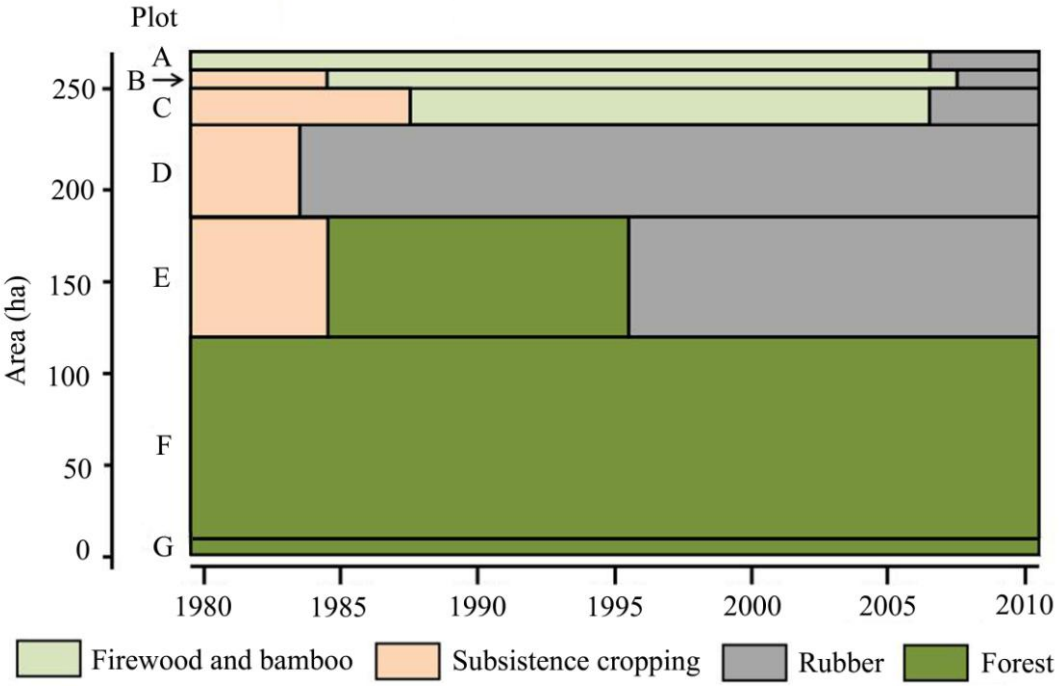

Fig.3-8 Changes in upland use in Manjiang

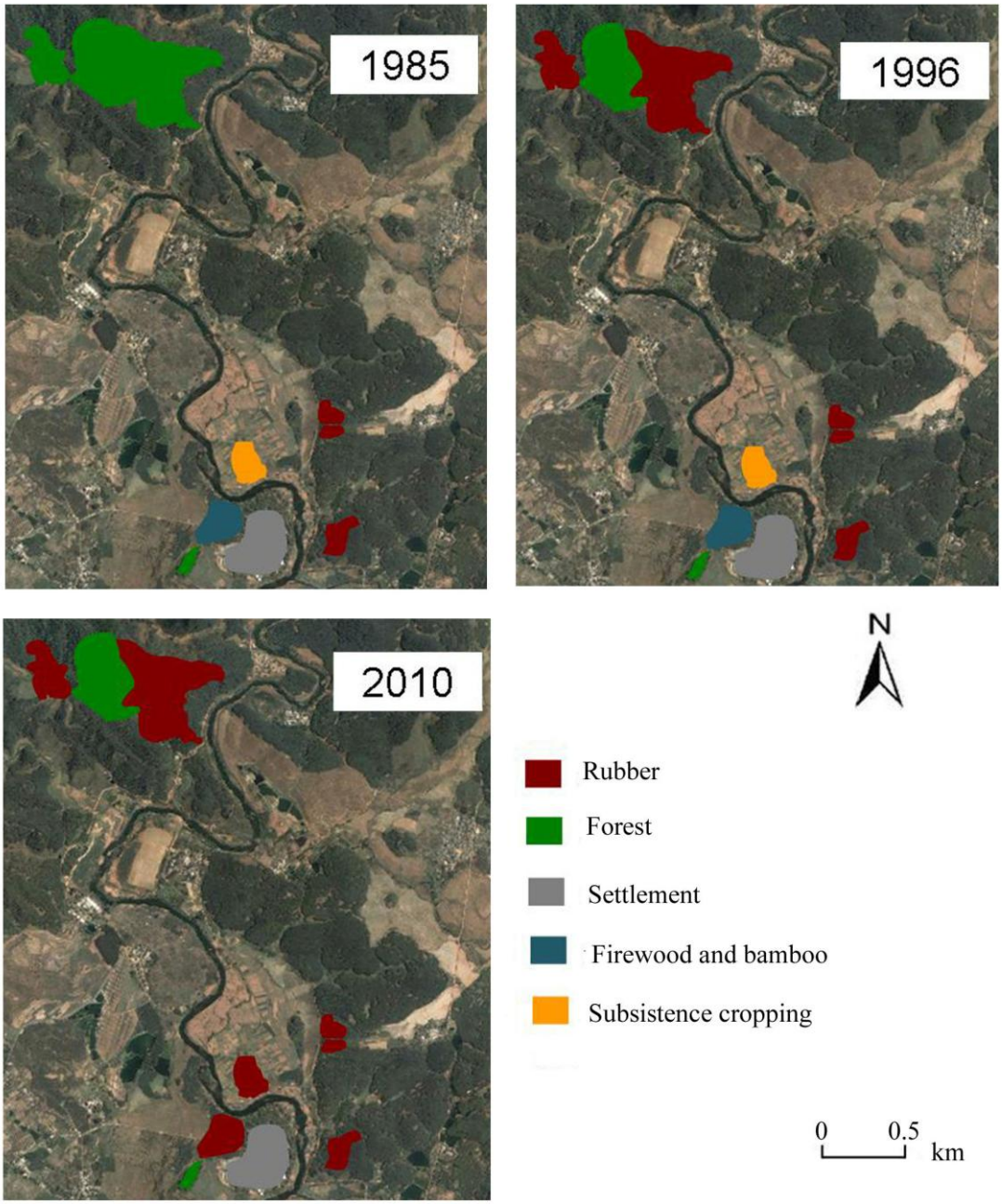

Fig.3-9 Land use pattern of upland plots in Manlongle

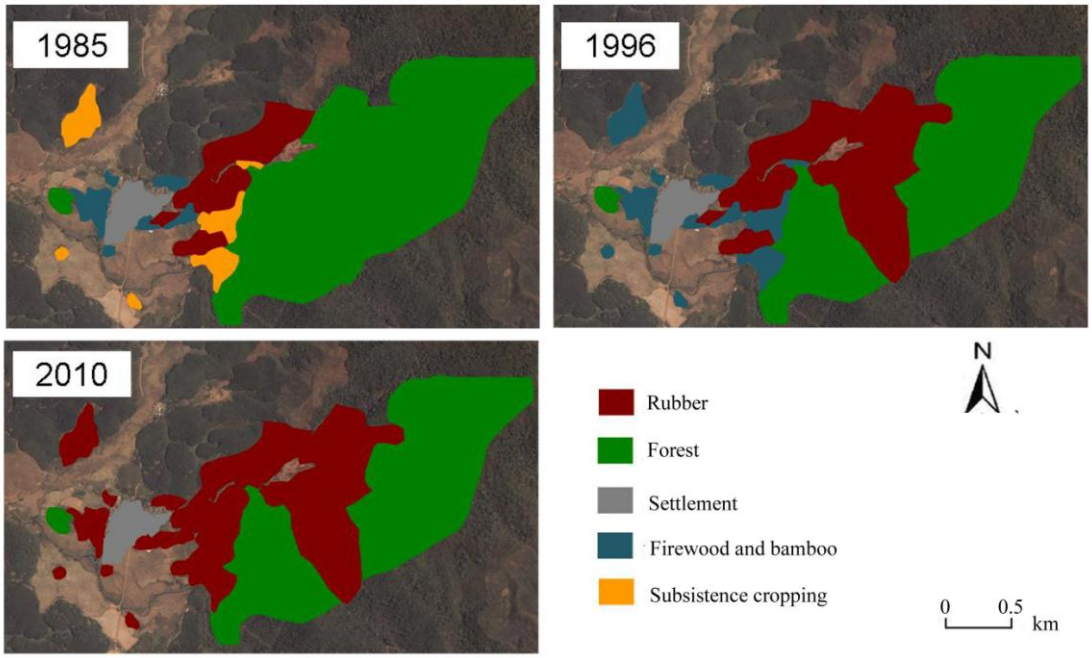

Fig.3-10 Land use pattern of upland plots in Manjiang

3.4.3 The transition period

Manlongle villagers collectively decided to utilize newly allocated forest land (Plot D). The area was used for shifting cultivation by Hani people until 1981 and had secondary vegetation. Before clearing forest, village authority reported their plan to Forestry Department of Mengla because they planned to log about 17 ha of old-growth trees inside this plot to open rubber garden.

The Manjiang villagers collectively employed workers from other villages to clear the remaining swidden-related secondary vegetation (Plot E), and allocated the land to each household. The village authority reported their behavior to the Forestry Department after the allocation was finished because they did not plan to log deep forest. These workers only cleared the central part of fallow land, and 29 households whose allocated lands were located at the edge of the collectively cleared land

spontaneously opened the remaining swidden-related secondary vegetation in the same plot for planting rubber without any permission. But they never touched the adjacent deep forest in Plot F.

Self-management of village community played an important role in conserving forest. The Manjiang villagers have incentives to protect forest for conserving water and timber. In 1964, a state-owned rubber farm planted rubber in the watershed area of Hu Nahai (a lowland block of Manjiang). As villagers said, it only took 2 years that this plot suffered from the shortage of irrigation water after logging forest. The community forest of Manjiang is located in the watershed area which conserves the irrigation and drinking water (Fig. 2-3). Therefore, the Manjiang villagers collectively decided to clear swidden-related secondary vegetation only and to conserve 110 ha of community forest in 1996. Even though the community forest of Manlongle does not locate in the watershed area which provides water for this village (Fig. 2-3), which should be the main reason that they cleared some deep forest, they still collectively decided to conserve 32 ha of forest for collecting timber. Both village committees announced that anyone would be forbidden from collecting timber for clearing it to plant rubber forever. This announcement is in fact very effective to protect community forest because there was no timber market until the late 2000s.

3.4.4 The strict control period

A strong demand of villagers for expanding rubber continued, but what the villagers can do was limited in the strict control period. In both villages, the target of new land for rubber was the area for firewood and bamboo collection where land use right was already established and how to use it was out of the scope of forest governance. Several reports of villagers indicate how strict the government control on forest

resources was in this period. Seven households of Manjiang illegally logged 2.4 ha of forest for planting rubber in 2006. Finally, each household was fined 600 yuan by Forestry Department, and these fields were procured by the village committee. The natural reserve and state-owned forest got stricter protection by the government than community forests. In 2008, a Manjiang villager cut down 2 old-growth trees of state-owned forest, and was fined 10,000 yuan and detained for 26 days. In 2012, two households of Manjiang illegally logged 0.4 ha of community forest for planting rubber. They were punished to pay 16,800 yuan (2,800 yuan/mu), and all the rubber seedlings were destroyed for recovering natural vegetation.

The holy hill forest is not touched throughout the periods (Fig. 3-7, 3-8, 3-9 and 3-10). The Dai search a hill nearby settlement as holy hill (In Dai, they call it *Nong*), and conserve the forest in this hill strictly once they determine the location of village settlement. After this, the village community collectively own the holy hill, rather than allocating it to each household, and the village community does not need to make rules for protecting the holy hill forest because each villager believes that they will be punished by the gods if they disturb the holy hill forest.

3.5 Discussion and conclusions

3.5.1 Changes in land use pattern

The expansion of smallholder rubber in Xishuangbanna is often considered to be uncontrolled (Xi, 2009; Ziegler et al., 2009). However, I found that although rubber area has increased in the study villages as observed in other parts of Xishuangbanna, the expansion process of smallholder rubber was more or less well coordinated, and the upland use has been stabilized in Xishuangbanna.

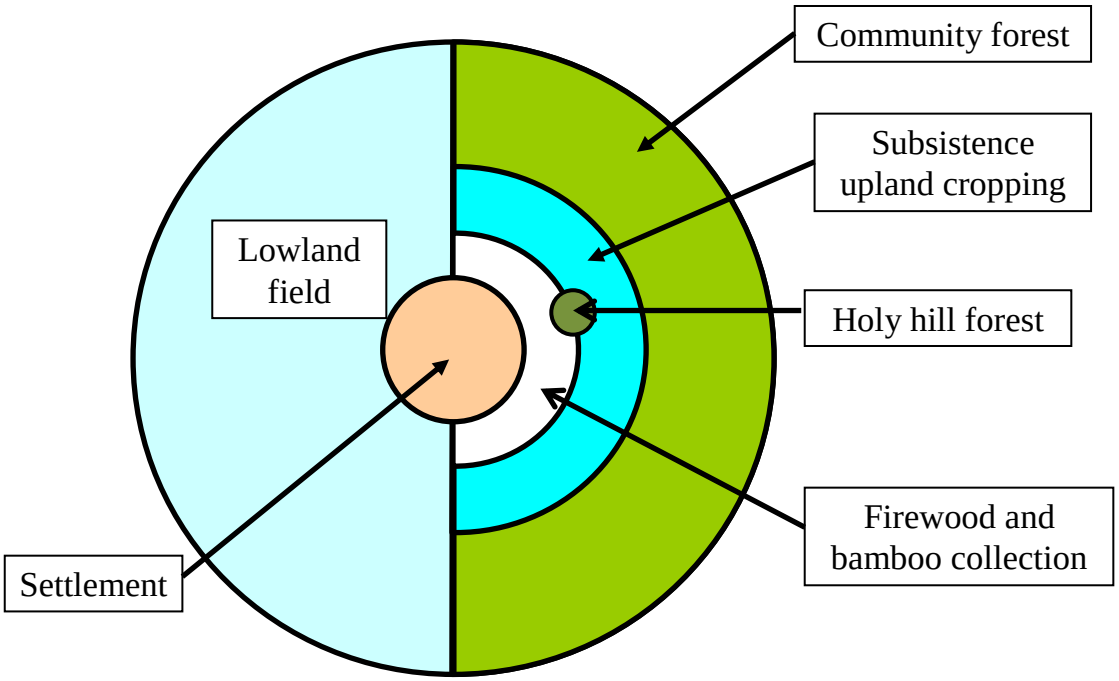

Fig.3-11 Thematic land use pattern of Dai villages before 1980

The two villages had similar upland use before the 1980s (Fig. 3-11). The settlement is located at the edge between lowland and upland, and therefore, one side faces lowland and the other side faces hills and mountains. Lowland has been used for paddy growing since the settlement was established. The upland use varied according to the distance from the settlement. A hill nearby settlements was chosen as sacred hill. Except this, the nearest upland was used for the collection of firewood and bamboo which were the necessaries for daily life, and then upland fields for subsistence cropping were located followed by forest land where villagers seldom visited.

