Faculty of Natural Resources and Agricultural Sciences
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Rural Development and Natural Resource Management – Master's Programme

The role of Co-management in enabling livelihoods change in context of creating natural reserves

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Abstract

Nowadays Chinese government pays more and more attention to environmental protection. The number of nature reserves and the size of protected areas have increased sharply in China. The establishment of nature reserves limits economic development of surrounding communities to some extent. Co-management is chosen as a strategy for handling the contradiction between environmental protection and community development. This paper chose NabanHe National Nature Reserve (NNNR) as case study. It overviewed the background of NNNR, and analyzed livelihoods change brought about by activities of co-management. On the basis of this analysis, it discusses how co-management enables livelihoods change in context of creating natural reserves. It also discusses the rights and duties involved in co-management arrangement.

Key words: Community Co-management, Capacity building, Livelihood, Nature reserve

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Abbreviations

BCN	Biodiversity Conservation Network
HRS	Household Responsibility System
IUCN	Iinternational Union for Conservation of Nature
LILAC	Living Landscapes China
NNNR	NabanHe National Nature Reserve
NTFP	Non Timber Forest Product
PA	Protected Area
TMI	The Mountain Institute
UNESCO	United Nations Educational，Scientific，and Cultural Organization
WWF	World Wildlife Fund

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1. Introduction

1.1 Why co-management in China

Nowadays Chinese government pays more and more attention to environmental protection. The first nature reserve in China was set up in 1956. That's to say, the establishment of nature reserves in China has a history of less than 60 years (Li et al 2006). However, in the past two decades, the number of nature reserves and the size of protected areas have increased sharply in China. As of end of year 2007, 2531 nature reserves of different types and levels had been set up in China, covering an area of 151.88 million hectares, accounting for 15.19% of China's territory (supplied by China's Environmental Protection Administration).

China's nature reserves are mainly in remote, mountainous and ethnic minority areas (Zhu 2001). By the end of 1997, nature reserves in Yunnan, Heilongjiang, Hainan, Guangxi, Sichuan, Liaoning and Hunan province, which are more underdeveloped than other parts of China's provinces, account for over 50% of China's nature reserves (Yang 1999). The socio-economic status of these regions is relatively low, and the people there are in poor conditions (Li et al 2006). Most people there are farmers, and most of them depend directly or indirectly on agriculture for their livelihoods.

Quick expanding of nature reserves has brought a series of problems. Most nature reserves in China were founded after the settlement of local land tenure, which led to the fact that many lands that local communities own in the past were claimed by the nature reserves (Li et al 2006). Taking the forest reserves as an example, farmers in surrounding communities have formed their livelihoods of making use of land, biological resources, and environmental resources. However, Chinese nature reserves claimed many lands that local communities own in the past and at present, which cuts down the resource available to the communities and therefore leads to farmers' economic losses. Those nature reserves just focus on environmental protection, not on community development, which creates huge contradictions between nature conservation and community development. Neither nature conservation nor community development can be ignored. It is a challenge to solve contradiction and conflicts

between conservation and development. On the other hand, local residents have accumulated abundant indigenous knowledge with their unique understanding on natural resources. For the sake of their livelihood and need for developing. Therefore, their traditional culture, values and beliefs in nature are in consistence with ecological protection (Li et al 2006). The indigenous knowledge of local residents can be useful in developing reserve management plans, and local residents can play important roles on reserve staffs as, for example, guards and environmental educators (Meffe & Carroll 1994). Thus, it makes sense to involve local residents in nature protection, especially on the process of decision making on how to use natural resources.

Co-management is chosen by some China's nature reserve bureau from 1990s, as a strategy for exploration and trial on handling the relations between nature reserves and surrounding communities (Li et al 2006). Although there are various forms of co-management in China, most co-management arrangements in China appear similarity, which is supporting community development. Since China's nature reserves are mainly in remote areas, people living surrounding those nature reserves are poor. In addition, some their rights and interests are deprived during the process of natural reserve building. And there lacks due compensations. Rural communities do not have enough trust towards nature reserves. With regard to the above factors, when embarking community co-management, to establish mutual trust relationships through supporting community livelihood and development is a practice usually adopted in China's natural reserve co-management(Li 2006).

There is also a growing literature that explicitly focuses on how local residents are involved in nature conservation, and how their livelihoods and conservation are linked in order to develop community economy, as well as preserve environment. Co-management is often formulated in terms of some arrangement of power sharing between the state and a community of resource users (Carlsson & Berkes 2004). Through this kind of power sharing, community villagers' capital, such as human capital, social capital, and financial capital can be raised, and thus their capacity to diversify livelihoods can be enhanced. That's my reason for conducting the research on how community co-management plays a role in enabling livelihoods change in context of creating natural reserves.

1.2 Research problem and research questions

During my research, I will explore how community co-management plays a role in enabling livelihoods change in NabanHe National Nature Reserve (NNNR). To be specific, I will focus on a set of research questions as follows:

1）How is the social and economic livelihoods context of two villagers in the community?

2) Why people implement co-management to enable rural livelihoods change？

3）What forms of livelihood are created by co-management?

4) How co-management links natural resources conservation and livelihoods. What does the process of livelihoods change look like within co-management?

5）How do local villagers perceive co-management?

1.3 Site introduction

NabanHe National Nature Reserve is located in Chinese Xishuangbanna Dai Autonomous Administrative Prefecture (Fig.1), which is one of the few pieces of rare lands well preserved tropical rainforest ecosystem type. The nature reserve covers an area of 266000 hectares and is located 20km northwest of Jinghong City, the prefecture capital of Xishuangbanna. It extends between 22°04′N to 22°17′N and 100°32′to 100°44′E(Yang et al 2009).

The reserve encompasses an altitude range of 539m to 2,304m with an estimated 90% of the area situated between 600m and 1500m areas (Yang et al 2009). The western and central parts off the reserve belong to the Naban River watershed, whereas the eastern slopes drain directly into the Mekong River.

NNNR has a status of national nature reserve and therefore has laws for protection of forest and river. The reserve has three management zones: (1) Core Zone – in which no research or agriculture production is allowed; (2) Buffer Zone – villages exist but have strict rules of what can be produced or cut from the forest; (3) Production Zone – where farmers are allowed to produce agriculture but have restricting rules regarding usage of the forest (Leshem et al 2010). NNNR has abundant of resources of plants and animals. It is a

comprehensive nature reserve with a multifunction of species diversity reserve, community development and education of science and research on regional, national and global environmental protection and development(Yang et al 2009).

Fig.1 Location of the research area

Source: adapted from LILAC 2008

Within the nature reserve, the ownership of land and forest doesn't change. Roughly 73% of the land areas in the nature reserve are stated-owned forests and barren mountains. The remaining 27% is collective land, belonging to the villages. Collective land is classified as collective forest, irrigated land, arable dry land and shifting land (Yang et al 2009) (Table.1). The nature reserve has 5 village committees and 33 villages, which belong to two administrative units, Jinghong City and Menghai County. At the end of 2007, there were

5769 villagers of 5 minorities[1] and Han majority in the nature reserve. All the villagers are farmers (Yang et al 2009).

Table. 1 Land-use in NNNR

	Land-use types	Managers	Land use rights situation
State-owned land	State-owned forests	State Forestry Administration NNNR management Bureau	● Owned by the state, villagers have no rights to use. ● Some forests adjacent to villages are nibbled illegally to shift arable land. ● Villagers are contracted to guard some forests, where NTFP collecting activities are allowed.
	barren mountains		
Collective land	Collective forests	Village committees	● Villagers have right to graze and collect NTFP. ● Were increasingly logged or degraded in favor of agricultural production. Those collective forests below an altitude of 1000m were widely replaced with rubber plantations.
	Shifting land (waste land)		● Villagers were strongly encouraged to put "wasteland" under production.
	Irrigated land	Household	● Were distributed in equal shares to each household and is rented for a period of 30 years. The households can decide to what to plant in the land. ● With the growth of population, per capita land was decreased.
	Arable dry land		

