

COMMUNITY-BASED CO-MANAGEMENT MECHANISM OF FOREST RESOURCES: A CASE STUDY OF BAISHUIJIANG NATIONAL NATURAL RESERVE, CHINA

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Abstract: Research on community-based co-management mechanism of forest resources is essentially an academic research proposition of mechanism design on common property resource. Although a group of community-based co-management (CBCM) mechanisms in forest resources has been constructed in Chinese Natural Reserves at the very beginning step, but there is a blind area in its mechanism operation evaluation in local level. This research mainly focuses on the evaluation of the current China's CBCM mechanism and its program implementation effect, especially through the case study of Baishuijiang National Natural Reserve (BNNR), from three evaluation perspectives: the operation efficiency, equality and sustainability. The survey data has approved that, generally speaking, local CBCM mechanisms have provide a good wide-participation platform for local villagers, relative administration managers, NGOs and other stakeholders. And it also has ensured and facilitated the execution of a series of CBCM projects which has help to greatly decline the forest resource dependency, improve the household income level and encourage local people to join forest resource protection work. Meanwhile gaps are identified to exist in institution-building, which noticeably appear to the inequity of responsibility and right for CBCM committee members, unscientific resource distribution, insufficient program-design and management experiences, and the defective information and capital sources. Based on these gaps, relative recommendations are provided for improvement of CBCM mechanism in CNNR.

Keywords: Community-based Co-management Mechanism Evaluation

1. Introduction

Community-based co-management (CBCM) initially gained attention during the early 1970s when many countries became disenchanted with the results of large-scale, capital-intensive, and centrally planned conservation and development projects for

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natural resource management (**Stephen et al., 2000; Enters et al., 2000; Horowitz and Painter 1986**). A large number of implemented cases have cited that the government centralized approaches are more easily to achieve dismal outcomes after decades of intrusive systems of sanctions and top-down decrees (**Scheberle, 2000**). These centrally planned natural resource management systems had a high frequency of faulty designs, inefficiencies, and even corruption (**Jusoff and Majid, 1995; Agrawal and Gibson, 1999; Kull, 2002**). While, on the contrary side of government centralized management, indigenous community governance or self-management were sometimes viewed as the major hindrance to successful outcomes rather than a necessary part of any sustainable solution. However, as an integration of indigenous and centralized government system, CBCM initiatives have a core value of the partnership arrangement in which the community of local resource users, government, other stakeholders (such as business people, etc.) and external agents (non-governmental organizations (NGOs), academic and research institutions) share the responsibility and authority for the management of the forest, which is efficiently avoid the problems that are brought by the former two systems. The emergence of CBCM has satisfied the requirement of participatory democracy and of building networks and linkages among different constituency groups, interdisciplinary groups, levels of governments, and economic sectors (**Stephen, 2006; James, 2008**). As a negotiated management system, how to build up an efficient communication platform, and how to ensure multi-party members' right and to fulfill their obligation are the most important issues for CBCM mechanism designers.

In order to spread CBCM system for widely using, recently, more and more researchers are focusing on institution of CBCM itself. They are challenging the issue by designing or improving recent natural resource management rules or regulations to affect people's behaviors, finally to balance the two requirements: environmental protection and livelihood improvement (**Raju, 1997; Mehta and Kellert, 1998; Tubtim and Hirsch, 2005**). **Ostrom(1990,1992)** have cited eight design principles illustrated by long-enduring common poor resource institutions, which has been repeatedly approved to be workable in United State, Bangladesh, India, Mali, Nepal, Norway and so on. **Agarwal (2002)** synthesized that the institutional arrangement is one of the critical enabling conditions for sustainability on commons. Supporters of mechanism design theory have summarized two principles of mechanism evaluation: information efficiency and incentive compatibility (**Tian, 2003**). Because different mechanisms can lead to diverse information cost, incentives and allocation results, in order to evaluate CBCM in a comprehensive way, both information efficiency and incentive compatibility can be taken as a series of foundational evaluation criteria to judge a mechanism to be good or bad. **Qian (1999)** denoted that the mechanism research should start from both incentive mechanism and restriction mechanism, which has basic function in efficient resource allocation.