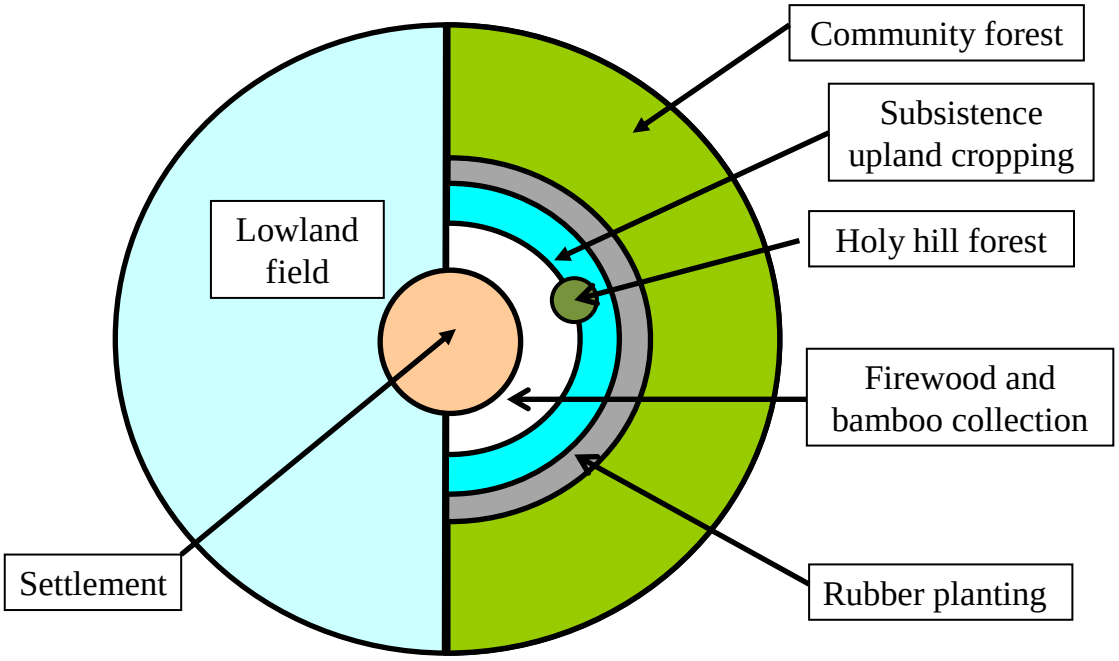

Fig.3-12 Thematic land use pattern of Dai villages in the initial period

It is basically understood that the excess uplands were used for risky commercial cropping and did not substantially affect the livelihood system. In fact, the villagers thought that planting rubber was a risky choice in this period. They were particularly worried about sale channel. Therefore, they kept growing the firewood, bamboo and subsistence cropping in the upland fields which was close to the settlements, resulted in a four layers of upland use (Fig. 3-12).

Forest governance of the government started intervening into the land use customs of village in the transition period. Villagers gradually recognized the feasibility and profitability of rubber growing, thereby their demand for expanding rubber garden increased. Under this background, two kinds of changes in upland use can be observed in this period. First, the remaining subsistence upland cropping disappeared and upland cropping areas were totally replaced by rubber garden. Second, rubber encroached on natural forest, resulted in the shift of boundary between

human-managed land and natural forest. This is the substantial impacts of rubber growing on forest cover (Fig. 3-13).

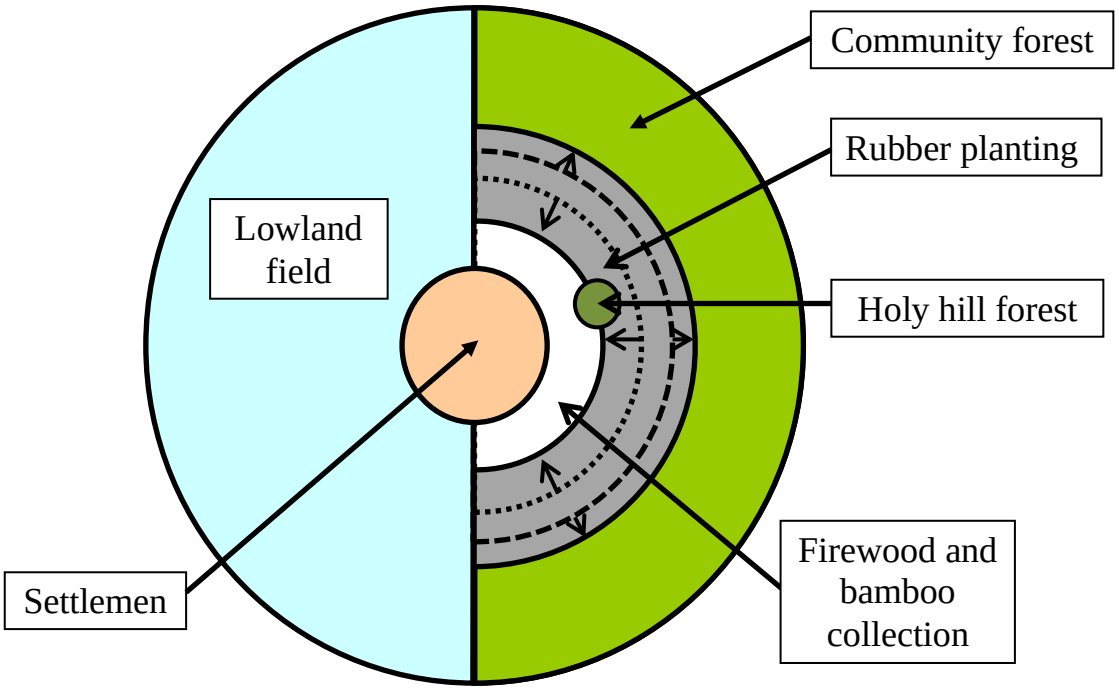

Fig.3-13 Thematic land use pattern of Dai villages in the initial period

The upland use was simplified in the strict control period. The area for firewood and bamboo collection was replaced by rubber, resulted in two layers of rubber in the nearby settlement area and forest in upland use (Fig. 3-14). This also may reflect the changes in energy source of the daily activities of villagers, from firewood to propane gas or electricity. I found that the number of households owning modern cookers (gas stoves or induction cooker) increases from 21 to 58 in Manjiang and from 40 to 64 in Manlongle during 2008-2010. So, the villagers can find other energy resource for daily needs.

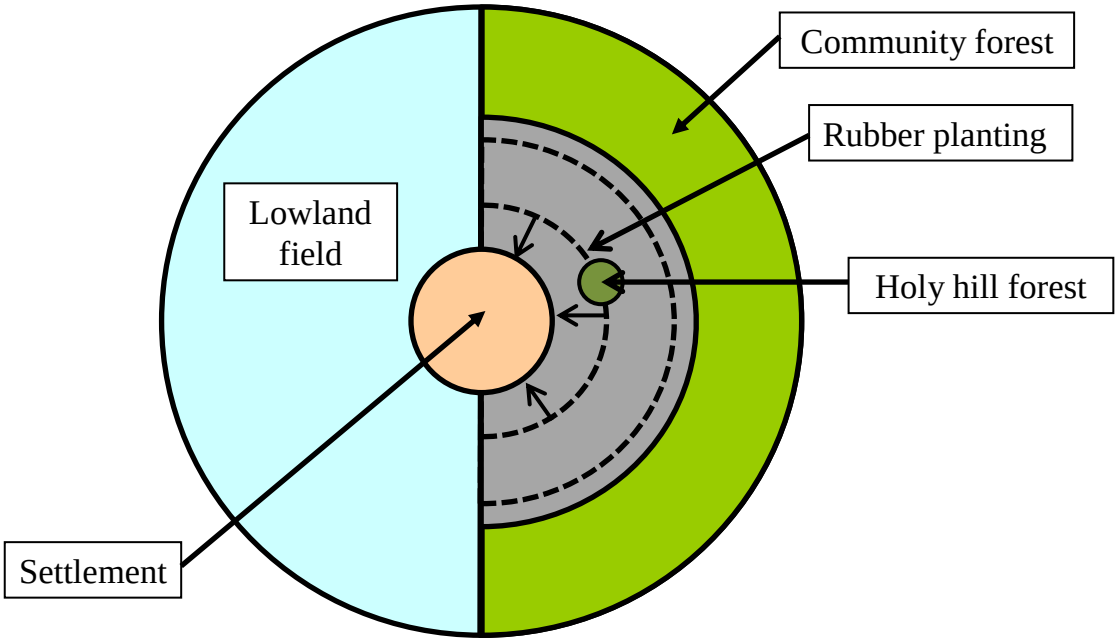

Fig.3-14 Thematic land use pattern of Dai villages in the initial period

3.5.2 The mechanism that contributes to control the rubber expansion

The stabilizing upland use is partly an outcome of step-by-step formation of forest resources administration and consequent effective governance. Brandon and Wells (1992) noted that forest conservation is critically dependent on government policies. The Chinese government gradually recognized that it was necessary to intervene in the behaviors of villagers out of ecological reason. Consequently, the forestry protection policies have being stricter since the late 1980s.

Religious beliefs also contribute to protect small-scale forest. Currently, there are about 250 holy hills in Xishuangbanna, occupying about 1,000-1,500 ha, and the Dai believe that a holy hill is the place where gods live, so any disturbance in the forest will be punished by the gods (Liu, et al., 2002). Therefore, the villagers strictly conserve holy hill forest in any period.

A number of enterprises choices potentially reduced villager's enthusiasm on clearing forest for planting rubber. Except tapping rubber, the villagers also have other choices to promote income. For example, the Manjiang villagers gradually changed dry season crop from maize, rice, vegetables and fallow to watermelon, invested in rubber farming in Laos and grew banana since 2008, and the Manlongle villagers engaged in off-farm activities, such as rice milling and wage labor work. These enterprises eliminated the poverty-driven forces of deforestation and secured the success of government's governance that aims at forbidding deforestation.

The possession of rubber gardens secured the sustainability of rural livelihood in the long run, thereby provided the economical ground of land use stabilization in the future. The normal distribution of rubber gardens holding among households has been stabile. There was no land transference among households at Manlongle, and the area of transferring land only accounts for 2% of the total area at Manjiang in the 2000s. This phenomenon is likely an outcome of "Family Planning Policy". This policy was implemented in 1982 and regulates that a Dai couple can only have two kids, and traditionally, Dai parents choose one offspring (son or daughter) to live with them. Therefore, young villager is easy to find a household to join through marriage. In the 2000s, there were only 4 new households at two villages, while there were 23 new households at Manlongle and 26 new households at Manjiang in 1980s. Land is very precious to the villagers, and the land use ownership is household-based, so they do not give land to their offspring, who will join other household through marriage.

Securing tropical forest is the premise of a good livelihood. Richards (1996) noted that the attitudes and incentives of people living around protected areas are widely considered to constrain successful management of these areas. However, Larson and

Ribot (2004) suggested that local knowledge and skills can be harnessed to the advantage of the resource, thereby ensuring greater efficiency in use and the greater internalization of externalities. In Xishuangbanna, the daily life of farmers tightly associated with tropical forest (Wu, 1997). Villagers obtained timber, irrigation and drinking water from forest. Some proverbs reflect people's perception about the interaction of forest-water-agriculture and its sustainable management (Wang, et al., 2000; Liu, et al., 2002). Therefore, indigenous people of Xishuangbanna have the incentives to protect forest for sustaining their livelihood.

Logging bans have been inadequate as a tool for forest conservation (Durst et al., 2001), and the poor conservation outcomes have forced policy makers and scholars to reconsider the role of local community in resource use and conservation (Liu, et al., 2002). The villagers have common space recognition and the firewood, subsistence cropping and forest are spatially concentrated distribution, according to the access, and the community forests refer to the interests of each villager. Pagdee et al (2006) noted that common interests among community members and local authority illustrate community ability to organize and continue collective activities, and protection of benefits, rights, and responsibilities in common resource management. In this study, the self-management of village community successfully remained large area of community forest in the government's poor control period.

Today, the villagers and government in fact rely on each other for conserving forest. Now that the village community coordinates even sometimes decides the pattern of land use to meet various needs, each villager is under the supervision of others, and the dissidents have to abide a collective decision. From the view of individuals, they are definitely eager to enlarge rubber gardens when the return of rubber highly

increased. However, they first have to face other villager' opposition if they tends to convert the community forest into private rubber gardens.

4. Expansion process of commercial banana cropping

4.1 Introduction

Diffusion of agricultural technology is a prerequisite of the spread of commercial cropping. Villager-to-villager diffusion is the main channel for villagers to acquire new technology (Alene and Manyong, 2006). However, when a new technology is more specialized, all farmers lack crop management technologies which may be provided by commercial agents specializing in certain types of information as well as by input suppliers, who may have incentives to provide information regarding new crops that make use of these inputs (Feder and Slade, 1985).

Risk also plays an important role in peasant agriculture although farmers can acquire inaccurate information regarding inputs and returns before they decide to adopt a new technology (Shahabuddin and Feeny, 1986). However, Binswanger (1980) suggested that differences in investment behavior observed among farmers facing similar technologies can not only be explained by differences in attitude but would also have to be explained by differences in their constraints set, e.g. in credit, marketing, and agricultural extension. Risk behavior by households is affected by levels of wealth, and wealthier people are less risk-averse (Sung and Hanna, 1996; Schechter, 2007). Wealthier households are prone to engage in both high-input and high-return activities. This allows for further accumulation, while poor households stay poor in the long run due to the limitations posed by their considerations of risk in terms of their investment. Thus, rural inequality is enlarged (Dercon, 1996; Dercon, 1998; Campbell, 2006).