Source: own compilation according to Yang et al 2009, mail interview

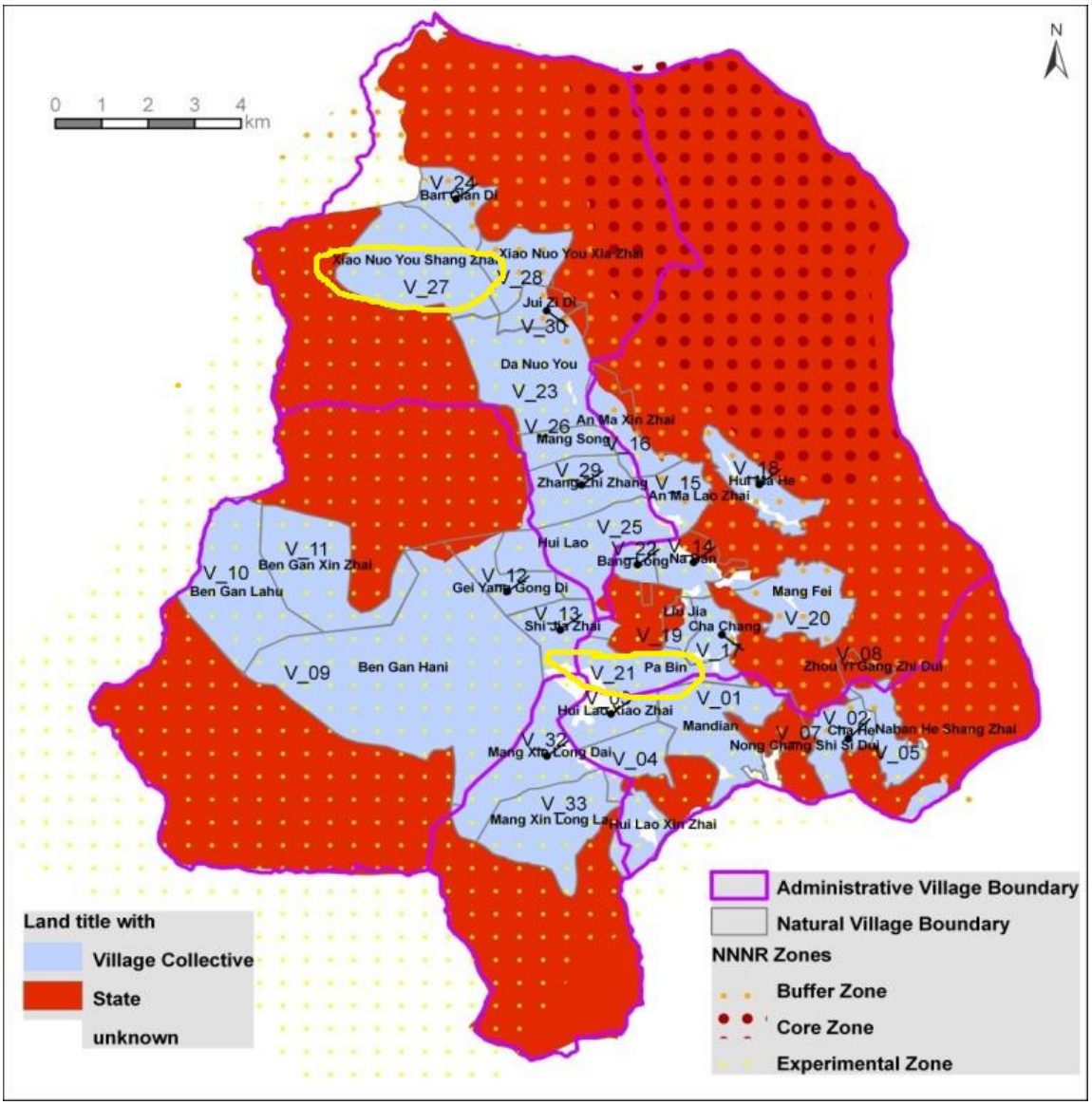
The nature reserve is classified as two areas according to altitude: one is high altitude area that the altitude is higher than 1000 m above sea level (a.s.l.), the other is low altitude area that the altitude is lower than 1000m above sea level (a.s.l.). The 33 villages are dispersing both in high and low altitude areas. Generally speaking, the economic condition in NNNR is

[1] Minorities in China refer to the non-Han Chinese population in the People's Republic of China (Wikipidia 2011).

poor. Compared with Chinese farmers' per capita net income per year of 4,140 Yuan [2] (supplied by the State Statistics Bureau), local farmers' on average per capita net income was 2390 Yuan in 2007(Yang et al 2009). There is also a large income gap between high altitude areas and low altitude areas. Farmers in low altitude areas are richer than the one in high altitude areas.

1.4 Site selection

Fig. 2: Administrative Boundaries, Nature Reserve Zones and Villages in NNNR



[2] 1 yuan≈0.16 U.S.dollars

Source: adapted from Wehner 2010

Two villages are chosen as case studies, they are Xiao Nuo You Shang Zhai and Pabin (see Fig.2).

First, the two villages belong to different minorities , thus they may be diverse in socio-cultural environments. Second, the two villages locate in different altitude areas. Xiao Nuo You Shang Zhai locates in high altitude area over 1000m. Pabin locates in a low altitude area below 1000m. Their differences in natural conditions determine differences in types of livelihoods and level of economic development. In other words, there are great disparities in the level of development between each other. At the same time, they have something in common, they are both located inside NNNR and both of them need to search for livelihood alternatives. The reason why I choose two different contexts is that I think it is easier to understand about what is specific and what is common in the community. To be specific, I want to understand what forms of livelihoods are created by co-management and how people perceive co-management under different circumstances.

The reason for choosing the two villages is from both a research perspective and my internship. Xiao Nuo You Shang Zhai is the village where I visited several times during my internship. There were co-management activities implemented in the village at that time. Thus it's easier for me to answer my research questions since I had got a preliminary understanding on the villagers' living conditions and their response to co-management. The choice of Pabin was the outcome of discussion with the head of co-management department of NNNR Management Bureau. He said co-management activities were characteristic in Pabin, which can be a representative for villages in low-altitude area. However, since I have never been there, data collection is more limited compared with Xiao Nuo You Shang Zhai.

1.5 Structure of the study

This thesis is organized in six chapters. Chapter one introduces the justification of the research, the research problem and the research questions and overviews the background of study site. Chapter two presents the methodology of the research. Chapter three reviews the theory and concept of the research. Chapter four presents results and findings of the case

study. Chapter five brings the analysis and discussion of case study and literature review. The last chapter offers final remarks of the research and discusses possible future research questions.

2. Methodology

2.1 Informal consultation and participation observation

Last summer, I participated in a project of women capacity building supported by World Wildlife Fund（WWF）, which was implemented by the department of Community Co-management in NNNR. My job was helping to distribute fertilizers and got feedback on cultivation technology of dendrobiums. In the work process, I told farmers how to fertilize dendrobiums, and asked the difficulties they had encountered in their farming work. In addition, the condition of dendrobiums was recorded, and the cultivation experience of dendrobiums was shared as well. Through this fieldwork, I got the opportunity to visit and spend time in some villages. I visited several villages, and got a preliminary understanding on local farmers' living conditions in terms of different areas and ethnics. I was also invited to dine with local villagers. During this visit, I got a good opportunity to further discus issues with family members. I also got a good opportunity to understand how local villagers perceive co-management. While we were talking, I found some farmers and the staffers of community co-management get very well with each other, but some farmers don't. A farmer told me there were a lot of conflicts between the nature reserve and local farmers in the past. By contrast, there are more and more cooperation and harmony among them now. Most farmers are content with the work of community co-management. The great contrasts regarding farmers' response to community co-management inspired me to conduct further research on community co-management in NNNR.

Generally speaking, I got a preliminary understanding on how community co-management is implemented and the activities of livelihood diversification and capacity building connected with co-management during this field work. This experience was a valuable source of information for my research. It came to be a useful complement to the interviews and data

analysis.

2.2 Telephone interview

Interviews were conducted through telephone. I mainly interviewed staffers of NNNR and villagers in NNNR. Staffers of NNNR administration bureau were interviewed to understand how co-management is implemented in the area. I had tried to conduct interviews to understand villages' condition, as well as villagers' responses to co-management. Telephone interviews were conducted without face-to face interaction, thus it was difficult to know interviewees' responses and their expressions, which makes the interview difficult to be evaluated. Especially when I interviewed the villagers, most of them can't understand the questions well. Worse still, I found it was hard to explain my questions over telephone interview. To a certain extent the failure of interviewing villagers was due to no face-to-face interaction. The advantage is that it makes me more convenient and less uncomfortable over the telephone interviews.