CBCM is most often found in developing countries due to their need for overall community and economic development and social empowerment, in addition to

resource management (**Robert and Rebecca, 2006**). In China, the import of CBCM are accompanied by the implementation of a series of funded projects which are supported by Global Environment Facility (GEF), World Wide Fund (WWF), World Bank (WB) and other international organizations with the main goals of China's biodiversity conservation, socio-economic development of nature reserves and their surrounding communities, and sustainable use of nature resources (**Yang J., Yan J. and Wang L., 2008**). As the implementation of these co-management projects, a large number of local CBCM organizations have been established under the support of local governments or relative administration departments. Most of the administrative jurisdictions of these co-management organizations are within the relevant administration departments. As a foreign management model, community-based co-management approach has emphasized on the management notions of "empowerment" and "down-to-top" and the relative operation process and mechanism. It has aroused an impact and challenge to Chinese traditional management notions of "centralization" and "top-to-down", which has dominated for a long history. Moreover, it is a crash between east and west culture (**Yang, et al., 2008**). Therefore, how to integrate foreign management concepts into Chinese natural resource management system and how to ensure the mechanism efficiently work are big challenges for natural resource managers.

2. Materials and Methods

2.1 Study Area

Our study region was located in Baishuijiang National Nature Reserve (BNNR), Wenxian County, south of Gansu Province (See Fig.1). BNNR established in 1978 and is mainly used for the protection of giant pandas, other rare wildlife and their ecosystem. The whole preservation zone is covering an area of 223,671 hectares with more than 100,000 people living in. The topography is characterized by steep slopes from northwest to southeast. The mean annual temperature of the study area is 14.9℃, with about 260 frost-free days in a whole year (**Wei and Zhang, 2006**). In the reserve, there are 2,160 species of higher plants and 67 rare, precious and endangered species of plants. What is more, there are totally 265 species of terrestrial vertebrate, 180 species of birds and over 2,000 species of reptiles (**Zhang and Wu, 1997**). Its ecological value is unmeasurable.