Credit for smallholders, especially in agriculture, is not only necessitated by the limitations attached to farmers' abilities to fund themselves, but also by uncertainty

pertaining to the level of outputs and the time lag between inputs and outputs (Kohansal and Mansoori, 2009). Availability of credit to farmers increases their risk-bearing ability, and they may therefore be willing to adopt new and riskier technologies (Oboh and Kushwaha, 2009). However, Adams et al. (1984) noted that wealthier households are generally the borrowers, and they received larger loans.

In Mengla County, the area of commercial banana cropping increased from 1,113 ha in 2005 to 5,240 ha in 2010 (SBMC, 2010). Some scholars suggested that almost farmers often chose to rent out their land to investors from other province, and did not benefit from this expansion process of commercial banana cropping (Yang and Liang, 2008). Therefore, I purposely selected the two villages, one of which grow banana mainly by itself (Manjiang), and the other rent out land to the investors out of village. The objectives of this chapter are to examine the adoption process of commercial cropping of banana from the viewpoints of land arrangement and technology diffusion, to determine the factors of rapid expansion at the village and household levels by paying attention to farm economy and land conditions, and to identify its impacts on livelihood, and finally to figure out why some villagers can catch up the opportunities but others failed.

4.2 Manlongle case

Changes in cropping pattern reflect these try and errors by villagers. Double cropping gradually expanded in the 1980s and 1990s, but its area was limited about 30% of the lowland filed and single cropping of rainy season paddy occupied the remaining part. Commercial cropping of banana, which was not commercially grown in Manlongle Village until 2004, drastically converted the cropping pattern of lowland fields in this village (Fig. 4-1).

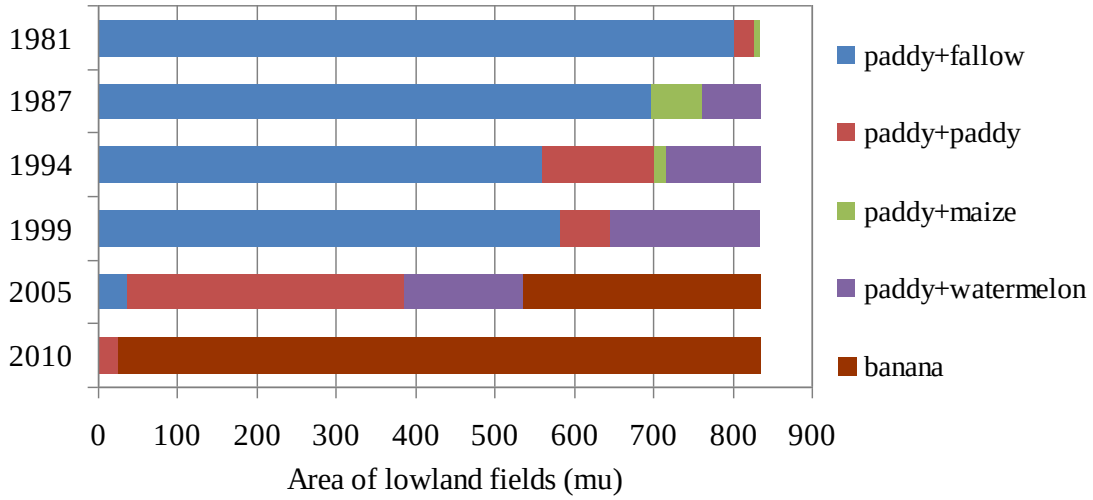

Fig. 4-1 Changes in lowland cropping pattern of Manlongle
Data source: author's fieldwork based on government yearbook

In 2005, a Han businessman (Mr. A in Table 4-1) visited the village. He was a farmer in Sichuan Province before coming to the study area (Table 4-1). He expressed his wish to rent lowland fields of Na Nuanlong for growing banana to the village headman and offered 500 yuan/mu of annual rent, which was slightly higher than the income derived from lowland farming in the previous years (1 ha is equal to 15 mu). After a series of negotiation between the businessman and villagers, all the land holders of Na Nuanlong agreed to rent out fields for three years with the offered rent. The lease contract had a typical format including the location of the land, period, rent, responsibility of the both side, conflict solution measures and others, and was signed and fingerprinted by the businessman, land holders and village headman.

After successful banana growing at Na Nuanlong, Mr. A proposed to expand banana farm to Na Mengxia in 2006 and Na Mengshang in 2007, and offered higher rent, 700 yuan/mu in 2006 and 1,000 yuan/mu in 2007 (Fig. 4-2). The land holders accepted it.

In 2007, a staff of nearby state-owned rubber farm (Mr. L in Table 4-1) also rent Na Manjiang and started banana growing. In 2008, Mr. A set up new banana farm in other village and banana farm in Na Nuanlong was succeeded by several new comers. By 2010, 54 ha of lowland fields have been rented out, occupying 97% of the total lowland field. During the process, 13 businessmen rented lowland fields for growing banana, of which 12 businessmen are Han people (Table 4-1). The unique Dai businessman is a farmer at a village close to the county capital and got married with a Manjiang woman.

Land suitability for banana growing is slightly different from that for paddy-based cropping. Na Honge was not rent out by 2010 though land holders wished to do. Na Ge was rent out, but it was in 2010, later than other blocks. These suggest that poor drainage is the major constraint for banana growing and insufficient water supply in the dry season and poor water quality are not crucial constraints.

By 2004, all the households were engaged in paddy growing and produced enough amount of rice for home consumption. The villagers did not give up self-supporting rice production when they started to rent out in 2005. The households who rent out their field rent lowland fields of their neighbors in the dry season to grow paddy. This effort is reflected in sudden increase of double cropping of rice in 2005 (Fig. 4-1). But according to the expansion of banana farm in the village and shortage of land to grow paddy, they quickly abandon the idea to be subsistence farmer and accepted to be land owners. In 2010, only 5 households, out of 76 households, were engaged in double cropping of paddy and produced 15 ton in total. The remaining households purchase rice from Han retailers coming from Hunan and Sichuan Provinces at Mengla Agricultural Product Market or from local merchants who visit the village weekly.

Table 4-1 Banana businessman at Manlongle village

Name	Home place	Former occupation	Ethnicity	Name
A	Sichuan	farmer	Han	Zhu CY
B	Sichuan	retired staff	Han	Wu
C	Sichuan	farmer	Han	Gui
D	Sichuan	farmer	Han	Zhu JS
E	Sichuan	farmer	Han	Tang
F	Guangdong	driver	Han	Chen
G	Guangdong	farmer	Han	Liang
H	Guangdong	farmer	Han	Dong
I	Guangdong	farmer	Han	Jiang
J	Anhui	farmer	Han	Pan
K	Hubei	farmer	Han	Xin
L	Yunnan	state-owned rubber farm staff	Han	Zhang
M	Yunnan	farmer	Dai	Bo

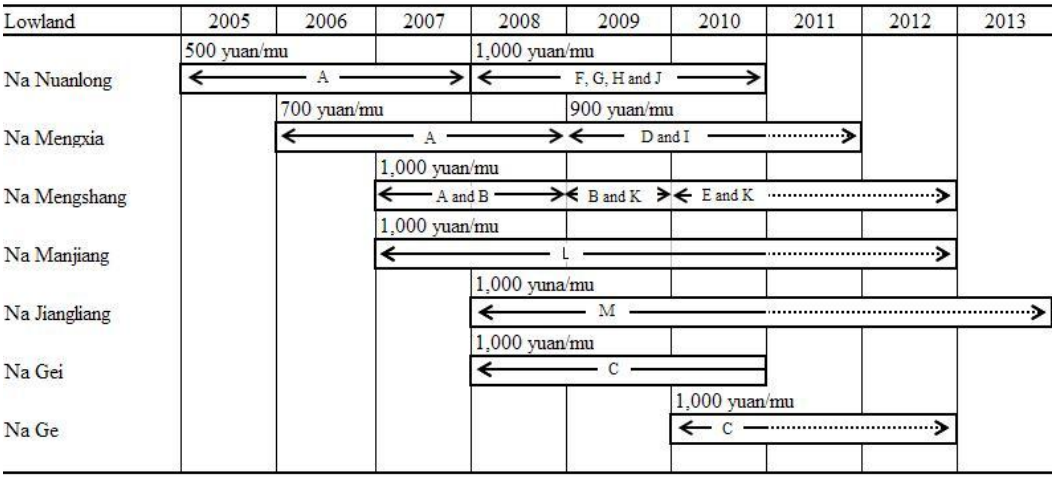

Fig. 4-2 Lease contract of lowland in Manlongle village
Data source: author's fieldwork

4.3 Manjiang case

In March 2008, 54 households decided to initiate banana farming, instead of paddy, in their lowland fields, purchased banana seedlings from a nearby banana farm managed by a Sichuan businessman and planted them in April. Out of 54 households, 8 households were worried about poor harvest due to insufficient knowledge on cultivation techniques and unreliable sales channels, and chose to rent out lowland fields with banana seedlings to the Sichuan businessman, and 9 households rent out some of their fields to the same businessman. Another 16 households just rent out their fields to the same businessman with the annual rent of 1,500 yuan/mu. As a result, 37 households were engaged in banana growing as grower, 9 households as grower cum land owner, and 22 households as land owner in 2008 (Table 4-2).

As it was the first time for villagers to grow commercial banana, the growers have to learn the cultivation techniques. There were three resource persons, a farm worker, a pesticide trader and the businessman mentioned above (Fig. 4-3). The farm worker moved from Jiangxi Province to the study area in 2004 and worked as a technician at a banana farm located in a neighboring village. The pesticide trader is a relative of Manjiang villagers and run a business at the county capital. She supplied pesticide to Manjiang villagers since the 1990s. The banana businessman moved from Sichuan province in 2008. His friend heard from a sister who was a fruit retailer in Sichuan that banana was a boom crop in Mengla and moved to other village in the county to set up a banana farm. Then, he invited the businessman to set up a new farm at Manjiang. Later, a brother of his friend who was a butcher and construction worker in Sichuan joined him. 28 households collectively hired the farm worker to learn the cultivation techniques. They paid 0.06 yuan/seedling monthly until the harvest. 10 and

1 households learned them from the pesticide trader and the banana businessman, respectively, without any payment. Out of these 39 new growers, 6 persons taught how to grow banana to 4 neighbor households. Then, out of 4 growers, 1 person taught again to 3 households.

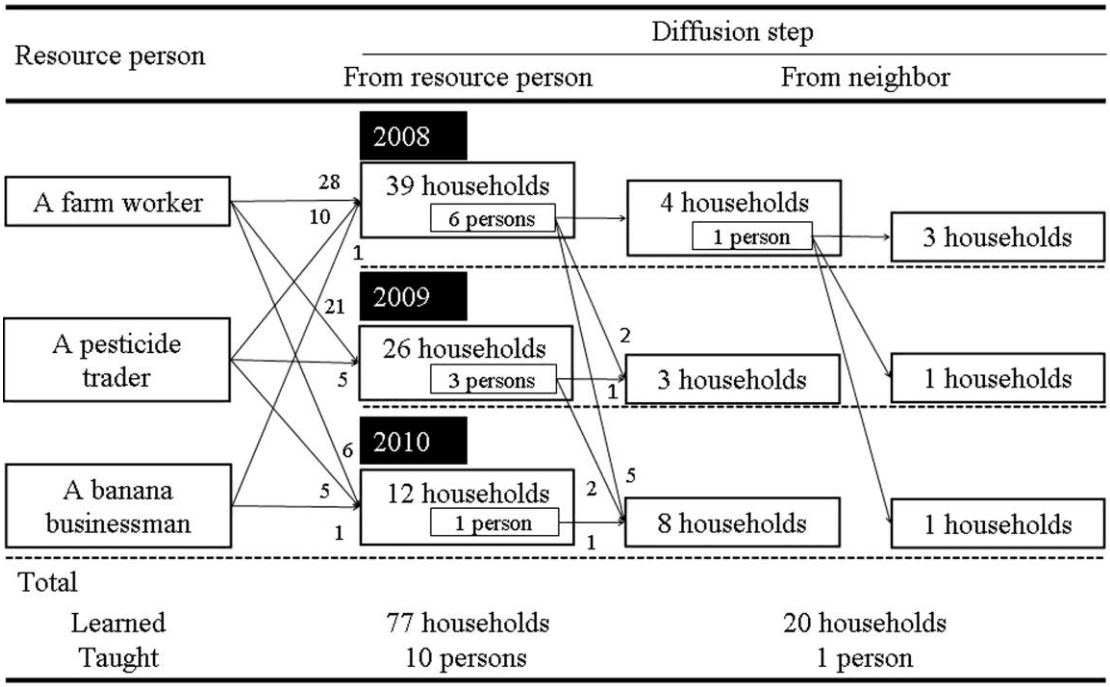

Fig. 4-3 Learning path of cultivation technique of banana at Manjiang
Data source: author's fieldwork

They hired laborer for hard works such as digging channels and harvesting. Many migrant workers coming from neighboring prefectures, particularly from Puer and Honghe prefectures, stay at Mengla County. Most of them live in a hut beside banana farms managed by Han businessmen and work there, and look for a part-time job to get additional income. Villagers contact workers directly by mobile phone without the brokerage of any agents. The payment to workers depends on workload, one yuan for digging two-meter channel or carrying a bunch of banana (about 20 kg) from a banana tree to the sale position, for example.