2.3 Mail interview

Mail interviews were conducted during my research. Sometimes the staffers of NNNR preferred mail interview to telephone interview. They thought mail interviews are more convenient and flexible, and thus they could give a more systematic and clear answer. Indeed, mail interviews were sometimes a good complement to other interviews, especially when I had questions about complex data, such as the villagers' social and economic livelihoods context and responsibilities and rights of co-management. However, it was difficult to respond to and feedback answers given by interviewees on time. When I had new questions I needed ask them and wait again, which made the interviews inefficient and time-consuming.

2.4 Literature review

Although the study builds upon fieldwork conducted in context of my internship with the course of Theory and Practice of Rural Development. A literature review has been the main method to conduct my study.

Linkages between livelihood and conservation

Since the 1972 Stockholm Conference on the human environment, the importance of biodiversity conservation and its linkage to global development issues has been recognized (Luan 2006). Since then many developing countries have paid more and more attention to environmental degradation and environmental conservation. Conservation has contributed to human well-being by maintaining ecosystems but it has also contributed to local poverty by denying the poor people control over and access to the natural resources that underpin their livelihoods (Fisher 2005 Cited in Luan 2006). Actually, poverty and environmental degradation is intimately connected; poverty is both a cause and an effect of natural resource depletion (Leonard 1989 cited in Ellis 2000). Those who are poor and hungry will often destroy their immediate environment in order to survive. On the other hand, environmental degradation further intensifies the degree of poverty experienced by marginal groups, and drives them to ever more intensive exploitation of the resources that are accessible to them (Ellis 2000). Therefore, the damage to local environments cannot be effectively halted unless poverty itself is addressed. Hence many scholars point to the necessity of liking economic development and conservation. Fisher (2005 Cited in Luan 2006) asserts the necessity of the integrated approaches to conservation and development and that approaches should be highlighted as significant conservation strategies in protected area.

In this paper, I used Biodiversity Conservation Network's (BCN's) "three linkages" approaches to understand the linkage between livelihoods and conservation and then how co-management builds this linkage. The concept of linkage between conservation and livelihoods can perhaps best be understood by considering the different approaches to reconciling the demands of conservation and livelihood that have evolved over the past century (Salafsky & Wollenberg 2000). There are three approaches along this spectrum, which can be characterized as no linkage, indirect linkage and direct linkage between livelihood activities and conservation (BCN 1997 cited in Salafsky & Wollenberg 2000).

- **No linkage:** protected areas are created and livelihood activates are excluded to protect natural resources. Obviously, protected areas remain an important approach for conservation. Protected areas have often further restricted the livelihood options of people who are destitute, since those people have no access, or limited access to natural

resources of protected areas (Salafsky & Wollenberg 2000).

- **Indirect linkage:** In the buffer zone of a biosphere reserve, local people are allowed to use natural resources in a limited way. Substitute economic activities are implemented to reduce local people's reliance on natural resources. The zonation is used to create a spatial compromise that enables local people to continue to meet their livelihood needs while still protecting key species and habitats. Reliance on the natural resources is decreased by substituting other livelihood activities. These indirectly linked approaches have been difficult to implement. Perhaps the biggest problem has been that these approaches have not been directly tied to conservation behavior (Salafsky & Wollenberg 2000).
- **Direct linkage:** Livelihood activities depend on and directly linked to biodiversity. Local stakeholders are given opportunities to benefit directly from the biodiversity, and increase their sense of environmental protection. Livelihoods drive conservation, rather than simply being compatible with it (Salafsky & Wollenberg 2000). Direct linkage means that local people are involved in both livelihood activities and conservation. If local people are not involved, it is likely over time, the resources on which tourism depends will be destroyed and the investment lost (Brandon 1996 cited in TMI 2000). Thus management by local people accompanied by devolved decision-making is more preferable since it can be more accountable and sustainable in the long-term (TMI 2000).

Literature reviews are efficient and inexpensive. A large number of data can be collected on library and internet. No scheduling or coordination is involved. The cooperation of others is not required over literature reviews (Marrelli 2005). However, the large amount of data often made me confused. It's difficult for me to identify useful resources. Literature reviews are limited to collecting information about what has happened in the past, and usually within organizations other than the researcher's own workplace. They cannot provide data about current actual behavior (Marrelli 2005). Furthermore, since I didn't do fieldwork directly related to my research questions and some of the data was given by the staffers of NNNR Reserve Bureau, it was difficult for me to get a clear picture of the power sharing in practice through mail interview and literature review. Thus, the analysis of the rights and responsibilities in regards to co-management arrangement has limitations.

3 Theory and concept

3.1 Community co-management

Co-management

Co-management is often formulated in terms of some arrangement of power sharing between the State and a community of resource users (Carlsson & Berkes 2004). Singleton (1998 cited in Carlsson & Berkes 2004) defines co-management as 'the term given to governance systems that combine state control with local, decentralized decision making and accountability and which, ideally, combine the strengths and mitigate the weaknesses of each.' The World Bank (WB cited in Carlsson & Berkes 2004) has defined co-management as 'the sharing of responsibilities, rights and duties between the primary stakeholders, in particular, local communities and the nation state; a decentralized approach to decision making that involves the local users in the decision making process as equals with the nation-state'. In NNNR, the staffers of NNNR Management Bureau together with stakeholders of local community share the responsibility and right to manage natural resources belonging to the nature reserve and community. In this regard, co-management in NNNR is in accordance with the above definition of The World Bank.

The land in NNNR consists of two parts (see Table 1): state-owned land and collective land. In this paper co-management is targeted at collective forest rather than state-owned forest, which I will discuss under 4.3.3

Community

In the specific case of NNNR, co-management is known as community co-management. Local communities can and should play a major role in conservation and environmental management. According to Ostrom (1998 cited in McCay 2002), there are three major elements that constitute a community. The general idea is that where people who live and/or work together share a sense of identity and belonging (therefore some notion of boundaries and membership criteria), where they share some level of dependence on or caring for the resources in question (or streams of income coming from those resources), and where they also share many norms and goals, they are more likely to be able to develop institutions

appropriate to deal with the challenges they face in using common-pool resources. These are critical to the development of the trust and reciprocity known to be essential to developing cooperative relationships. The more community there is, the lower the costs of getting information, bargaining, monitoring, and enforcement (McCay 2002). The more "community," the more likely people are to be able to communicate with each other about whether there are problems that need to be addressed and if so, what to do (Wilson & McCay 1999 cited in McCay 2002). Singleton and Taylor (1992 cited in McCay 2002) argue that community can bridge inequality and heterogeneity to some extent, although it also can be undermined by economic and social differences (Agrawal and Gibson 1999 cited in McCay 2002). They also theorize that the types of solutions that result will depend on the degree of community: At one extreme are fully decentralized, endogenous solutions, which depend on high degrees of community; at the other, solutions heavily dependent on the state, because of low degrees of community, and hybrids such as co-management (McCay 2002).

Community in the context of NNNR is accordance with Ostrom's three elements. Local people in the community share a sense of identity and belonging, such as forests, lands and river. They share some level of dependence on or caring for the resources of nature reserve in question and they also share many norms and goals, such as villages' regulation and goals of environmental protection.

3.2 Protected Area

According to International Union for Conservation of Nature (IUCN) (2008), Protected Area (PA) is defined as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. There are currently six PAs management categories provided by IUCN. In this study protected area refers to nature reserve. Nature reserves are protected areas set aside to protect biodiversity and also possibly geological/geomorphologic features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values (IUCN 2008). Although PAs play an important role in protecting natural resources, they have some negative

impacts. Protected areas often define strict boundaries, which has led to socially problematic practices such as forced relocations from PAs and denial of secure livelihood opportunities to people living in and around PAs (Gadgil & Guha 1992 cited in Pisharoti 2008).

3.3 Livelihood and capital

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). A fundamental characteristic of rural livelihoods in contemporary developing countries is the ability to adapt in order to survive. The construction of a livelihood therefore has to be seen as an ongoing process. Furthermore, the main components (assets, mediating processes, activities) of livelihood are not static. Assets can be built up, eroded, or instantaneously destroyed. Available activities fluctuate seasonally. Access to resources and opportunities may change for individual households due to shifting norms and events in the social and institutional context surrounding their livelihoods (Ellis 2000).