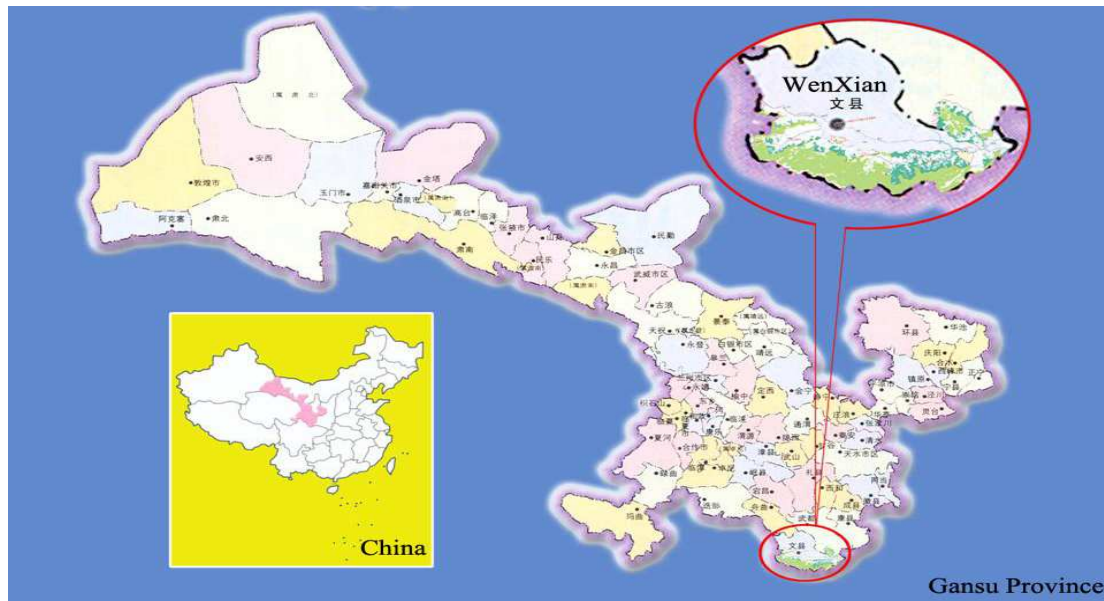


Fig.1 Location of BNNR

The whole reserve is under the management of Baishuijiang National Natural Reserve Management Bureau (BNNRMB), which consists of seven protection stations, they are Baimahe, Danbaohe, Liujiaping, Rangshuihe, Bikou, Hongtuhe, and Minbaogou Protection Stations. For management purposes, the whole reserve is divided into 3 subareas-- testing area (100,310 ha.), buffer area (26,032 ha.) and core area (97,329 ha.) (**Fig.2**). Most of local people live in testing area, less in buffer area. Since 1978, farming, grazing, and logging have been excluded from core area. Productive and commercial activities in buffer areas are also prohibited. Only in testing area, limited agriculture and subsistence hunting is permitted. BNNR comprises 159 villages in all. The natural population growth rate is between 5.85‰ and 6.08‰, and the annual per capita income is 1131 RMB, less than 200 USD (**Wei, Zhang, 2006**). Due to the restriction of region condition and the bad traffic circumstances, the livelihood of local people greatly depends on the local natural resources. Fuel-wood is the main source of household energy source. The annual fuel-wood consumption per household is about 15,000 Kg before 2002. The main sources of household income are crop planting, livestock breeding and potherb or herb collection. Such traditional life style leads high dependency of local natural resources, which gives a huge threat and pressure to the forest resources, and a negative impact on biodiversity conservation work. “A dilemma appears: how to protect forests and their biodiversity and at the same time ensure the local people’s livelihood” (**Minna 2006**). Instead of forbidding forest resource using, a group of CBCM projects which is aimed at livelihood diversity and resource using substitution have been implemented. Such as substitution of firewood-saving cooking stoves, application of marsh gas pool, planting diverse species of trees or crops, different agro-technical trainings and so on. The CBCM approach as a recognized instrument of natural resources management has introduced to CNNR for application and improvement. Accompany with these widespread projects, local CBCM organizations are set up one after the other, and more and more local villages

participate in these CBCM programs. The speculate conflict between forest resource manager and local villagers has been mitigated, at the same time, some of the villagers even actively enjoy the protector teams.



Fig.2 Distribution of divisional administration and subareas of BSNNR

Although all CBCM projects are under the management of BNNR Management Bureau, the condition of four CBCM committees and the process of CBCM projects are different from each other.

Caoheba Community a typical village of mixed Han and Tibetan. There are totally 135 households with 610 people, including Han 396 and Tibetan 214. Caoheba CBCM Committee was set up in 2003 accompanying with the livestock breeding project supported by World Wildlife Fund (WWF). The CBCM committer members of Caoheba were made up of Caoheba village committee members. Since the election process is not transparent, democratic, and over-centralized of power distribution for village leaders, the villagers are unpleased with such arrangement. Under the help of WWF, the livestock breeding project has joined 5 households to be project partners with 3 eves for support. When the eves gave birth to young, they would be raised by another project partner. So more and more beneficiaries got support through this project. Meanwhile, the project has also supported 10 households to have Tianma technique training. Until April 2006, the number of sheep has climbed up to 62 which were worth 2,325 USD, and the average household income was increased 465 USD from the project.

Yanggashan Community is also a multinational community by Han and Tibetan residents. There are 5 Tibetan households with 27 people, and other 37 households are all Han villagers. Villagers were in low level of education, and very few people worked outside the community. Yanggashan CBCM Committee was set up in March 2006 with the implementation of CBCM project, which was “Protection of Giant Panda Habitat”

supported by Foundation of Oxfam Hong Kong. Such local organization is also under the management of BNNR Management Bureau. It comprises 5 committee members, 1 village leader, 1 village accountant, 1 cashier, 1 men representative and 1 women representative. All these 5 villager members should be selected on community meeting by secret ballot election. The project was divided into three steps. The first step was to build energy-saving stoves. By the end of August 2006, 36 households have completed the substitution work, another five households have not enjoyed the project because they worked outside in that period, and only one household can not participate in this activity due to their fund shortage. After stove-transformation, the firewood using amount of each household has reduced 50% -60%. Supposed that each household consumed 20,000 kg firewood using amount each year, this project could save at least 360,000 kg firewood, which could greatly reduce the dependence of local villagers on forest resources. The second step of the project was to build a bridge for local community residents. The third step of the project was to take use of Community Development Fund and to keep the fund in rolling using. This fund was managed by the project participator themselves. Through negotiation between project leader and local villagers, they eventually have signed the "Agreement of CBCM Project by Hong Kong Oxfam". In terms of this agreement, 20,000 CHY of project fund was distributed to project applicants. The loan time is one year. The interest should be return every three months, and the month rate is 3%. Debt service should be done. Partners can use the fund for investment or livelihood improvement. By April 2007, all project funds have been paid back. And then the fund has been distributed for the second time. By far, there are 20 households obtain benefits from this project and it operated well in this community.