Table 4-2 Number of household engaged in banana farming at Manjiang

Class	Land holding (mu)	2008				2009				2010			
		No engagement	Grower	Grower cum land owner	Land owner	No engagement	Grower	Grower cum land owner	Land owner	No engagement	Grower	Grower cum land owner	Land owner
Smallest 20%	3.0 to 7.0	9	5	0	6	1	7	5	7	0	7	10	3
Smaller 20%	7.0 to 8.5	7	8	2	3	3	11	3	3	0	14	6	0
Intermediate 20%	8.8 to 10.1	7	9	1	3	4	8	6	2	0	12	8	0
Larger 20%	10.2 to 12.0	6	8	2	4	1	12	6	1	0	13	7	0
Largest 20%	12.0 to 19.5	3	7	4	6	0	7	9	4	0	7	13	0
Total		32	37	9	22	9	45	29	17	0	53	44	3

The harvest in February 2009 was satisfactory. The banana yields of the 46 growers ranged between 2,500 and 3,100 kg/mu and averaged 2,810 kg/mu. The products were sold to Han traders through 6 residential brokers. The brokers negotiated the farm gate price of banana with Han traders, fixed it to 2.3 yuan/kg and announced it to the growers. They applied the same price for all the products, regardless to their quality and whether growers are close friends, relatives or not. Finally, the growers found that the return of banana growing was 2 to 3 times higher than that of the existing cropping pattern in the previous years and 4 to 5 times higher than the rent when family labor cost is not considered (discussed in detail later).

The high profitability provided the remaining villagers with further incentives to participate in banana farming. 30 households started growing banana in 2009, of which 2 households did it not at his own fields but at rent-in fields. The average yields of banana in 2009 was 2,970 kg/mu, a slightly higher than that of 2008. The return was about 3 times higher than that of double cropping and 7 times higher than the rent. Then, 21 households started growing banana in 2010. These resulted in 97 households out of 100 households of Manjiang became banana grower within three years. Land owner of banana farm also increased to 46 and 47 households, including 29 and 44 grower cum land owner, in 2009 and 2010, respectively (Table 4-2). Accordingly, the area of commercial banana cropping increased from 28.6 ha (43.9%) to 62.6 ha (96.3%) of Manjiang lowland fields (Fig. 4-4).

New growers in 2009 and 2010 learned cultivation techniques mainly from three resource persons (Fig. 4-3), but 9 households, out of 21 households who started growing banana in 2010, learned the techniques from their relatives or neighbors. This suggests

that the knowledge is gradually accumulated among the villagers and the teaching and learning process among villagers became operational, though the number of teaching villagers is limited. Totally, 77 households learned the techniques from the resource persons, and the remaining 20 households learned them from 11 neighbors.

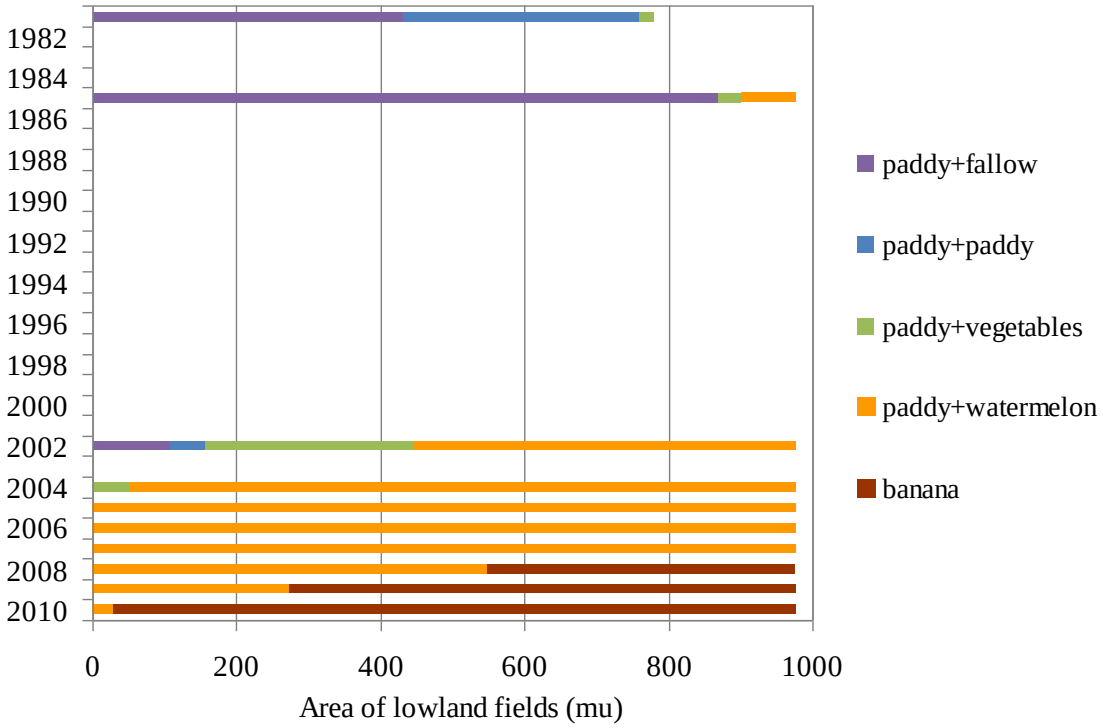

Fig. 4-4 Changes in lowland cropping pattern in Manjiang village
Data source: author's fieldwork based on government yearbook

The villagers also improved the methods of selling and skill of negotiation with Han traders. Since 2009, several households who have nearby fields make agreement to sell the products at the same time, proposed a larger sale price to brokers and let them negotiate with Han traders, and collectively organize the harvesting operations to equally share the profit. Owing to all of these efforts, banana farming quickly replaced the paddy-based farming at Manjiang.

4.4 Driving forces of expansion

4.4.1 Profitability and risks

Investment and return

The profitability is one of the major concerns for farmers in choosing cropping patterns in general, and villagers reported that high profitability was the most crucial incentives for them to participate in banana farming in particular. In order to confirm this point, investment and return of various crop productions during the last several years were surveyed through interview from all households of the two villages. The data covers rainy season paddy in Manlongle from 2004 to 2007 and in Manjiang from 2005 to 2010, dry season paddy in Manlongle from 2004 to 2007, watermelon in Manjiang from 2005 to 2010, and banana in Manjiang from 2008 to 2010. The data items include costs of hiring labor, fuel and agricultural inputs including seedling, fertilizer and pesticide, yield and selling price. Family labor was not considered in the calculation of net return because I found that the villagers do not pay attention to it when they compare the profitability.

The differences in the costs and yields among the villagers are rather small. In case of watermelon in Manjiang, for example, the total production cost ranged between 276 and 332 yuan/mu in 2007, between 313 and 376 yuan/mu in 2008, between 336 and 400 yuan/mu in 2009, and between 364 and 432 yuan/mu in 2010, suggesting 20% differences between the maximum and minimum. The yields ranged between 1,200 and 1,600 kg/mu for all years. Therefore, I simply used the average values for further the discussion here.

The net return of rainy season paddy is gradually increasing from around 300 yuan/mu in 2004 to nearly 1,000 yuan/mu in 2010, and that of dry season paddy is slightly lower (Table 4-3). The net return of watermelon increased from 1,000 yuan/mu in 2007 and 2008 to 1,400 yuan/mu in 2009 and 2,500 yuan/mu in 2010 mainly due to the rise of selling price which was 1.1, 1.4 and 2.3 yuan/kg in 2008, 2009 and 2010, respectively. Therefore, the total net returns of paddy-paddy cropping and paddy-watermelon cropping are estimated to be around 2,000 yuan/mu and 3,500 yuan/mu when the 2010 conditions are applied. While, the net return of banana growing is around 7,000 yuan/mu, about twice of the paddy-watermelon cropping and more than three times of the paddy-paddy growing. These differences are attractive enough for the villagers to challenge the new farming. On the other hand, the rent for banana farm is 1,000 yuan/mu in 2010, which is the same between Manlongle and Manjiang, and rather competitive to or even lower than the net returns of conventional cropping, even though family labor is released from farming works. This suggests that economic incentives cannot explain why villagers agreed to rent out their fields. Actually, Manjiang villagers reported that they refused renting out lowland fields because they benefited more from the double cropping of paddy and watermelon than renting out land.

Table 4-3 Changes in the net returns of cropping and land rent for banana farm (yuan/mu)

	Cropping					Land rent for banana farm	
Year	Rainy season paddy in Manlongle	Rainy season paddy in Manjiang	Dry season paddy in Manlongle	Watermelon in Manjiang	Banana in Manjiang	Land rent in Manglongle	Land rent in Manjiang
2004	335		234				
2005	387	426	244	638		500	
2006	414	461	254	746		576	
2007	437	560	295	973		712	
2008		678		1,061	4,559	928	1,000
2009		819		1,424	7,038	976	1,000
2010		936		2,527	6,942	977	1,000

Risks of banana farming

During the interviews, Manjiang villagers often mentioned that they could afford investing in banana farming at their lowland fields, but they were afraid of risk. Risks involved in banana growing was another major concern for the villagers, though they did not spent much time to recognize that banana farming is a high-input and high-return choice with low risk after observing the success of the local rubber broker.

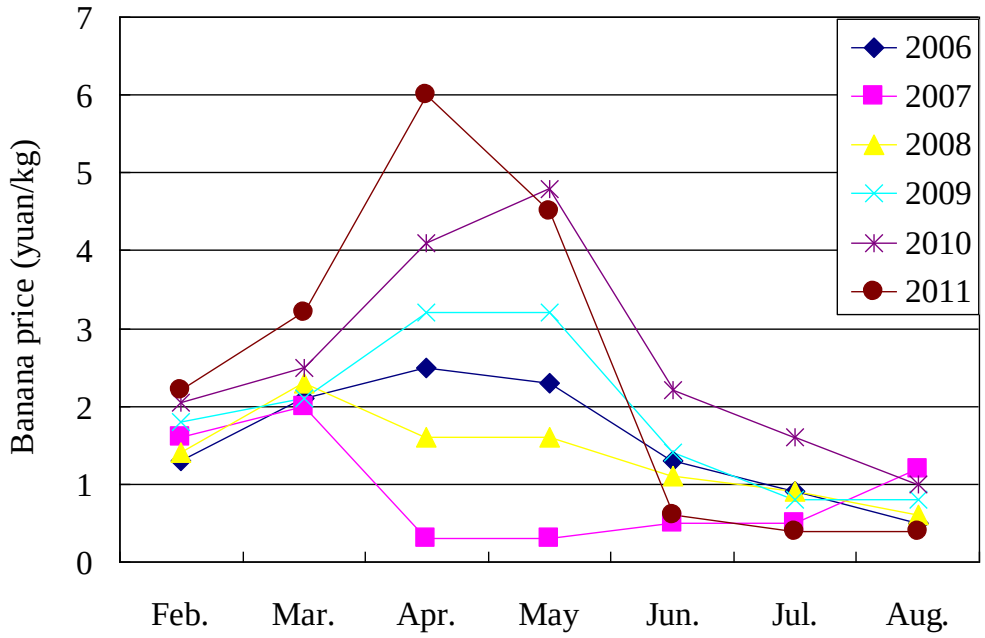

Fig. 4-5 Changes in farm-gate price of banana
Data source: author's fieldwork

Manlongle was the first village of introducing banana farming among its neighbors. Growing banana was a high risk choice in the eyes of the villagers because of the unclearness in technology, sales channels and return. Considering both profitability and risks, therefore, Manlongle villagers chose to rent out lowland fields rather than growing banana by themselves. Such judgment was enhanced by the failure of a pioneer villager. Inspired by the Han businessman (Mr. A in Table 4-1), the pioneering villager

grew 0.7 ha of banana in 2005. However, he failed to control the harvesting time and harvested it in June when the banana price was lowest (Fig. 4-5). He tried again in 2006 and failed again. In 2007, a Chinese media reported banana panama disease as “banana cancer”. This bred a rumor that eating banana caused cancer, brought on a panic to avoid consuming banana nationwide, and led to a collapse of prices (Fig. 4-5 and 4-6). Consequently, he failed to sell out the product in that year and benefited nearly nothing from three years growing. Villagers, therefore, preferred to choose renting out when businessmen offered rents that are quite similar to the income derived from lowland farming in the previous years. This implies that to be land owner of banana farm was recognized as a way to acquire the income without risks involved in banana growing.

Fig. 4-6 A media report Banana panama disease in 2007

Roles of banana businessman

The opportunity that Han businessmen provided for the villagers to be land owner of banana farm plays a role of risk hedge in terms of ecological experiment and management diversification. The initial stage of banana production at Manlongle was apparently born by Han businessmen. They showed that banana growing fitted to the natural environment of study area and could control the harvesting time to be off-season of banana production in Hainan Island, the biggest banana production area in China.

In the first year of banana production at Manjiang, small-scale farmers preferred renting out fields than growing banana by themselves, while large-scale farmers preferred to grow it by themselves (Table 4-2). This indicates that renting out fields functioned as a risk hedge for risk-sensitive small-scale farmers. But these tendencies cannot be found in the second year, and another tendency that villagers grow banana by themselves within the capacity of family labor emerges in 2010. So, the pure land owner disappeared rapidly and large-scale farmers show bigger proportion of grower cum land owner, though some small-scale farmers give up growing banana by themselves due to the shortage of family labor.

Out of 100 households at Manjiang, 53 households grow banana by themselves and never rent out fields, and 3 households are rent out fields and never grow banana by themselves. The remaining 44 households have both experiences to be grower and land owner. Of which, 15 households started to be grower cum land owner in the same year (9 households in 2008 and 6 households in 2009). 4 households became grower first (3 households to be grower in 2008 and land owner in 2009, and 1 household to be grower in 2009 and land owner in 2010). 26 households became land owner first (13 households to be land owner in 2008 and grower in 2009, 7 households to be land owner in 2008 and grower in 2010, and 6 households to be land owner in 2009 and grower in 2010). The tendency of renting out land to the Han businessman is 5 years, and the tendency of renting land among villages is 3 years. Renting out fields and letting Han businessman to grow banana is, consciously or unconsciously, a pilot stage for adopting new farming particularly for these 26 households.

4.4.2 Collectiveness in the adoption process

Household wealth and attitudes toward banana farming

Although the replacement of previous cropping patters with banana at the whole village fields may give an impression to be a collective action under the instruction of village authority, the replacement is undoubtedly an aggregate of the decision making of each household. However, it is also true that the household decision makings are not independent and rather interdependent in many ways. This caused de facto collectiveness of the changes.

Household wealth should be one of the most crucial household-level constraints to cause the diverse decision making among households. Banana growing requires the investment around 4 times higher than the double cropping of paddy and watermelon, and is a choice of high input and high return challenge.