Table. 2: Categories of capital

Categories	Definition
Natural capital	The natural resource base (land, water, trees) that yields products utilised by human populations for their survival.
Physical capital	Assets brought into existence by economic production processes, such as tools, machines, and terraces.
Human capital	The education level and health status of individuals and populations.
Financial capital	stocks of cash that can be assessed in order to purchase either production or consumption goods, and access to credit
Social capital	the social networks and associations in which people participate, and from which they can derive support that contributes to their livelihoods

Source: own compilation according to Ellis 2000

Capital can be utilised directly, or indirectly, to generate the means of survival of the household or to sustain its material well-being at differing levels above survival (Ellis 2000). Scoones indentify five main categories of capital contribution to assets in the livelihood definition, and these are natural capital, physical capital, human capital, financial capital and social capital (Table. 2).

Those capitals are not always static in the context of livelihood activities; they can convert to each other, and thus leading to livelihoods change. Since different context presents different capital. Different researchers have identified different categories of assets as capturing for them strategically important distinctions between different types of capital (Ellis 2000). In the context of NNNR, I will focus on natural capital (land and forest), social capital (associations between different stakeholders) and human capital (training and human capacity) to explore how these capitals contribute to livelihoods change. As for the analysis of another two components of livelihood, there also exists limitation and focus. The analysis of available activities and mediating activities is mainly related to natural resource based activities. Natural resource based activities include collection or gathering(e.g. from woodlands and forest), food cultivation, livestock keeping and pastoralism, and non-farm activities such as brick making, weaving, and thatching and so on (Ellis 2000).

3.4 Capacity building and empowerment

Capacity building

The term *capacity building* has appeared recently in the wildlife management literature in the context of community-based co-management (Raik 2002). Capacity building has been defined as the sum of efforts needed to nurture, enhance and utilize the skills and capabilities of people and institutions at all levels-nationally, regionally and internationally(Carlsson & Berkes 2004). Lauber and Knuth (2000) defined capacity building as “increasing skills, experience, or knowledge of citizens or agencies”. This definition is similar to Nelands’ (1984): “Increasing the ability of people and institutions to do what is required of them”. Despite of variety and vagueness in definition of capacity building, the definitions have something in common.

- They consider "skills increase" as the process or goal of capacity building.
- Capacity building is used in three major contexts (Raik 2002) and can be categorized thus:

  Institutional (referring to an organization or set of organizations; e.g., state or federal wildlife management agency, local government)

  Community (referring to informal groups bounded geographically; e.g., town, neighborhood)

  Individual (referring to people as such; i.e., citizens)

Empowerment

Empowerment in the context of co-management generally refers to the process of gaining a sense of democratic participation in one's community, particularly a sense of ownership about and influence over important events and outcomes in one's own life (Rappaport 1987 cited in Raik 2002). Empowerment is cited as an outcome of both capacity building (Foster-Fishman et al 2001 cited in Raik 2002) and participation in decision making (McMillan et al 1995 cited in Raik 2002). According to Rappaport (1987 cited in Raik 2002), empowerment is a mechanism by which organizations, communities, and individuals gain a sense of mastery over their affairs. Empowerment occurs in a particular social environment and therefore cannot be understood apart from its context. Through a process of empowerment, these capacities may contribute to sustained and meaningful action or participation (Rappaport 1981 cited in Raik 2002). Thus, empowerment plays a central role in community-based co-management.

There are three types of empowerment resonate with the three types of capacity described earlier – institutional, community, and individual (Raik 2002).

Institutional empowerment appears in two forms. *Empowering* institutions build the confidence and facilitate the competencies of groups and individuals, and provide mechanisms for the public to influence decisions (i.e., when wildlife agencies work with communities to improve their effectiveness as partners or participants in wildlife management). Empowered institutions make people learn new ways to use their resource and organizational capacities to influence their environment (Rich 1995 cited in Raik 2002).

Community empowerment is "the efforts of individuals with common concerns and

characteristics to increase the degree of control over their own destiny and their capacity to influence bodies that make decisions that affect the community and its members" (Balcazar & Keys 2001 cited in Raik 2002). This process of empowerment assumes a sense of common purpose among individuals that allows them to take action collectively (Raik 2002).

Individual empowerment has been defined more specifically as a psychological phenomenon (Zimmerman 1990 cited in Raik 2002). It refers to the connection between a sense of personal competence and a desire to take action in the public domain (Zimmerman & Rappaport 1988). Competence to take action is determined by the interaction of such factors as relevant knowledge and analytical ability (Rich 1995 cited in Raik 2002).

The concepts of capacity building, empowerment and participation are integral to community co-management. In other words, capacity building, empowerment, and participation in co-management can be played out by a cycle (Fig. 3). Agencies, groups, and individuals draw upon sources of capital when engaging in community participation, like capacity building. Increased capacity contributes to growing reservoirs of capital and empowers agencies, groups, and individuals to engage in collaboration over time (Raik 2002). With regard to co-management, people's capacity will increase through capacity building. Increased capacity contributes to capital raise and empowers people to engage in co-management activities.

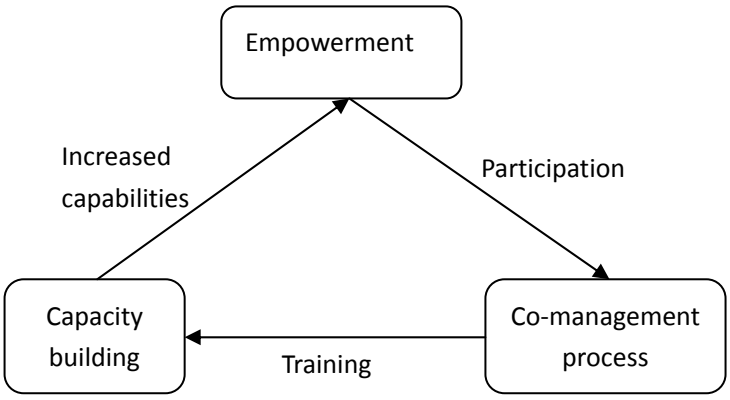


Fig. 3 Cycle of capacity building, empowerment, and participation

4 Results and findings

4.1 Background

In the mid-1980s, rubber was introduced in Xishuangbanna Prefecture, which has led to fundamental changes not only in land use, but also in social life. Introduction and diffusion of rubber is clearly dependent on the development of land tenure in NNNR (Table. 3). Rubber was initially planted on state-owned land in NNNR. In 1982, Household Responsibility System (HRS) was adopted in NNNR. According to HRS, farmers can decide what to plant in their land. Farmers started to plant rubber on their land after 1989.

Table. 3 History of tenure of land in NNNR

Time	Background	The tenure of land in NNNR
- 1956	Dai Autonomous Prefecture of Xishuangbanna	Landlords
1956-1958	Land Reform	Landlords dispossessed; land distributed to households from local government
1958-1982	People Commune Movement (Renmin Gongshe)	Community: co-operation of villagers, profit distribution by work quota.
1982-1999	First land contract (Household Responsibility System)	Villages distributed forest land, rotation land and paddy land to the households; contracts of 15 years
1999 -	Second Land contract (Household Responsibility System)	Land contracts adjusted to the population and land re-source change; contracts extended to 30 years.

Source: Adapted fromTang.et al 2009

Because of the high economic profit of rubber, many farmers in low altitude areas tend to harvest all other crops on their lands in order to plant rubber trees. The size of rubber plantations grew rapidly and by 2004, the total planting area covered nearly 12% in NNNR (Tang.et al 2009), which has directly led to two problems stated on the following part.

Ecologic problems and change of landscapes

Since 1980, rubber has become the main source of income for many farming households in NNNR. The economy of the community improved considerably. However, this rapid rural development is coupled with a series of ecologic problems (Tang et al 2010). An old man told

me the changes brought about by rubber trees:

> "We consider rubber trees as "water pumps", because they suck so much water. Since the introduction of rubber trees, here the number of foggy days has reduced sharply. This phenomenon directly reduces precipitation, especially in dry seasons, when we have to walk long distances to get water" (Ai, 2010).

Furthermore, because of high economic benefit of rubber plantation, many farmers tend to harvest rainforest to plant rubber plantations, which cause loss of tropical rain forest and tremendous decline in biodiversity.