Diebuzhai Community is a Tibetan village. The population is 120 with 32 Tibetan households and 2 Han households. The traditional Tibetan culture and customs have been perfectly preserved. They have their own language and unique dress, music, dances and festivals, and possess many traditional beliefs, such as "hill cultural", "worship trees", "white mascot", etc. (Qiu, 2009). Besides there is a high prestige chief in Diebuzhai community, and almost all villagers are under his guidance faithfully. Diebuzhai CBCM Committee was formally established in June 2004. It comprises 7 members: two members are from management bureau, one of them is committee director, the other one is the vice director; The other five members are from local community, including 1 village leader, 1 village accountant, 1 cashier, 1 representative of woman, 1 representative of disadvantaged group. Each of the committee members has his or her responsibility. A group of management rules were set down by the committee, for example "Working System Rules of CBCM in Die Buzhai", "Community Protection Fund Regulations", "Regulations on Sustainable Use of Community Protection Fund ", and so on. In 2005, BNNR Management Bureau implemented one project in Dibeuzhai Community supported by the Global Environment Facility (GEF), namely "Sustainable Forestry Development Project in China." The project lasted 4 years and finished by the end of 2008. According to PRA investigation with the consideration of local people's real ability and village situation,

the activities of this project were mainly including firewood-saving stoves, breeding sheep and cattle, grinding machine installation, plant Huajiao and walnut, planting economic forest, carrying out environmental education and agricultural technical training and a series of sub-projects. However, the project had to be abandoned in 2008 because of the friction between villagers and Diebuzhai Committee caused by neglect of chief's prestige. Since then, no CBCM project is introduced to Diebuzhai Community any more.

Liziba Community is made up of 9 villages, with a total of 207,774 people, including Muslims 1,051, and 197, 723 Han villagers. Liziba is famous for its tea planting because its natural environment is fitting for tea growth. During 1990s, the villagers have successfully transformed from traditional "crop planting farmers" into "tea planting farmers". Before such transformation, illegally logging phenomenon was prevalent which led to serious damage of local forest. The reduction of forest vegetation led to potential change of local micro-climate, decreased quality and yield of tea, and it also affected the tea planting. When the villagers realized that climate change is the main reason leading to changes in the quality of tea, they reached a consensus: to protect forests is to protect their life. In 2003, a local CBCM organization, namely "Farmer forest patrol team", was established with 20 young and strong volunteers. All these members were widely selected from 9 villages. It is a nonprofit organization, in which the volunteers' responsibility is to help BNNR Management Bureau to complete forest patrols and to join the CBCM projects. In order to reduce the destruction of biological diversity, which is caused by overuse of firewood, the project named "Community Action for Biodiversity Conservation in BNNR", which is supported by Critical Ecosystem Protection Fund (CEPF), is implemented in 2006. The volunteers have got support from the project to install firewood-saving stoves. In 2008, during the second stage of this project, all of other 87 households in Liziba Community have joined the transformation project, which greatly reduced the amount of firewood consumption. Meanwhile, to be a member of patrol team is a kind of honor for local villagers. Since the establishment of this local organization, until June 2007, the protection team has uncovered 53 pieces of illegal logging, poaching and other violation events. Moreover, they have dealt with fire fighting and report the fire for 13 times, helped to close more than 60 charcoal kilns, and have seized a takin-hunter. Owing to their outstanding work, they have restored economic losses more than 10 million CHY. The presence of the patrol team has not only protected the local ecological environment, safeguarded the economic interests of the villagers, but also has reduced the pressure on protected area management. In 2007, it was awarded the 2007 "Ford Foundation Conservation and Environmental Award.

2.2 Investigations and Analysis Method

Theoretically speaking, in order to evaluate management mechanism, it should compressively take large volume of factors into consideration, for example the rule-system itself, community attributes, environmental condition and the interaction between them (Ostrom, 1994). It is a difficult concept of mechanism to quantify, but because how

the mechanism works will reflect to the participators' perception, or even affect their livelihood. Thus, in this paper, we focused our investment on how local villagers perceived the effects of CBCM project on their livelihood, and identified the changes by comparing income and consumption data to support the perceived impacts. Our goal was to get a more comprehensive and objective understanding about current CBCM mechanism by our first-hand survey data analysis, and to find some ways to improve it.