Asset indicators can be used to provide reasonable measures of inequality (Mckenzie, 2005). Specifically, farmer's income was highly correlated with the amount of land he owned, especially the land planted in rubber (Xu et al., 2005). According to government data, 74.8% of the total income of Manjiang Village was derived from tapping rubber and lowland farming during 2000-2007 (SSMT, 2000-2007). According to our observations, each household has just one house and TV, which are of quite similar quality and size. Also, the villagers possess hardly any furniture. In order to avoid disturbance, variables linked to family members, such as motorcycles and mobile phones, and fluctuated dramatically, such as number of livestock and area of renting land, were not considered. 32 households owned cars in 2008, and as a luxury, a car is

definitely a good indicator for ranking households. 21 households owned modern cookers in 2008, and this was proposed to be a good indicator, though its price is much lower than a car. The reason is that Dai people traditionally use firewood for cooking, which is hard work in a tropical climate. As a result, wealthier households buy modern cookers, but other households choose to use firewood.

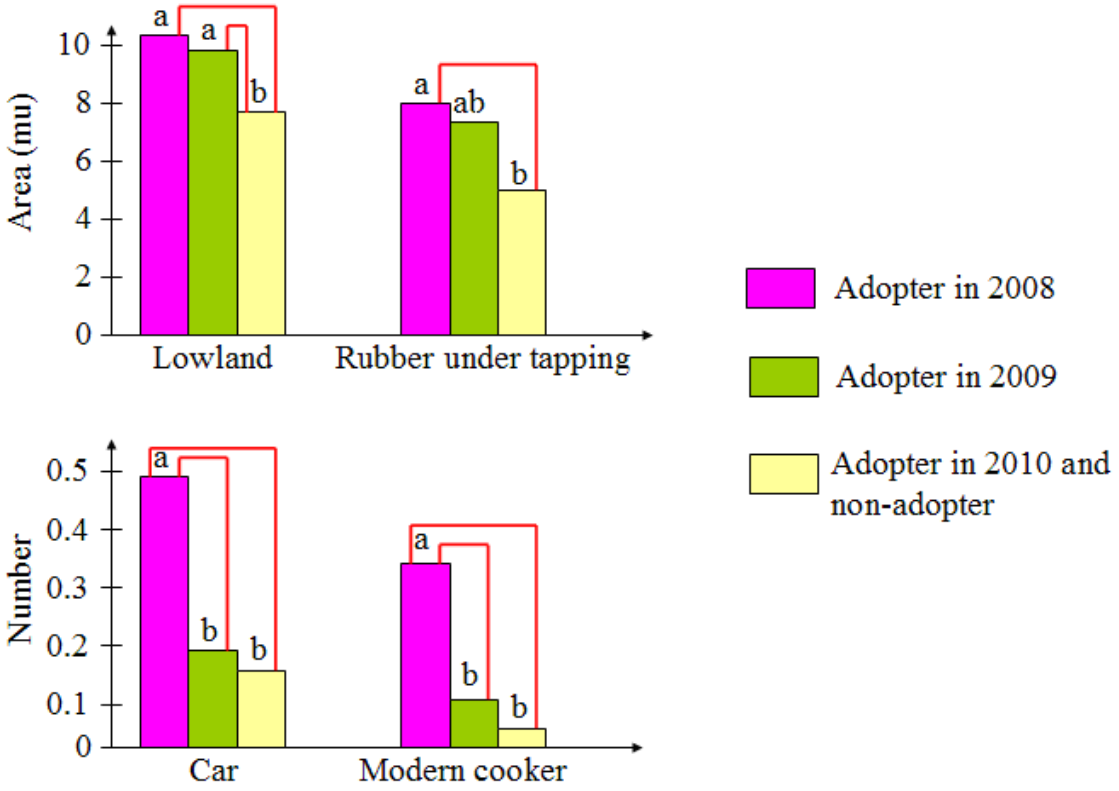

Fig. 4-7 Household wealth and adoption of banana farming at Manjiang

Note: different letters means significantly different by the LSD test (p=0.05)

Fig. 4-7 clearly suggests that adopters tend to have larger lowland fields and rubber farm, and possess more durable goods. Therefore, household wealth definitely affects early adoption of banana farming. But the more important point is that it does not affect whether they adopt or not. Finally, all households except three adopted it and the time

lag between the earliest and latest is just for two years. This indicates that the difference in household wealth was overcome by other promoting factors.

Village leadership

The first Han businessman at Manlongle (Mr. A in Table 4-1) first contacted the village headman. The headman coordinated the negotiation between the businessman and villagers and let all land holders make consensus to rent out the whole block. The lease contracts between the businessmen and the villagers were signed and fingerprinted by the village headman. The village headman is undoubtedly a mediator between the villagers and the businessman coming from outside as he is so between villagers and the local government.

Besides the headman, the members of village committee also play important roles in promoting banana farming. In Manjiang, in addition to three resource persons, 11 persons taught cultivation techniques to neighbor villagers. Out of 11 persons, 5 are the members of village committee. There are 6 banana brokers, of which 4 are the members. The remaining persons are a woman who got married with Han people from Sichuan province and have good network with Han society and Han traders and a villager who has an experience of managing a pig farm (the number of pigs reached 50-60) formerly and is a broker of watermelon and rubber too. The committee members play a role to disseminate knowledge and information among the villagers and to allocate the benefit of banana farming more or less equally to the whole village.

Land conditions

Poor farm layout functioned as a constraint of independent crop selection of household.

The density of farm road and farm ditch is small. Most of fields can be approached through neighboring fields, and irrigation water reaches by plot-to-plot irrigation. Therefore, once the surrounding fields change the cropping pattern, they have to follow it. In Manjiang, some villagers said that they had to rent out the small pieces of lowland fields even though they still doubted on growing banana because their fields were surrounded by banana farms and became inconvenient to grow watermelon.

Institutional background

A wide range of government institutions are also related to the expansion of banana growing in the study area, of which micro-credit and rice price policy are directly related.

Rural Credit Cooperatives of Yunnan is the most popular microcredit provider for the villagers. Collateral is required for loans. The fact that all households have, more or less, land which they can use as collateral is one of the fundamental conditions to initiate high investment farming, such as commercial banana cropping.

The local market provides plenty of rice from Thailand, Laos and other parts of China. The rice price is increasing with the average rate of 7.5% per year during the period between 2005 and 2010. But, in case of sharp increase of rice price, for example, in 2008, the government intervenes in domestic rice price formation and to prevent its violent fluctuation (Pang et al., 2009).

4.5 Emerging entrepreneurs

Expansion of banana farming totally converted the livelihood of villagers from

subsistence-based to market-dependent ones, in which the Han businessmen played a leading role. In a sense, they were samples of how to survive in the expanding market economy.

Migrated Han banana growers provide Dai people with a business model in which land holding is not a constraint. Entrepreneurs are emerging among Dai people. Most of the Han businessmen were farmers in their home land (Table 4-1). Their life there depended on a small land allocated through the official procedure after the introduction of Household Responsibility system as it is in the study area. Limited access to land resource was the major constraint for them to improve livelihood. They overcome it by renting lands, hiring labor, producing boom crops and earning a big money though they always struggle with risks of boom cropping. This inspires the villagers who face the same constraint and provides a new business model.

6 Manjiang villagers rented in lowland fields mainly at nearby villages for banana growing in 2008 (Table 4-4). Of which 4 villagers grew banana at their own fields too. The size of rent-in field is rather small, mostly less than 10 mu. Later, the number of household who grow banana in rent-in field increased to 14 and 39 in 2009 and 2010, respectively. The majority of them rent in small area which is supposed to be for fully utilizing family labor, but some households rent in larger area.

Table 4-4 Number of household engaged in banana growing at rent-in field

Year	The number of households engaging in renting-in different farm size					Total number of households
	<5 mu	<10 mu	<20 mu	<40 mu	>40 mu	
2008	4	1	0	1	0	6
2009	8	1	2	3	0	14
2010	10	6	5	13	5	39

In 2010, 18 households rent in lowland field of 20 mu or more. As the maximum land holding of lowland field at Manjiang is 19.5 mu, managing such scale of banana farm cannot be achieved without renting in. They may try to follow the business model provided by Han businessmen. I call these villagers as emerging entrepreneurs. Their challenge is just the initial stage and I do not know whether they would be successful or not. I am also not sure whether the remaining villagers follow to be emerging entrepreneur or not. But still it must be interesting to examine what type of villager the emerging entrepreneurs are.

The size of lowland holding of the emerging entrepreneurs is diverse. 2 households belong to the smallest 20%, and 3, 3, 6, 4 households in the smaller 20%, intermediate 20%, larger 20% and largest 20% classes. The average is 10.1 mu, showing no much difference with the average of other households (Table 4-5). Available family labor is 3 or 4 persons, slightly more than the average of other households. Education year of household head does not show significant differences between the emerging entrepreneurs and other households. The size of rent-in field for watermelon of the entrepreneurs is larger than other households, but the difference is not significant (Table 4-5). This experience is thought not to link directly to the expansion of banana farm at rent-in field because the majority is less than 20 mu. The significant difference can be found in income. The average cash income of the emerging entrepreneurs in 2007 is around 50% higher than that of other households, and the major difference is the income of non-farm sector (Table 4-5). They are early adopter of banana growing, and the majority started it in the first year. This information suggests that the emerging entrepreneurs are not always big family with higher education, but always look for an opportunity to challenge.

Table 4-5 Characteristics of emerging entrepreneurs

	Emerging entrepreneur	Other households
Number of household	18	82
Average lowland holding (mu)	10.1[a]	9.7[a]
Family labor		
2 or less	1	29
3	6	22
4	11	23
5 or more	0	8
average (person)	3.6[a]	3.1[a]
Education years of household head		
2 or less	3	13
4	5	26
6	8	38
9	2	5
average (years)	4.8[a]	4.7[a]
Rent-in for watermelon growing in 2007		
no	4	36
less than 10 mu	1	17
10 to 20 mu	9	19
20 mu or more	4	10
average (mu)	15.1[a]	10.6[a]
Income (2007)		
Paddy	5,722[a]	5,475[a]
Watermelon	20,139[a]	16,590[a]
Rubber	17,061[a]	12,275[a]
Livestock	4,222[a]	3,363[a]
Non-farm	15,076[a]	3,343[b]
Total	62,221[a]	41,047[b]
Year started banana growing at own field		
2008	12	34
2009	3	25
2010	3	20
no	0	3

Note: different letters means significantly different by the LSD test (p=0.05)

4.6 Discussion and Conclusions

The introduction of commercial banana cropping caused a drastic change in the cropping pattern of lowland fields to a banana mono-culture in both Dai villages within a short period, and the banana farms in Manjiang village were mainly managed by villagers, whereas businessmen managed all the banana farms in Manlongle village. Manlongle village was the first village of introducing banana farming among its neighbors, growing banana was a high risk choice in the eyes of the villagers because of the unclear technology, sales channels and return. Such judgment was enhanced by the failure of the Manlongle pioneer. When the rent provided by businessmen was similar to the return of paddy-based farming, all the villagers were willing to rent out lowland fields. In contrast, Manjiang villagers refused renting out lowland fields because they benefited much more from the double cropping of paddy and watermelon than renting out land. During the semi-structured interviews, Manjiang villagers often mentioned that they could afford investing in banana farming at their lowland fields, while they were afraid of risk. When the local rubber middleman, a Manjiang villager before marriage, succeeded in growing banana, half households immediately initiated growing banana in 2008. After observing the success of pioneers, it took a short time that banana farming in their lowland fields had a high input/return and was a low risk choice in the eyes of Manjiang villagers.

The availability to professional advice hindered the diffusion of technology for banana farming among villagers. Feder and Slade (1985) argued that information on new technology in the agricultural sector is often a public good, inasmuch as the provider of information to one user cannot exclude other users from obtaining the information

without charge, and the value of information is not affected by the number of users. In this village, a considerable number of households have managed banana farm one or two years, but other households still asked for assistance from outside the village. The reason was, although farmers, who have learned the technology, were willing to teach, almost villagers were more prone to seek advice from professional persons because the advice of professional persons was more reliable, as well as the cost of hiring the worker to teach technology was negligible for all households, and as villagers said, the pesticide salesman always liked answering villagers' questions for selling pesticide potentially. Under this background, more than 90% of bananas of Manjiang Village were harvested in February-May, when the banana price was generally 4-6 times of that in June-August.

Wealthier households are less risk-averse, and risk takers benefited from their risky behavior during the period of initial adoption of banana farming. As Rogers (1983) noted, earlier adopters must take a risk that can be avoided by late adopters, and they must be wealthy enough to absorb the loss from their occasional failures. This is a good explanation for why household wealth affects risk consideration, and then leads to behavior differences among farmers. Here, earlier adoption not only refers to the earlier adoption of banana faming, but also to the earlier renting of large areas of lowland fields for banana farming.

Further extension services such as technical and economic advice are required to assist villagers, especially the pioneers in the initial adoption period of a new agricultural practice. During 2008-2010, growing banana was much more profitable than renting out lowland fields, while Manlongle villagers had rented out most lowland fields before

2008, and such consequence was comprehensively caused by the technical barriers, risk consideration, irrigation and traffic conditions. When I explained why banana price collapsed suddenly in 2007, the Manlongle pioneer was quite surprised. Obviously, he did not know it was only a low- probability accident. Similarly, nearly half households of Manjiang village chose to rent out some lowland fields, and as a result they miss out on opportunities to increase their incomes substantially. Even though, I still suggested that villagers might ignore risk with a stable increase in the return of banana farming, in addition to the credit availability, once they invested large amount in commercial banana cropping that they cannot afford an occasional loss, any severe collapse of market (price or sale channel) or production (disease, water logging or wind damage) must be disastrous.

5. Cross-border activities

5.1 Background

In ancient times, there was no strict national boundary between China and Laos, and the people of Xishuangbanna and Northern Laos have shared languages and customs, and conducted cross-border trade over a long period. During the 1950s-1970s, the cross-border activities were constrained by the poor traffic conditions and backward economy, and the border trade was conducted basically within the scope of 20 km boundary area (Shen, 1995). The cross-border trade of China and Laos was interrupted due to the outbreak of China-Vietnam war in 1979, and it didn't recover until 1989 (Zhang, 1999). The flight between Jinghong and Luang Prabang was opened in 1991, and the Chinese and Lao governments opened Mohan (China)-Boten (Laos) trading ports in 1993. Mohan became the first national-level port in China-Lao boundary area. In 2002, the international bus route connecting Kunming and Vientiane through Xishuangbanna was opened. In 2004, the Yunnan Province and Laos government established the "the cooperation system of Yunnan & Northern Lao", which focused on the key areas of cooperation including agriculture, resources utilization, trade and investment, tourism, transportation and education. Under such the background, the cross-border activities have been booming. This chapter introduces the situation of cross-border activities, and more importantly, it examines the role of cross-border activities in rural livelihood transition and constraints that local villagers have to face.