Income gap and poverty

Since rubber trees cannot be cultivated on altitudes higher than 1000 m above sea level (a.s.l.), the innovation has resulted in a division of the region: whereas farmers on lower altitudes gained rapid economic growth through the tapping of natural latex, their counterparts on higher altitudes experienced a comparatively slow economic development (Wang 2010). In other words, larger income gap between the rich and the poor was brought since the introduction of the rubber in NNNR. Furthermore, because of bad condition of land, the forest resource dependency of farmers in high altitude areas is much stronger than the one in low altitude areas. Farmers in high altitude areas use more wild resources from the forest as their livelihoods. Some farmers there have never planted vegetable. They are used to collecting wildlife as their food. In 2000, in order to prohibit hunting wildlife, guns were confiscated in the whole Xishuangbanna Prefecture, which cut off hunters' sources directly. Furthermore, the nation's "Natural Forest Protective Project" started to prohibit logging in Xishuangbanna Prefecture (Yang et al 2009). Undoubtedly, those two policies have cut local farmers' livelihoods, which increase the contradictions between the local people and the staffers of NNNR Management Bureau.

4.2 Development of co-management

NNNR was set up in 1991, while rubber was first introduced in NNNR in 1988. Thus rubber problem struggled before the establishment of the nature reserve. Over time, more and more farmers planted rubber trees. More and more collective forests, which just can be used to

collect NTFP and graze (Table.1), were harvested. More and more state-owned forests were nibbled by local villagers in order to plant rubber trees. The income gap between low altitude areas and high altitude areas became larger and larger. There was more and more contradiction between local farmers and staff of NNNR. The contradiction was extremely big in 2000. In order to prohibit hunting wildlife, guns were confiscated in the whole Xishuangbanna Prefecture in that year. The Reserve bureau was responsible for confiscating guns in the nature reserve areas. Many villagers refused to give their guns; some of them even shot staff of the Reserve administration. In the same year, another big change was taken place. The nation's "Natural Forest Protective Project" started to prohibit logging in Xishuangbanna Prefecture. As managers of forests, the staffers of reserve bureau had to prohibit local people cutting trees. Undoubtedly local people's livelihoods were restricted again, which increased the contradictions between villagers and the staffers of the nature reserve. As a worker in the nature reserve said, "We were working amidst heavy fire"[3].

In order to handle the relations between the nature reserve and surrounding communities, a formal co-management department was set up by NNNR Administrative Bureau in 2000. 2000 was a watershed year in the management work of NNNR, specifically manifested in the following aspects:

4.2.1 Management content

Before 2000, the staff of NNNR just focused on forest conservation, now community development has been put on their agenda.

4.2.2 Managing authority and institution

Before 2000, the local governments over the 33 villages had the direct right and responsibility to support the development of economic activities, most of which were not related to natural resources protection. Meantime, the Reserve bureau was under the authority of another two departments—environmental protection agency and forest department to protect natural resources in the reserve and state-owned forests respectively. That's to say, the

[3] This comes from the conversation with the head of co-management department of NNNR Reserve Bureau.

activities of economic development and natural resource management were implemented separately.

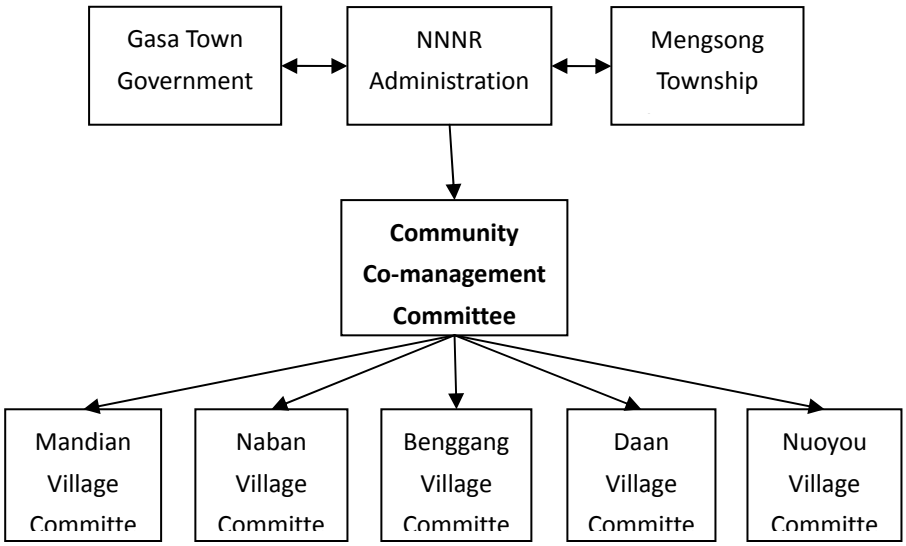


Fig. 4 Institution Building of Co-management
Source: Adapted from Yang et al 2009

In 2001, the local governments authorized the Reserve Bureau to implement support to the economic activities of the community . The formal co-management department, as well as co-management committees in different administrative levels was set up consequently (Fig. 4). As a part of NNNR Administrative Bureau, the co-management department needs to negotiate with the local governments on how to establish community co-management committee and how to apply co-management. In turn, there are five co-management sub-committees established in village level in order to negotiate with the co-management department of the Nature Bureau. The content of the negotiation usually comprises natural resources protection by the community, farmers' production and living conditions, community economic development. Since then conservation and development has been linked.

4.2.3 Rights and duties involved in co-management arrangement

Co-management is the sharing of responsibilities, rights and duties between the primary

stakeholders, in particular, local communities and the nation state; a decentralized approach to decision making that involves the local users in the decision making process as equals with the nation-state (WB cited in Carlsson & Berkes 2004). According to this definition, duties and rights are emphasized in context of co-management and shall be outlined clearly to ensure the conduct of co-management arrangement. In NNNR, local traditional village rules and customs have been making a very important function to development of the villages. After the establishment of community co-management, some of those protection regulations were put on the duties with villagers' permission. The rights involved in co-management arrangement were outlined as well.

For villagers and other stakeholders, duties and regulations[4] involved in co-management arrangement include:

- The duty to protect wildlife and birds. Hunting is prohibited.
- The duty to prevent forest fires and immediately organize fire fighting in case of fire accident.
- The duty to build economic forests and firewood forests.
- The duty to stop illegal use of forests and report this illegal action to village committee for decision.
- The duty to take part in activities of co-management actively and present opinions without any reservation.
- Deforestation is prohibited.
- No entry to state-owned forests to collect NTFP without the approval of the Reserve Bureau.
- Grazing must be done within assigned area.
- In case of wildlife damage to crops and economic forests, drive wildlife rather than injure or kill them.
- Repay the loan provided by community protection and development fund in accordance with the provisions of the contract.

For villagers and other stakeholders, rights involved in co-management arrangement include:

[4] The following duties and regulations come from Yang et al 2009

- The members of village co-management committee have rights to vote and to stand for election.
- The right to use community protection and development fund to develop household production and operation.
- The right to collect NTFP and graze in case of approval.
- The right to take part in the meetings, training course and communication activities organized by community co-management committee.
- The right to attain benefit from protection and development programme.
- The right to information and to supervise village's activities of co-management, especially on the use of community protection and development fund.

4.2.4 Relation of villagers and workers

Before 2000， the relation of villagers and workers of NNNR administrative bureau was bad. After establishment of community co-management, more and more attention has been paid to community development. Villagers started to accept the management work of NNNR. Furthermore, before community co-management, all the staffers of NNNR administrative bureau were outsiders. After establishment of community co-management, NNNR Reserve Bureau hired some local people, who work as managers or as forest guards being hired by the nature bureau. Local people started to get involved in forest management arrangement.

4.3 Livelihoods change in NNNR

4.3.1 A case from Xiao Nuo You Shang Zhai

Socio-economic background of Xiao Nuo You Shang Zhai

Xiao Nuo You Shang Zhai is located at the altitude of 1536 meters. It is in the north of NNNR. It has 33 households and 147 Lahu minority and a few Mountain Han[5] persons (Wehner 2010).

[5] "Mountain Han" is not minority. It also belongs to Han Chinese. But "Mountain Han" like many minorities live in mountainous and isolated areas because of historical reasons (Baidu 2011).

- Social relations

Xiao Nuo You Shang Zhai has a mixed population of Lahu and "Mountain Han". But the proportion of "Mountain Han" in the village is low. Most of them are assimilated by Lahu. In Xiao Nuo You Shang Zhai, Male:Female ratio is 1.18. Women play a significant part in agricultural activities and environmental protection. Women are the ones mainly responsible for collecting NTFP and raising livestock and courtyard crop. However, sex discrimination still exists in the village. Girls' education level is lower than boys'. Girls' drop-out is common in the village.

- Livelihood context

Xiao Nuo You Shang Zhai is in a remote area and in bad natural conditions; there was a non commercial natural economy before 2001. Farming conditions were bad in the village; more than 85% of farmers' arable is sloping land for corn, and they had a few land for upland paddy. People mainly depended on corn, upland paddy, livestock and Non Timber Forest Product(NTFP). All of those livelihoods were just enough for own consumption. People had few or even no cash income. Many farmers had the tradition of hunting, some of which even hunt for a living. Furthermore, farmers liked to collect wildlife plants as their vegetable, which was never planted for food before. In a word, farmers of Xiao Nuo You Shang Zhai had traditionally strong linkages with the forest, especially in providing NTFP (Tang.et al 2009). However, with the increase of population, the supply of NTFP and wildlife from collective forests was not enough. To make a living, farmers had to aim at state-owned forests to collect NTFP and hunt. The number of wildlife had dramatically declined in such circumstances. However, in order to prohibit hunting wildlife, guns were confiscated in the whole Xishuangbanna Prefecture in 2000, which had directly restricted local villagers' livelihood.

Livelihoods change brought about by co-management arrangement

In order to relieve the contradiction between economic development and nature conservation, NNNR Nature Bureau mainly runs capacity building projects and implements support to the substitute economic activities.

Although land and forests products are restricted to be used, the other types of livelihood

capital are increased during the process of co-management (see Table 4). Since 2009, NNNR started to implement women capacity building in Xiao Nuo You Shang Zhai. Women's capacity on managing forests, dendrobiums plantation and family financing were trained during this activity. Capacity building not only makes local women nurture, enhance and utilize cultivation skills to diversify livelihoods, but also in turn empowers them to participate in co-management activities. People's sense and knowledge are increased when engaging in the activities of capacity building, which in turn makes them have more courage to speak actively during collaboration process. For example, in NNNR, villagers made the cycle time of NTFP collection. They also have the decision-making right on technical extension projects and introduction of exotic forest trees planted in the forest of NNNR.

Substitute economic activities are implemented to reduce local people's reliance on natural resources (Salafsky & Wollenberg 2000). Intercropping technology was introduced by NNNR in 2001. Farmers were encouraged to intercrop tea with other trees or plants such as walnut, corn or bamboo in order to diversify their agriculture production system (Tang.et al 2009). People got their first cash income from tea in 2006. Till 2008, all 33 households depended on tea and some surplus corn as cash crops, with an average income of 2460 Yuan per person in 2007 (Wehner 2009). In addition, eco-pigsty was built in the village. Farmers get better knowledge of livestock keeping. Recently two years, hemp and dendrobium plantation was introduced in the villages, from which some villagers have got benefits. The introduction of substitute economic activities not only increases the income of local famers, but also diversifies farmers' sources of meat and vegetables, which reduce their reliance on wildlife.

Villagers' response to co-management

Under this kind of cooperation management, villagers have developed a stewardship relation to both collective forests and state-owned forests and manage them, in cooperation with the Reserve Bureau very well in Xiao Nuo You Shang Zhai, With the seedling provided by NNNR Reserve Bureau, areas around the village have been reforested by the villagers themselves over the last 20 years (Wehner 2009). Furthermore, some villagers are contracted to patrol state-owned forests around the village. Although the contracted forests are state-owned, activity of collecting NTFP is allowed in the contracted forests. The cooperation between the NNNR administration and the village community works rather well, with a high

acceptance of the NNNR staff and the regulations. This cooperation is based on good personal relations between villagers and staffers and also on financial support, for example in village infrastructure projects (biogas, road improvement) by the Reserve administration (Wehner 2009).

Table. 4 Capital change enabled by co-management in the villages

Village / Capital	Xiao Nuo You Shang Zhai	Pabin
Natural capital	Land and forest product were limited to be used	Land and forest product were limited to be used
Physical capital	Bio-gas pools, gas stove and Eco-pigsty building	Bio-gas pools
Human capital	Training of cultivated technology in dendrobium, tea, walnut, hemp	Training of cultivated technology in dendrobium, tea
Financial capital	Small loans were provided by Asian Development Bank (ADB) to help farmers start business.	Financial support for courtyard building.
Social capital	The degree of participation in co-management activities was increased. Local people's social networks became wider and wider.	The degree of participation in co-management activities was increased, but lower than Xiao Nuo You Shang Zhai.

Source: own compilation according to Tang.et al 2009, Wehner 2010, telephone interview

4.3.2 A case from *Pabin*

Pabin consists of 38 households and about 149 people from the Hani ethnic group. It is located in the buffer zone at an elevation of 770 meters (Wehner 2010).

Socio-economic background of Pabin

- Social relations

Pabin is ethnically homogonous. Male: Female ratio in Pabin village is larger than the one in Xiao Nuo You Shang Zhai, it is up to 1.5. This is due to sex discrimination. Generally speaking, each family has at least one boy, but it may not have a girl.

- Livelihoods context

Agricultural activity in Pabin are focused on rice and rubber cultivation, hence the village economy is mono-structured, depending on rubber as their only cash crop (Wehner 2009). Only part of the rice for subsistence is produced by the villagers themselves. Since they receive high income from rubber, villagers prefer to avoid strenuous labor and to buy rice instead, leaving the paddy fields to lie fallow for one season, despite the potential of a second harvest. Pabin is now one of the richest villages in the area (average cash income per person in 2007: 5500 Yuan). Even though Pabin is now one of the richest villages in the area, people still collect and sell NTFPs to complement their daily diet and also for sale (Wehner 2009). Only two decades ago, native forests and wildlife were abundant in the village area. Today, very little of this collective forest remains--most of it has been turned into rubber plantations (Wehner 2009). Since the forest resources of Pabin are very limited, they use the nearby state forest, which is officially not allowed.

Livelihoods change brought about by co-management arrangement

Some co-management activities similar to XiaoNuoYouShangZhai are implemented in Pabin. Intercropping technology was also introduced in Pabin (see Table 4). The difference is that farmers were encouraged to intercrop rubber with tea and other cash crop. However, most farmers haven't adopted this technology because of the uncertainty of new technology. Farmers think they may get less economic benefits from other cash crop compared with rubber. In other words, they don't want to take a risk in the situation of stability of rubber price. On the contrary, farmers show a great enthusiasm to courtyard economy, such as dendrobium plantation. Likely, capacity building was implemented in Pabin, where villagers' livelihood capital (see Table 4) was also increased.

Villagers' response to co-management

There remain many conflicts between the Reserve Bureau and local villagers, especially referring to the boundary between village collective forests and state-owned forests. Although some villagers in Pabin are contracted to patrol state-owned forests around the village, it is

hard to prevent other villagers using those forests. This is not because of but in spite of the serious disagreement on the boundary between collective forest and state-owned forest. Before the introduction of the Nature Reserve, people used those forests. Even after more than a decade, people still consider it is their forest which they are entitled to use. All in all, the new regulations about forest management have so far not been widely accepted (Wehner 2009).

Based on the analysis of the villages, two differences between the villages are concluded as follows:

First, the activities of co-management are different. There are more co-management activities in XiaoNuoYouShangZhai, which is poorer than the other one. The projects of co-management tend to develop economy in XiaoNuoYouShangZhai, while those projects have less attraction for villagers in Pabin, since they don't want to take a risk in the situation of stability of rubber price.

Second, villagers' response to co-management is different. Villagers in showed more ethusiasm to co-management. It's probably because they got more benifits from co-management. Or because they are poorer, so they have more pressing needs to get help from co-management.

However, according to the elements of community. Peopele in a community should share some level of caring for the resources in question, and motivation of developing institutions. Obiviously, by comparision, villagers' atitudes to those items are different, which contradicts with the definition of community. It's hard to measure how different they are. But we can imagine the difficult of implementation of co-management in villagers with different contexts.

4.3.3 Co-management not appliable to state-owned forest

In NNNR, villagers have no rights to use state-owned land (state-owned forest) unless they contact with the Reserve Bureau to patrol the forest. The staffers of NNNR Reserve Bureau insist that contracted management of state-owned forest is co-management; they think forest protection and increasing of villagers' income (from the pay of forest patrol) are ongoing at

the same time to achieve a "win-win" effect. In other words, they think villagers not only take responsibility for forest protection, but also have right to develop their economy through the pay of forest patrol. This is their reason for considering contracted management of state-forest as co-management. Actually, this phenomenon doesn't exist only in NNNR. Many nature reserves that implement co-management also consider it as co-management, for example the nature reserves in Anhui province (Pan et al 2011) and Yunnan province.