5.2 Manlongle case

Rice milling and trading are the most critical cross-border activities for the villagers of Manlongle (Fig. 5-1). As a staff of Mohan Port said, Han businessmen were engaged in milling grain business between China and Laos as early as 1990s. Some Manlongle villagers, who have tractors with 4-6 tons loadings (the loading of other villager's tractors are 1.5-2 tons), have started to purchase unhusked rice from Laos and sold to domestic market since 2001.

Fig. 5-1 Villager's tractor and Han businessman's truck for rice trading

The way was that, the Manlongle villagers contacted their Lao partners in advance and bought the grain in the border area by only 25% of the price in China. Occasionally, the Chinese villagers would go into Laos. Since 2003, the Manlongle villagers have sold husked rice to the people of Phongsaly Province by a little higher price than that of China after milling. However, since 2005, the people in Phongsaly have started to mill

unhusked rice by themselves because the electric power was introduced. Since 2009, the Chinese custom have begun to strictly control trading rice from Laos, and China only could import a limited amount of grain, which might be produced by the substitution planting (the Chinese government assist Laos to change the cropping from opium to grain and cash crops, such as rubber and banana). Therefore, it is very competitive for Chinese to gain the quotas of purchasing grain in Laos, and they need to apply the quotas in Kunming. Most importantly, only companies, rather than any individuals, are entitled to apply for the quotas and to buy grain from Laos and then to sell into China by individuals would be judged as smuggling. Once the villagers trading rice from Laos were caught by the Chinese Custom, their rice and tractors would be confiscated and sold publically. In contrast, the Laos traders began to carry grain to China for sale after 2011, and as the Manlongle villagers said that the Laos traders came to their village for selling rice almost every week (Fig. 5-2).

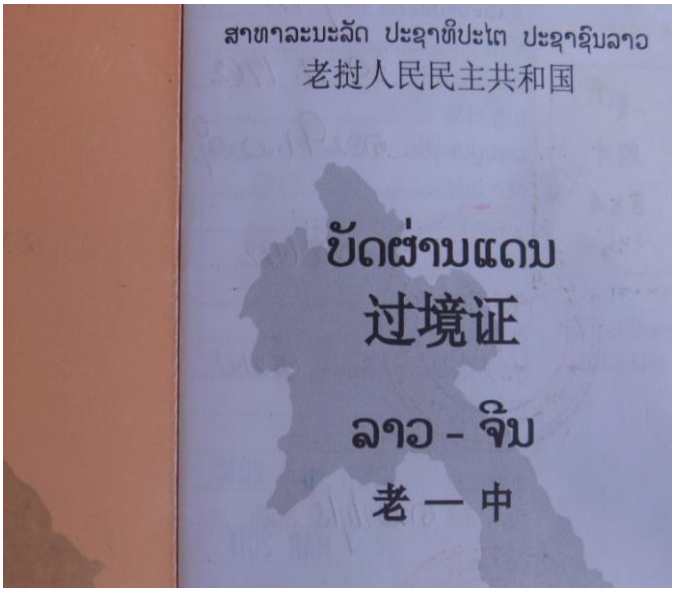

Fig. 5-2 The passport of Lao businessman into China

Timber is important goods in cross-border activities. The Chinese businessmen buy timber from Laos and sell into domestic market. The earliest Dai person engaging in this business was a farmer of Mandan, a village of Mengla, and this farmer has done the business since 2005. Almost households of Manlongle bought timber from this Dai businessman for building house in 2007. This is very important for their livelihood

because there are no enough old-growth trees in the community forest due to rubber growing.

5.3 Manjiang case

The Manjiang villagers chose to invest in rubber farming in Laos (Fig. 5-3). With a rapid increase of rubber price, villagers are eager to grow more rubber, but it is hard for them to find land in China. Therefore, more and more Chinese started to invest in rubber farms in Laos. In 2007, a staff of state-owned rubber farm invited some households of Manjiang to rent upland fields for growing rubber in Phongsali Province, Laos. This triggered the cross-border rubber farming.

The self-organization among households plays a critical role in villager's cross-border investment. Totally, 23 households planted rubber in Phongsali Province in 2007. However, this group was too large, the relationship among these households was community-based, and they weren't all relatives with the organizer. In 2008, they had conflicts with each other, and 12 households gave up. Unfortunately, the organizer in this group is unclear because this question was too sensitive, and no villager was willing to introduce this issue to me. Another group (9 households) collectively rented upland for planting rubber in Luang Namtha Province of Laos. This group waaas based on kinship, and all the following households were the relatives of organizers. As observed, this group internally cooperated well, and no household gave up.

In regard to growing rubber in Laos, there are many risks that the Manjiang villagers have to face. The Manjiang villagers employed Lao villagers to manage their rubber farms, and they brought seeding, fertilizer, capital and technique from China. However,

the Manjiang villagers said, the Lao villagers only accepted money but do not care about their rubber. They also heard that when the rubber plantations could be tapped, the Lao villagers would withdraw the upland fields. I am not sure about the reality of the information because I just got such information from the Chinese side, but anyway, the Manjiang villagers were worried about the safety of their investment in Laos.

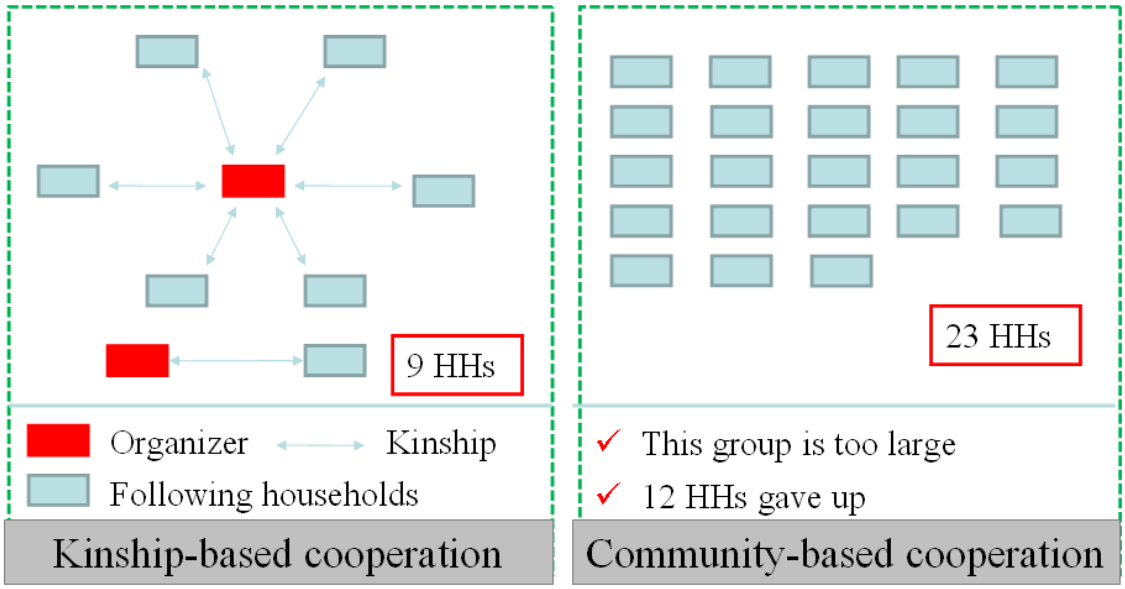

Fig. 5-3 The Rubber enterprise of Manjiang in Laos

In 2009, a villager of Manjiang started to buy timber from Laos and sold it to the Chinese side. However, other villagers didn't follow such the villager to trade timber. Villagers said that it was difficult to find timber buyers and the investment was very large. Of course, from view of China's forest protection policy, trading business should be continued unless the Lao government changes forestry policy, but it is very difficult to be accepted by ordinary villagers due to huge investment.

5.4 Summary

Laos is rich in natural resource, while it is in lack of capital and techniques. Under this background, Chinese have opportunity to extend their business into Laos. The villagers' cross-border activities aim to obtain more economic benefits, rather than survival needs.

The enterprises of Manlongle in Laos have been declined due to the electrical construction of Laos, as well as under strict control by the Chinese Custom. The participants benefiting a lot from the cross-border activities are mainly rich businessmen and enterprises, who are engaged in scalping timber, mining and large-scale para rubber planting. Therefore, the commercial opportunities for smallholders are becoming fewer than before although the cross-border activities are booming in the boundary area of China and Laos.

The cooperation among the Manjiang villagers has made impact on the rubber enterprise in Laos. In spite of some potential problems, such as conflicts of land use right, the Manjiang villagers still have opportunities to invest in agriculture in Laos. However, regarding cross-border investment, a single smallholder is weak in both economic and social network, so such the smallholders need to collectively deal with conflicts. Therefore, some villagers had to give up the investment once they conflicted within group.

6. Changes in rural income

6.1 Introduction

China has experienced a rapid economic growth over the last three decade, and the incidence of extreme poverty fell dramatically (Ravallion and Chen, 2007). During the process, there is mounting concern that increases in inequality indicate that many are being left behind, and failing to share the achievements of development (Benjamin et al., 2005). Studies of China's inequality almost report that there is a huge income gap between urban and rural household in China, and such the gap has increased over time (Sicular, et al., 2007).

Rising inequality is often considered as a likely outcome of the transition to a market economy when individuals are being increasingly paid in accordance with their abilities and the existing social safety net is dismantled in the process (Tsui, 1998). Non-farm activities play an increasingly important role in sustainable development and poverty reduction in rural areas, and can be considered as a critical approach to increase overall rural economic activity and employment in many developing countries. Currently, almost 85% of the rural households in China have at least one family member working in the non-agricultural sector (Rozelle et al., 2002). However, there has been a debate on the role of non-farm income in rural inequality. Some studies show that although non-farm income increases total rural income, it worsens income inequality because it is more unequally distributed than farm income (Barham and Boucher, 1998; Elbers and Lanjouw, 2001). However, de Janvry and Sadoulet (2001) suggested that if the households have a higher participation rate (in particular, casual wage activity) than rich

households, non-farm income can reduce inequality in rural region.

Increased income in the urban sector creates markets for new products such as vegetables, fruits and meat (Van den Berg et al., 2007). Diversification of agriculture from rice to these high-value products is often considered as a critical approach to increase farmers' income (Hossain, 1998). Market-oriented agriculture has spread widely and rapidly in tropical China, which has a great advantage in terms of its climate for providing tropical products to the huge domestic market in China's temperate zone (Guo et al., 2002; You, 2004; Li et al., 2007). However, wealthier households are prone to engage in both high-input and high-return activities. This allows for further accumulation, while poor households stay in poor life for a long run due to the limitations posed by their considerations of risk in terms of their investment. Therefore, rural inequality is being enlarged (Dercon, 1996; Dercon, 1998; Campbell, 2006).

This chapter introduces the changes of rural income and aims to evaluate the rural livelihood transition that has been demonstrated in the chapter 3, 4, and 5, from the viewpoint of income change and rural inequality. In order to understand the transformation of household income well, the household income is decomposed into the income derived from rubber, banana, cross-border activities (cross-border timber and rice trading), crop farming (paddy, sugarcane, jujube and watermelon etc.), livestock breeding and off-farm activities in China (rice trading, labor work, operating shop etc.), which corresponds to the foregoing three chapters at the village level. The classification system of household income at the household level is slightly adjusted for exploring more information.

6.2 Income calculation

Household income is decomposed into the income derived from various portfolios, thus it is available to calculate the inputs and outputs for each enterprise, and aggregated them by analysis. All inputs and outputs, including output retained for own consumption, are valued at market prices. After prior investigation, it is found that villagers judge whether they benefit or not just through comparing the "real" inputs such as cash, fertilizer, fuel, and pesticide with outputs, which determine their livelihood strategies. Therefore, I didn't consider villager's self-labor input as cost following the calculation way of villagers.

About the income derived from labor work, firstly I asked the villagers to estimate how many months they were employed, and then asked their payment. About the income derived from some business, such as operating a restaurant or shop, trading *Fructus Amomi* and timber etc., I directly asked the annul income from these activities. About calculating the income derived from rice milling and trading, I firstly asked the loading of tractor, and asked the villagers to estimate how many times they engage in this business per month, and then asked the price difference between buying and selling transactions. Thereby I got the total revenue of this business. The total revenue subtracted the cost such as machine maintenance fees and fuel was the income derived from rice milling and trading.

6.3 Transformation of village-level income

The income of Manlongle village has increased by 1.6 times during 2004-2010, and the income portfolios were transformed substantially (Fig. 6-1). In 2004, the Manlongle villagers mainly depended on crop farming, the income derived from cross-border rice milling and trading accounted for 21% of the total household income, and there was no tapped rubber and commercial banana cropping. In 2010, more than half of household income was derived from tapping rubber, and 26% of household income was from renting out lowland fields where banana were grown. The income from cross-border business disappeared, and only 21% of the total household income depended on others (crop farming, livestock breeding and off-farm activities).

Fig. 6-1 Average household income of Manlongle Village between 2004 and 2010
Note: constant prices (the price in 2004 is the benchmark)

The income of Manjiang Village increased by 2 times during 2007-2010, and the income portfolios of this village were also transformed substantially (Fig. 6-2). In 2007, the income derived from others (crop farming, off-farm activities and livestock breeding) accounted for 65% of the total household income, and crop farming was the critical income source. Other income was derived from tapping rubber. However, income from

the two sources only accounted for 48% of the total household income in 2010, and the income derived from growing banana accounted for 49% of the total income. It is notable that the cropped area of paddy in Manjiang is quite small and nothing except for rubber is grown in upland, but the Manjiang villagers rented in large area of lowland fields for growing watermelon from other villages in the dry season in 2010, so they still averagely acquired 18% of household income from crop farming in 2010.