However, I don't think contracted management of state-owned forest is co-management. According to the definition provided by The World Bank, stakeholder should share rights, not just responsibility. In particular, the rights of decision making should be involved in the process of co-management arrangement. The definitions provided both by The World Bank and Singleton emphasize decentralized decision making in context of co-management arrangement. While according to my survey, local villagers in NNNR haven't been involved in the decision making process on the management of state-owned forest. Thus, it's not co-management. This is the reason why I didn't consider the pay from contracted management as livelihood diversification enabled by co-management.

5 Discussions

5.1 The reason of livelihoods change

According to Ellis (2000), livelihood diversification reflects factors of pressure, as well as opportunity that cause families to adopt increasingly intricate and diverse livelihood strategies.

The political climate

In many protected areas, the pressure on livelihoods from policy is mainly in terms of the change of ownership and use right of natural resources, which people depend on for their livelihoods. The creation of protected areas excludes livelihood activities. That's to say; linkage between conservation and livelihood is broken. Local people's use of these natural resources to meet their livelihoods was limited, if allowed at all (Salafsky & Wollenberg 2000). In NNNR, local people's access to forests products was restricted directly since the creation of nature reserve. Although local people in NNNR don't need to move out of the

protected area, relocations are forced in many other Chinese protected areas (Yang et al 2009).

However, pressure and opportunity are often coexisting. Policies can also bring opportunity for livelihood diversification. Livelihood and conservation are indirectly linked around protected areas. Over the past few decades, conservationists (primarily in developing countries) began working with local communities to make economic development feasible around protected areas (Salafsky & Wollenberg 2000). The political climate also became more supportive of the resource rights of local people and the need for providing economic development to them ((Wells & Brandon 1992 cited in Salafsky & Wollenberg 2000). In a biosphere reserve, people are entitled to use biological resources according to designed spatial zones. In NNNR, alternative livelihoods, such as hemp and dendrobium are introduced in high altitude areas. Rubber trees were introduced in low altitude areas.

Poverty and income distribution

In poor countries, a highly unequal income distribution is often accompanied by a high incidence of poverty, and a challenge to rural poverty policies is to find means of reaching the rural poor that do not inadvertently merely add to the incomes and wealth of the rural rich(Ellis 2000). In the case of NNNR, poverty, as well as the income gap between high altitude area and low altitude area is one of the main reasons for finding alternative livelihoods, especially in poor high altitude area, where Poverty forces people to find alternatives. Livelihood diversification is often a strategy that enables the poor to survive in the absence of ownership of assets like land livestock, the form of this diversification is typically in low-paid, casual, and unskilled types of employment (Ellis 2000), such as patrolling forests in NNNR.

Environmental degradation

Poverty and environmental degradation were intimately connected; poverty was seen as both a cause and an effect of natural resource depletion (Leonard 1989 cited in Ellis 2000). Those who are poor and hungry will often destroy their immediate environment in order to survive. Adversely, environmental degradation further intensifies the degree of poverty experienced by marginal groups, and drives them to ever more intensive exploitation of the resources that are accessible to them (Ellis 2000). Before the creation of NNNR, local people were always

hunting, logging, collecting in the forest without limitation. Forest products were an important part of their livelihood. Some of poor people are still using the forest resources illegally even if the forest is under the supervision of NNNR. Therefore, the damage to local environments cannot be effectively halted unless poverty itself is address. Alternative livelihoods can be seen as a potential solution to the poverty-environment trap. The critical factor is to provide the poor with alternative sources of livelihood that reduce their reliance on gathering activities in the local environment, and diminish their motivation to initiate cultivation in environmentally sensitive locations (Ellis 2000).

5.2 The role of Co-management in enabling livelihoods change

Co-management can have a lot of roles in enabling livelihoods change. Co-management combines policy reforms, new institutions for local resource tenure and management, secure and equitable access to resources, and technological innovation to increase productivity (Tyler 2006). Through those spectrums, livelihoods are changed directly or indirectly. To be specific, co-management has two roles in enabling livelihood change. One is providing a livelihood opportunity for local people; the other is building capacity to enable local people to empower themselves.

5.2.1 Introduction of alternative livelihoods

In the case of NNNR, co-management was introduced to link conservation and livelihood through providing alternative livelihoods for local farmers, which can be considered as an indirect linkage between conservation and livelihood. The key feature of the strategies is to create a spatial compromise that enables local people to continue to meet their livelihood needs while still protecting key species and habitat. In particular, the theory is to decrease reliance on the natural biodiversity by substituting other livelihood activities (Salafsky & Wollenberg 2000). Taking the village Xiao Nuo You Shang Zhai as an example, local farmers are assisted to grow teas, dentrodiums and hemps to keep them from livelihood activities that damage the local natural resources. According to (Salafsky & Wollenberg (2000), there is a big problem to implement this approach. People may just focus on economic incentives, with

little consideration of the environment conservation. As a matter of fact, Xiao Nuo You Shang Zhai has been avoiding this problem successfully through building the responsibility of preserving forests and rights of using forests, such as collecting NTFP and grazing (described under 4.2.3), as well as trust with staff from NNNR. Farmers and staff of the Reserve are building good relationships during the process of economic activities, thus it's easy for them to build trust. As long as the contacts are made, it is possible to avoid this problem.

However, the process of introducing and adopting agriculture innovations is dependent on various environmental parameters (biological and physical) and those of the social, cultural and economic spheres (Rogers, 2003 cited in Leshem.et al 2010). In the case of NNNR, the altitude in which a farmer can or cannot grow rubber is a precondition to the discussion on economic and ecological goals in the NNNR. This is a primarily environmental factor, which determines whether the farmers consider adopting alternative livelihoods or not (Leshem & Aenis 2010). For farmers in Xiao Nuo You Shang Zhai (high altitude), livelihoods uncertainty has existed because of the natural conditions. Alternative livelihoods in that respect may be a good solution for economic risk reduction, shortage of cultivated land and natural resources protection. However, in the case of Pabin, livelihoods are comparatively securer because of the stability of rubber price. Farmers can get better economic benefits from the existing livelihood, namely rubber. Therefore, compared with the high economy- benefit rubber trees, farmers don't want to take a risk on uncertainty alternative livelihoods. However, the rubber price is stable temporarily; no one can assure that the rubber price will be stable in the long term. More importantly, rubber trees can make soil erosion, which makes farmers' livelihood unsustainable in the long term. It is also necessary to exploringly introduce alternative livelihoods in context of mono-structured economy and unsustainable livelihood in Pabin.

5.2.2 Evolving direct linkage from no linkage

No linkage means protected areas are created and livelihood activities are excluded to protect natural resources (Salafsky & Wollenberg 2000). In china, most nature reserves are managed in an enclosure way, which local people should move out of the areas (Yang et al 2009).

There is no linkage between conservation and livelihood. In other words, this management cannot be considered as co-management. For co-management refers to sharing of responsibilities, right, and duties. However, no linkage may evolve to direct linkage, and thus co-management. In NNNR, local people haven't been forced to move out from the nature reserve. They have the rights to use natural resources of collective forest. From this point of view, livelihood activities depend on and directly linked to biodiversity. In this occasion, local villagers are given opportunities to benefit directly from the biodiversity and thus presumably have an incentive to stop external threats to the biodiversity (Salafsky & Wollenberg 2000). Given opportunity, knowledge, and secure access to resources, people will choose to invest in common efforts to conserve those assets and sustain their livelihoods (Tyler 2006).

5.2.3 Capacity building

Co-management can play an important role in enabling livelihoods change through the activities of capacity building, which are often implemented in context of co-management. According to its content in NNNR: choosing and training women as assistants of forest management, publicizing cultivated technology in Dendrobium, silo building and training of women's family financing, capacity building presents three categories, which is accordance with the categories provided by Raik (2002):

a. Institutional capacity building

   It refers to an organization or a set of organizations (Raik 2002). With the regard of the activity of training women as assistants of forest management in NNNR, NNNR Reserve Bureau, cooperate with other organizations, such as village co-management committee, local government to form a forest management structure and environmental protection institution.

b. Community capacity building

   Community capacity building refers to informal groups bounded geographically (Raik 2002). Each community shares many norms, goals and common purpose (Ostrom 1998 cited in McCay 2002), which may be increased through publicity or

participatory action. For example, people' sense of environmental protection over a community may increase through the participation in forest management. Public awareness to achieve integrity of sustainable use of community resources can be built.

c. Individual capacity building

Individual capacity building mainly focuses on increasing people's leadership skills, analytical skills/problem identification, and technical knowledge and skills/information (Raik 2002). This can be reflected on the capacity building in NNNR, where people's cultivated technology was trained, women leadership of forest management were chosen and trained.