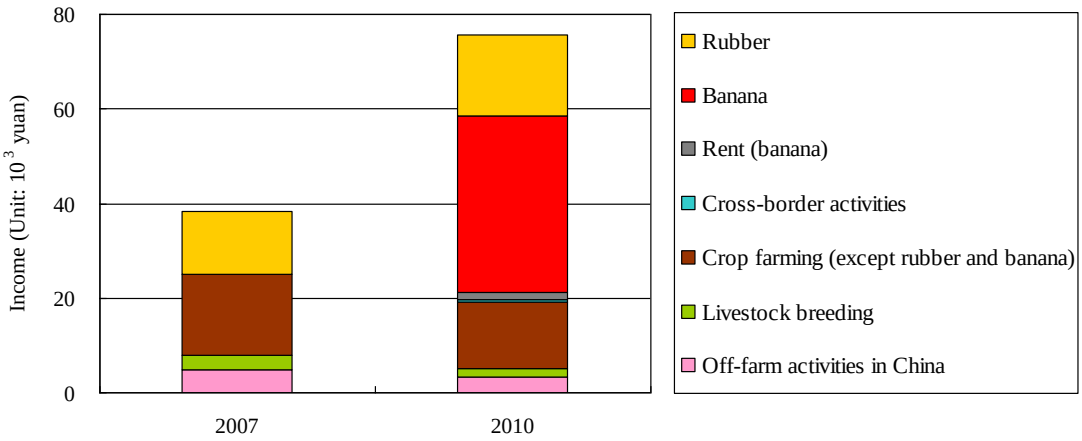

Fig. 6-2 Average household income of Manjiang Village between 2007 and 2010
Remark: constant prices (the price in 2004 is the benchmark)

In addition, 47% of the total rubber area of Manlongle Village (villager-managed) and 62% of the total rubber area of Manjiang Village was untapped in 2010, which ensure a higher potential income in the near future.

6.4 Transformation of household-level income

Table 6-1 shows the distribution of household income data at Manlongle and Manjiang Village. The difference between maximum and minimum of income derived from various sources is very large at both villages. So, the following sector introduces income dynamic of each household, aiming at exploring the situation of income disparity.

Table 6-1 Description of household income data at Manlongle and Manjiang Villages

	Minimum	Maximum	Mean	Number of households engaging in the enterprises
Manlongle Village				
2004				
Rubber	0	0	0	0
Rent (banana)	0	0	0	0
Cross-border activities	0	50,550	4,441	17
Crop farming (except rubber and banana)	1,702	28,480	13,639	76
Livestock breeding	0	5,278	1,255	64
Off-farm activities in China	0	26,350	2,304	13
2010				
Rubber	0	64,987	18,284	67
Rent (banana)	1,475	15,984	8,734	76
Cross-border activities	0	0	0	0
Crop farming (except rubber and banana)	0	6,806	362	5
Livestock breeding	0	4,866	619	24
Off-farm activities in China	0	40,984	6,222	49
Manjiang Village				
2007				
Rubber	0	66,644	13,219	78
Rent (banana)	0	0	0	0
Cross-border activities	0	0	0	0
Crop farming (except rubber and banana)	4,831	35,267	16,573	100
Livestock breeding	0	44,425	3,113	88
Off-farm activities in China	0	58,407	4,827	58
2010				
Rubber	0	80,500	17,184	89
Banana	0	25,4130	37,192	76
Rent (banana)	0	9,016	1,414	44
Cross-border activities	0	49,180	492	1
Crop farming (except rubber and banana)	0	167,102	13,932	86
Livestock breeding	0	21,708	1,755	63
Off-farm activities in China	0	66,393	3,537	47

Note: constant prices (the price in 2004 is the benchmark)

Most household income of Manlongle Village increased due to tapping rubber during 2004-2010 (Fig. 6-3). The low and middle-income groups derived income mainly from farming (paddy, maize, sugarcane or jujube) in 2004, whereas the high-income group mainly derived income from rice milling and trading (Fig. 6-3, Table 6-2). However, in 2010, tapping rubber became the most important income source for 55 households and the rent from renting-out land was the most important income source for 13 households, and no household mainly derived income from land farming (paddy, maize, sugarcane or jujube). In additionally, only 2 households mainly got income from rice milling and trading in 2010 (Fig. 6-3, Table 6-2). It was notable that 11 households experienced income decrease during 2004-2010, and thereinto, 6 households decreased income due to the decline of rice milling and trading and others decreased income due to the conversion of cropping pattern from sugarcane or jujube to rubber plantations.

Table 6-2 Number of households deriving main income from various sources at Manlongle Village

	Low-income group (25 HHs)	Middle-income group (26 HHs)	High-income group (25 HHs)	Pan-village
2004				
Rice milling and trading	0	1	14	15
Farming (Paddy, maize, sugarcane and jujube)	25	25	11	61
2010				
Rubber	10	24	21	55
Rent (banana)	13	0	0	13
Labor work	3	2	0	5
Shop	0	0	1	1
Rice milling and trading	0	0	2	2

Note: The income groups (low, middle and high) of Manlongle Village was sorted by household income in 2004 and 2010, respectively

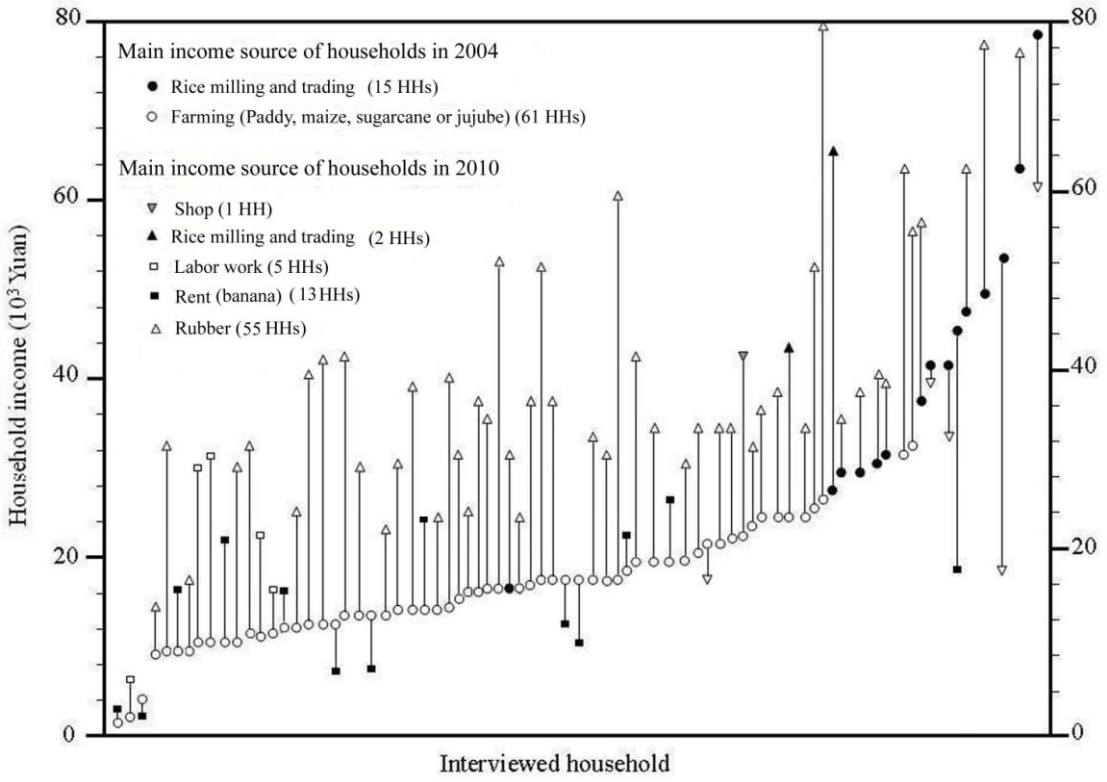

Fig. 6-3 Income dynamic of each household at Manlongle Village between 2004and 2010
Note: constant prices (the price in 2004 is the benchmark)

Most household income of Manjiang Village had also increased from 2007 to 2010 (Fig. 6-4). In 2007, lowland farming (paddy and watermelon) was the most important income source, and 68 households derived main income from growing paddy and watermelon. Tapping rubber was as the second important income source, and 22 households derived main income from tapping rubber in 2007. Although only 7 households derived main income from off-farm activities in 2007, these households belonged to the top group of Manjiang Village (Table 6-3). In 2010, the commercial banana cropping became the most important income source (55 households derived main income from growing banana), and 89% of these households were belonged to middle and high-income

groups. 23 households derived main income from tapping rubber, and more than half of these households were belonged to low-income groups. 20 households mainly derived income from land farming (paddy and watermelon) in 2010, and more than half of these households were belonged to the low-income groups (Table 6-3). Additionally, only 2 households mainly got income from off-farm activities in 2010. It was notable that 10 households experienced a little income decrease during 2007-2010, and thereinto, 7 households decreased income due to the conversion of cropping pattern from double cropping of paddy and watermelon to a mono-culture banana (paddy and watermelon was planted, and could be harvested in the same year, while banana was planted, and would be harvested in the following year) and others decreased income due to decline of livestock breeding and off-farm activities.

Table 6-3 Number of households deriving main income from various sources at Manjiang Village

	Low-income group (33 HHs)	Middle-income group (34 HHs)	High-income group (33 HHs)	Pan-village
2007				
Livestock breeding	0	0	3	3
Off-farm activities	0	0	7	7
Rubber	2	11	9	22
Farming (paddy and watermelon)	31	23	14	68
2010				
Off-farm activities	0	1	1	2
Farming (paddy and watermelon)	14	5	1	20
Rubber	13	8	2	23
Banana	6	20	29	55

Note: The income groups (low, middle and high) of Manjiang Village was sorted by household income in 2007 and 2010, respectively

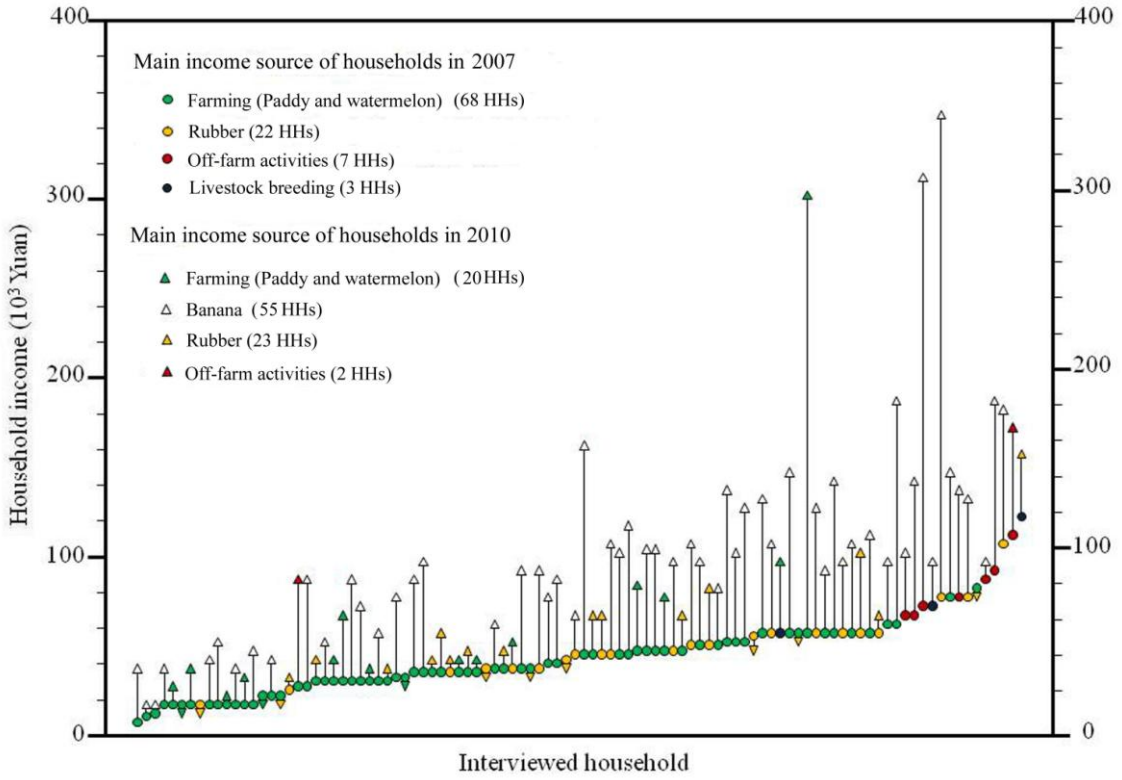

Fig. 6-4 Income dynamic of each household at Manjiang Village between 2007 and 2010
Note: constant prices (the price in 2004 is the benchmark)

During 2004-2010, the Gini-index of Manlongle had decreased from 0.31 to 0.27, and the main reason was the decline of rice milling and reading. Gini-index of Manjiang was enlarged from 0.29 to 0.33 during 2007-2010, and this was mainly caused by the introduction of commercial banana cropping (Fig. 6-5). In contrast, the income difference of rural and pan China reached 0.60 and 0.61, respectively (data source: Southwestern University of Finance and Economics, 2012).

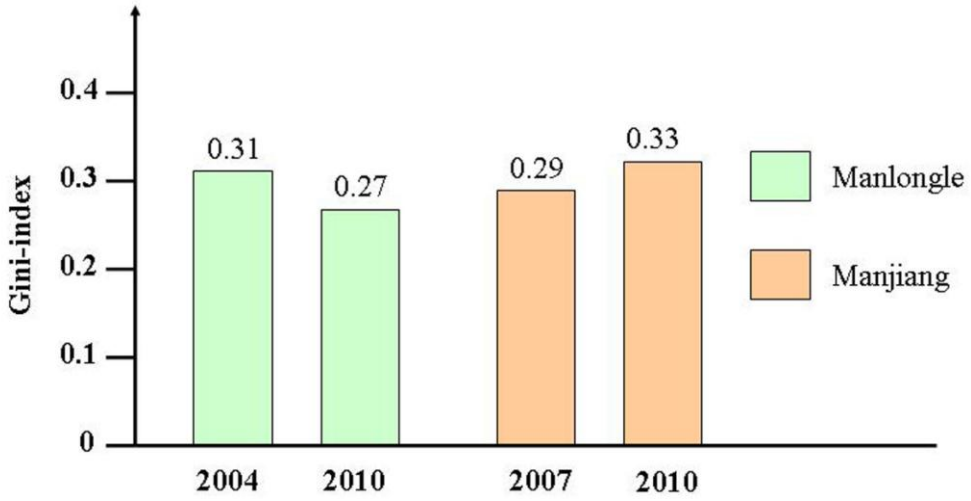

Fig. 6-5 Change in Gini-index at Manlongle and Manjiang

6.5 Summary

Almost villagers benefited from the transition of rural livelihood in the late 2000s. Tapping rubber was important for villagers, while the commercial banana cropping was more beneficial than other crops, and finally the income of banana cropping in the village was much higher than that in the other village.