These capacities, after being gained by the institution, community, or individual, may remain dormant unless there is some impetus to action, or empowerment (Rappaport 1987 cited in Raik 2002). That is, capacities of individuals, groups, or organizations may go unrecognized, unvalued, or unexercised. This phenomenon really exists in NNNR. Take Xiao Nuo You Shang Zhai for example, the biogas tanks which were built by NNNR Reserve Bureau, have become villagers' storages now. Villagers think biogas technology is too complicated and difficult to master, so they gave it up. Furthermore, the biogas tanks have almost become one of the most beautiful and durable facilities in the village ; Villagers think they would be waste if they didn't use them. In a word, villagers are not empowered to do what they need to do. Thus, empowerment plays a central role in community-based co-management. Through a process of empowerment, these capacities may contribute to sustained and meaningful action or participation (Rappaport 1981 cited in Raik 2002).

In NNNR, there are both failure and success. Like the cycle shown under 3.4, capacity building, empowerment, and participation are integral to some co-management activities and play out repeatedly. Co-management enables to capacity building through training and fund raising. Some villagers' capacities and income are increased when engaging in the activities of capacity building. A farmer told me her experience on co-management:

Last year I borrowed 7000RMB from ADB[6] to keep sheep. The number of sheep has

[6] In 2009, ADB provided 50,000 RMB for villagers' loans, which were used to develop cultivation and help

> increased from 30 to 70 after a year, now I can not only repay the loan, but also earn a good income (Li 2010).

Another woman in Xiao Nuo You Shang Zhai told me about how she was involved in co-management:

> Last year I attended the training on how to plant Dendrobiums. Now as you see, I have planted Dendrobiums in my courtyard. Dendrobiums are easy to live and they don't occupy much land. They can be planted surrounding houses. The staffers of NNNR will supervise and trace the planting process every two weeks. I don't know how much I can earn from the dendrobiums, but one thing I am sure of is that I can benefit from them since the dendrobiums grow well and the market price is good. If so, I will continue to plant it next year, and I think I can do it myself without help from the staffers of NNNR then (Wang 2010).

In Xiao Nuo You Shang Zhai, there still exists sex discrimination, which inevitably makes women had a lower status than men. While I think the woman planting dendrobiums is empowered to some extent. I can feel her confidence through talking with her. I think this confidence comes from the new skill she learned and her positive expectation for the future. As a matter of fact, the increase of capacities makes people feel more confidence and have more desire to take action to control over their own destiny and influence decisions. In turn, empowerment leads to continued and genuine participation in the co-management process (Raik 2002). For example, villagers in NNNR not only participate in some co-management activities, but also influence the decision on how to collect NTFPS. This decision is not just made without any basis, but with local people's indigenous knowledge and cultural capital. From this point of view, co-management enables local people to use their cultural capital to create new spaces for negotiation and problem-solving that supports sustainable livelihoods and conservation.

Generally speaking, the process of livelihoods change in the context of co-management in NNNR can be shown on figure.5.The first step of the process of livelihoods change in the

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farmers start business.

context of capacity building is implementing activities of training and fund raising to increase individual, community, and institutional capability. People's livelihood capitals are drawn on and converted when engaging in the activities of capacity building. Once their capitals change, people tend to change their livelihoods activities and thus livelihoods outcomes (Fig. 5).

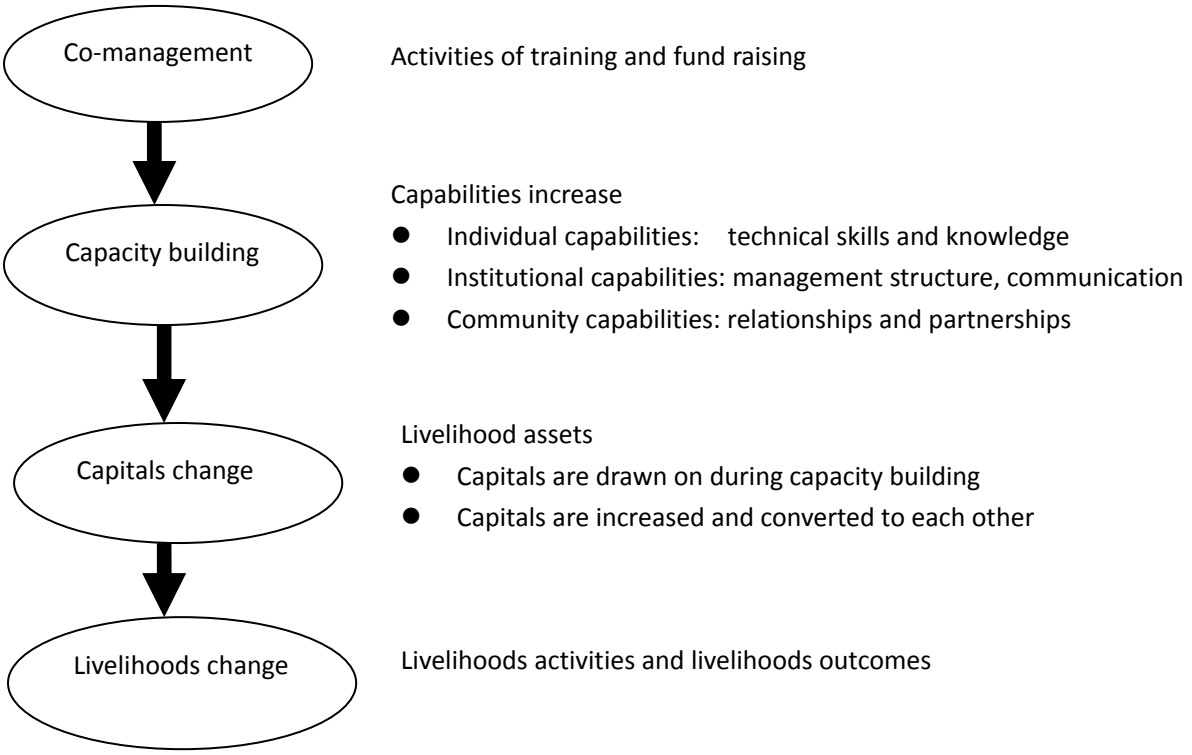

Fig. 5 Process of livelihoods change in the context of co-management

Source: own compilation according to informal consultation and mail interview

Like many other China's natural reserves, NNNR adopted supporting community livelihood to establish mutual trust relationships and negotiation. However it is hard to strike a balance between conservation and development. As the head of co-management department in NNNR told me:

> Many villagers consider co-management as a simple work of poverty relief. Once we can't meet their economic needs, their enthusiasm to participate in co-management reduces sharply. Now we are in a dilemma, since many NGOs stopped providing money, which means villagers will get less direct economic benefit and some existing projects will stop. I don't know if co-management is the best choice. I just know now that we've just begun, we must do our best. But nobody can guarantee how long

co-management will last (Wang 2010).

6 Conclusions

Based on the analysis of co-management in NNNR, co-management plays an important role in alleviating the contradiction between environmental protection and community economic development. Especially through capacity building, villagers' livelihood capital was raised. The increase of capacities makes people, especially for women feel more confident and have more desire to take action to control over their own destiny and influence decisions on how to protect environment and use natural resources, like how to design a cycle of NTFP collection in NNNR. But after all, co-management is still in the exploring stage. It is hard to produce an immediate effect on economic development, which may make villagers feel dubious on some new projects of co-management and thus quit their participation in the project. Thus it's a big challenge to sustain co-management.

Co-management should achieve the goal of power sharing, right and responsibility sharing. Before suggesting co-management as a general strategy for handling problems, one must ask if co-management activities are involving power sharing. In the case of NNNR, although the duties and rights of co-management are listed clearly, it's not hard to find that the duties are not equal to the rights. Villagers can't injure or kill wildlife in case of wildlife damage to crops and economic forests as described under 4.2.3. However, there is no corresponding right of compensation for the damage resulted from wildlife disturbance. From this example, I conclude that villagers' right is not fully secure. Notwithstanding villagers have been involved in decision making process of co-management, how many villagers have played a role in decision-making, how many rights they have enjoyed. Since the limitation of literature review and telephone interview, it's hard to answer those questions in this paper. I hope I will make a further research on power sharing and right of decision making involved in co-management arrangement.

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