Income portfolios have been transformed substantially. As mentioned in Chapter 3, the Manlongle villagers rented out their rubber plantations, which planted in 1985, so they didn't have income derived from tapping rubber in 2004. However, tapping rubber became the most important income source for more than half households of Manlongle village in 2010 due to the tapping of the rubber gardens, which was established in 1996. In contrast, as mentioned in Chapter 3, nearly all the rubber seedlings of Manjiang Village were destroyed by frost in 1999, and only about 20 hectares of rubber plantations was tapped in 2010. Therefore, the income derived from tapping rubber was just increased slightly at Manjiang village. As the traditional livelihood, paddy farming

has nearly disappeared in both villages. Meanwhile, livestock breeding, as another traditional livelihood, wasn't an important income source for most households of both villages, and the role of livestock breeding in villager's livelihood further declined in the late 2000s. Some households were the top group for engaging in off-farm activities, while the impact of off-farm activities in villager's livelihood has been declining.

The off-farm activities has been losing the role as a main income source of top ranking households, and agriculture, especially growing cash crops has been more and more important in the livelihood of farmers in the study area. In the study area, the households, who have the ability to engage in off-farm entrepreneurs, are indeed the top group of a village community during a long period, but this advantage is being gradually replaced by the advantage of agriculture in the late 2000. Those households with larger land size and early adopter of cash crops became richer ones. Of course, the households engaging in off-farm entrepreneurs and early adopter of cash crops were generally the same group, while the difference was the approaches that they created wealth by.

In the study area, the emerging entrepreneurs who have created a better life than others, aren't always from big families with higher education, but always look for an opportunity to challenge. Therefore, the farmers didn't have desire to support children to study at school, and the young people usually have 9-year education experience as required by government.

7. Discussion and conclusions

7.1 Transition of rural livelihood

Increasingly, the rural livelihood increasingly relies on rubber and banana in the study area, which has a great advantage in terms of its climatic conditions for providing tropical products to the huge domestic market in China's temperate zone. With the rapid expansion of these cash crops, the impact of some general enterprises in China, such as livestock raising, rice growing and off-farm activities in villager' livelihood is declining sharply.

Farmers of Xishuangbanna are keen on agriculture, and investors from other places also prefer agriculture as their investment project. Banana was the most beneficial choice, even farmers just need to rent out their land, and they also can have a satisfied return on investment. Para rubber can be continuously tapped for 20-30 years once planted, and farmers just need to input a little fertilizer. Therefore, farmers still have large enthusiasm on growing rubber in spite of price fluctuation. Rubber gardens in upland fields were managed by local farmers, workers of state-owned rubber farm and various investors, while commercial banana farms in lowland fields were mainly managed by investors from other provinces.

Even though there were exceptional cases, almost farmers benefit from this livelihood transition. Farmers of Xishuangbanna averagely have 5.8 mu of land, which is about 2 times larger than the Chinese average, which contributes to secure a good life of these farmers even though they mainly depend on agriculture. Income difference among

households is much smaller than that of pan-China. This is an outcome of the relatively fair process of land allocation in the context of the high return of tropical cash crops. People from all over China, even Laos came to the study area for earning a living.

The adopting process of cash crops creates differentiation in wealth among rural households. Wealthier households are able to be as risk takers and to innovate earlier and so they become relatively even wealthier, while poorer households can't afford to take risks which would threaten their livelihood. However, the poor or risk-averse households missed out some opportunities to promote income rapidly, but they can catch up the successful pioneers rapidly and finally benefit from the innovation of livelihood systems. The richer households have to face various risks and severe competition with Han investor, so they could not unlimitedly enlarge their farm size. Therefore, the income difference was enlarged in the initial step, but most probably, it will be stabilized or even smaller in the future.

The rural livelihood transition has caused a dramatic land use change in the past three decades, while this process has been nearly ceased. There are many cases that the Chinese government can't control the land use change. For instance, even though the Chinese government issued policy for protecting grassland in 1985, the area of cropland doubled over the last three decades in the Horqin Sandy Land region of China, and this expansion was accompanied by large increases in water consumption and considerable loss of areas of grassland and woodland (Bagan et al., 2010). In the study area, the areas for subsistence upland cropping and firewood and timber collection were replaced by rubber garden, and rubber encroached on natural forest, resulted in the shift of boundary between human-managed land and natural forest. But the erosion stopped since 1998.

To conclude, rural livelihood has been completely commercialized and farmer's income increased rapidly and substantially, while this transition didn't cause uncontrolled social and environmental problems. Of course, there should be some more successful areas in China, but this study area provides valuable experiences, regardless of economic development and environmental protection. Therefore, I consider the rural livelihood transition of this study area is a successful case.

7.2 Exploring the mechanisms of rural livelihood transition

7.2.1 The role of government in rural livelihood transition

The Chinese government initiated the transition from planned economy to market economy, which is the basic premise of rural livelihood transition in the study area (Fig. 7-1). As the largest developing country, China has established and sustained planned economy for 30 years. Under this system, the government directed all major sectors of rural livelihood and formulates decisions regarding the use of inputs and outputs. As a result, the national economy is close to the edge of collapse in the late 1970s (Zheng and Liu, 2007). In 1978, Deng Xiaoping became the core of the "second generation" of Chinese leadership. He pronounced that no matter whether it is socialistic or capitalistic, the system that effectively promotes development of economy is deemed as a good system. From 1980s to 1990s, the GDP per capita had averagely reached up to 8.3%, which was 4 times more than that of the collective period (Gu, 2000). Meanwhile, the infrastructure development during the last three decades, together with a wide range of economic reforms including price and trading policies of agricultural products, facilitated the flow of people and goods between the production and consumption areas

in all over China. Under this background, the market and institutions, which are fully based on the reliable government credibility, secured the free movement of goods, information and people, and especially Han businessmen more frequently came into remote areas, such as Xishuangbanna for commercial opportunities, and built the necessary connections between villagers and outside the village.

In 1982, the Chinese government established the Households Responsibility System that would provide villagers the right to catch up with various opportunities (Fig. 7-1). Household Responsibility System reallocated collective land to individuals, and gave autonomy over decisions on crop choice and land use (Krusekopf, 2002). Under this system, farmers of Xishuangbanna can decide to convert paddy-based farming to a mono-culture banana and firewood or bamboo to a mono-culture rubber by themselves. Farmers are also responsible for the losses of an enterprise; therefore, sometimes it is more important to avoid risk than high return, especially for the poor households. When the rubber price decreased sharply, the Manlongle villager chose to rent out their tapped rubber gardens, and they chose to rent out lowland fields once the pioneer failed to benefit from the adoption of commercial banana. At Manjiang, some villagers chose the commercial banana cropping from a wait-and-see attitude initially. But all of the villagers have been gradually accumulating knowledge, capital, and experience and tried to expand their enterprises. For instance, the Manjiang villagers invested in rubber in Laos, and the Manlongle villagers are engaged in cross-border rice milling and trading business.

At the first step, the government strongly encouraged production by providing technology and subsidies. In the study area, the government introduced watermelon and

para rubber to the villagers in the 1980s; this triggered the expansion of cash crops. However, the government gradually recognized that they need to intervene the behavior of villagers out of the consideration of environmental protection. Exemplified by rubber planting, during collective period, the government policy was contradictory. Zhou Enlai, the former premier of China, encouraged local state-owned rubber farms to produce more rubber, while he also indicated Tropical Garden of Xishuangbanna to protect tropical forest well in 1960. As a result, the state-owned farms were established one by one during the 1960s-1970s, while natural reserve was also built in the late 1950s. Since the early 1980s, institutional aspects of upland management were evolved step-by-step. The government policy gradually changed from ambiguous targets to conserve forest strictly, and now, government took determined steps for conserving forest resources.

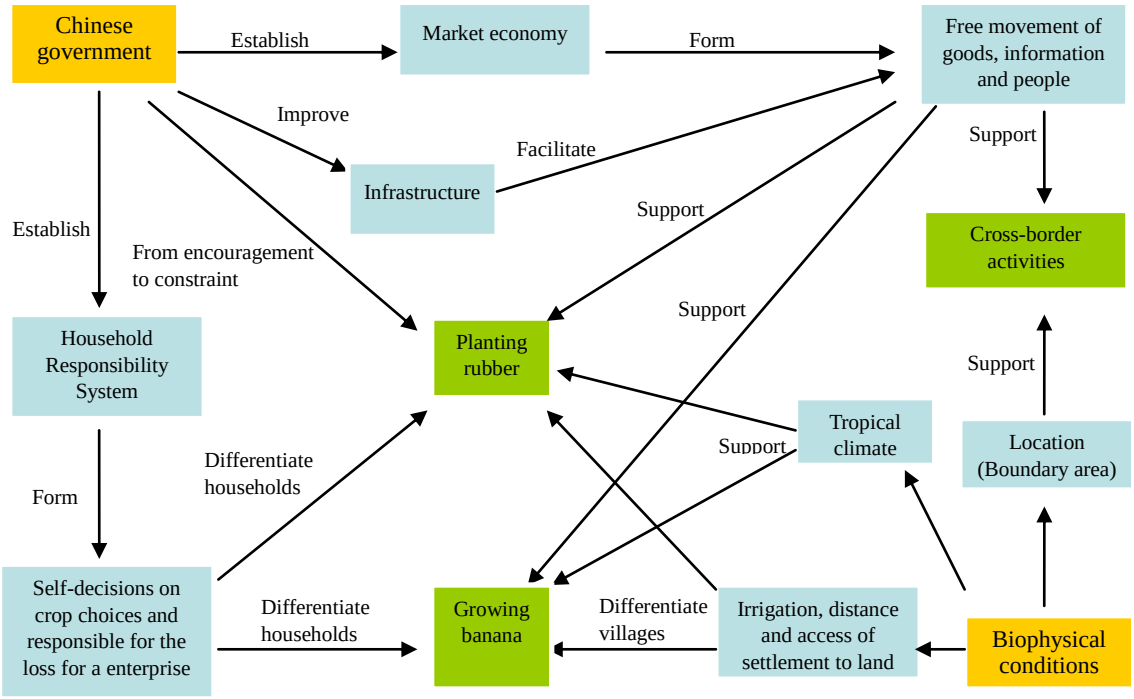

Fig. 7-1 Mechanisms of rural livelihood transition in the study area

7.2.2 The role of biophysical conditions in rural livelihood transition

Xishuangbanna is obviously advantaged in location facilitating cross-border activities (Fig. 7-1). Until now, Yunnan is still one of the poorest provinces in China, and as a traditionally backward area of Yunnan, Xishuangbanna is separated from advanced areas by numerous mountains. Indigenous people face inborn deficiencies, such as language barriers, poor education and insufficient capitals. With the development of China' economy, the demands for tropical products and natural resources have been enlarged, and Montane Mainland Southeast Asian is rich in tropical land, timber and mineral resources. Under this background, the Chinese government built the roads and airlines from China to Southeast Asian via Xishuangbanna, and Xishuangbanna also try to improve infrastructure by itself. For instance, all the administrative villages of Mengla have been connected by transportation network during 2005-2010. Therefore, Xishuangbanna, as an entrance of China into Montane Mainland Southeast Asian, has been rapidly changed from land-locked to land-linked. This is the context that cash crops was introduced and spread rapidly, and villagers have the opportunities to enlarge their enterprises through cross-border activities.

Xishuangbanna attracts outside forces to update its agricultural system to be suitable to its tropical climate. The tropical area is less than 5% of the total area of China, and the tropical climate provides the study area with an opportunity that its agriculture avoids competing with that of huge temperate area, and secures a high return of agriculture. Therefore, banana, as a tropical fruit, has replaced other lowland crops, such as paddy, maize and watermelon, which can be grown in the huge temperate area of China, and rubber, as a tropical product, has replaced other upland crops, such as maize and upland

rice in the study area (Fig. 7-1).

Capital shortage won't constrain adopting cash crops if this area can adapt high beneficial agriculture. Capital shortage may constrain smallholders adopting cash crops within a short time, rather than a long term. Indigenous people are able to obtain benefits from the passive transformation of agricultural system. They benefit more from renting out land than growing existing cropping. During the process, local peasants can accumulate funds, and more importantly learn new concepts.

The micro-level biophysical conditions, such as irrigation system, the distance and access of village settlement to the land plots created differentiation in behaviors among village when the cash crops were introduced (Fig. 7-1). In this study, the banana farms in Manjiang Village were mainly managed by villagers, whereas businessmen managed all the banana farms in Manlongle Village, which was mainly caused by these micro-level biophysical differences. Historically, the villagers also collectively decided upland use according to the distance and access of land plots to village settlements. When the rubber price increased rapidly, the Manjiang villagers still have incentives to protect forest for conserving water and timber because the community forest of Manjiang was located in the watershed area which conserved the irrigation and drinking water for this village. Therefore, the Manjiang villagers collectively decided to only clear swidden-related secondary vegetation for planting rubber. In contrast, the community forest of Manlongle wasn't located in the watershed area which conserved water for this village, so they cleared 17 hectares of deep forest for growing rubber.

It is concluded that the transition process of rural livelihood in the study area was

initiated by government, which established a market economy system in the early 1980s, and has successfully balanced economic development and forest protection, assisted by village community. The study area shares the same institutional settings of institutional innovation with other parts of China, but the tropical climate fostered a high-return agricultural system, which is quite different with other agricultural systems in China. The cross-border location provides local villagers an opportunity to expand their enterprises into Laos when they are constrained in China. The micro biophysical conditions, such as irrigation systems, the distance and access of village settlement to land plots make impact on the adoption process of cash crops and finally differentiate the villages in the study area.

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