To do so, we chose efficiency, equity and sustainability as three main evaluation indexes for evaluation of CBCM mechanism. The efficiency was tested by consumption amount of forest resource, which comprise the amount of fire-wood consumption, the value of non-timber forest product (such as potherb and herb medicine), and the amount of livestock (such as pig, cattle, sheep, horse and so on). In order to identify the affect of CBCM projects, we also compared the three sub-indexes with project household (which has taken part into CBCM projects) and non-project households in 2010 survey. The index of sustainability was tested through the improvement degree of livelihood from CBCM projects, which was achieved by comparative analysis on both 2006 and 2010 household surveys of family income at the same region, and also by horizontal comparison on family income changes between CBCM households and non-CBCM households among different regions in 2010. It accompany with the hypotheses of that, a bigger livelihood improvement for CBCM project participation is a more sustainable way for long-term forest resource protection. The equity was mainly judged by a group of sub-indexes. They are participation percentage of project, proportion of gender, proportion of minorities, information obtaining approach, equity of project participation test, competition of project participation, and satisfaction of project participation.

In survey of 2010, we have got total 200 copies of primary questionnaire data to support this paper. The survey data covers two protection stations with eight villages in BNNR. The interviewees were completely random chosen by theory of proportional stratified random sampling design (See Table.1). These eight villages belong to two protections, thus 200 pieces of questionnaire were equally divided. Besides, these eight villages are under the management of four CBCM committees. It means that Villages of Shuigoubian, Qingyanguan, Qingshuzhi, Majiaqiao and Wangjiaping were all under the lead of Liziba CBCM Committee. The choice of these research sites were based on our long-term research experience in BNNR, which could cover not only most of typical co-management cases, but also normal cases. The statistic data in 2006 was collected from "Baishujiang Investigation on Community Action of Biodiversity Conservation", supported by Chinese National Social Science Fund. The sample size we chose was as same as we did in 2010, with the purpose of comparative analysis on lengthways quantity data

Table.1. Management belongingness and questionnaire distribution of sample villages

Protection Station	Village	CBCM Committee	Questionnaires
Baimahe	Yangashan	Yangashan	30
	Diebuzhai	Diebuzhai	30
	Caoheba	Caoheba	40
Bikou	Shuigoubian		25
	Qingyanguan		30
	Qingshuzhi	Liziba	15
	Majiaqiao		10
	Wangjiayuan		20

3. Result

3.1 Efficiency of CBCM

According to our survey, the most part of forest resource consumption in BNNR is caused by three main human activities: fire-wood are collected for cooking, heating and other energy consumption; small part of non-timber forest product are self-saved for household nutrition demand or medical use, such as potherb and herb medicine, most of them are collected for sale; the same circumstances on livestock breeding. So we can identify changes of forest resource management through comparative analysis on relative survey data in both 2006 and 2010. Since our research focus on management mechanism, all of following analysis takes a CBCM committee as a statistic unit. Thus it means they are totally four units: Yangashan, Diebuzhai, Caoheba and Liziba CBCM Committees.

3.1.1 Impact of fire-wood consumption amount

By comparing statistical data in both 2006 and 2010, the rough change trends of fire-wood consumption presented in Fig.3 are obviously decreased, although Diebuzhai Committee has 2% increase. Both Caoheba and Liziba data show remarkable reduction, with respectively 16% and 15% of decrease. What is more, differences also exist in project households and non-project households in 2010 survey (Fig.4). Except Diebuzhai Committee, the project households in all other three committees consumed less fire-wood than non-project households. Interviewees of these three villages owe such success to CBCM project. During the four years, all of these four committees have completed the co-management projects of firewood-saving cooking stoves substitution and marsh gas pool constructing. The advantages of firewood-saving cooking stove mainly appeared on its high utilizing rate and practical function. Most of the respondents indicate that, comparing with the traditional tools, the new stoves help to reduce the demand of fire-wood. Because of the application of the stoves, housewives denote that they can have a faster speed for cooking and a cleaner environment in the kitchen. Most of them are satisfied with the project except several respondents complain the cost of substitution is too expensive for them.

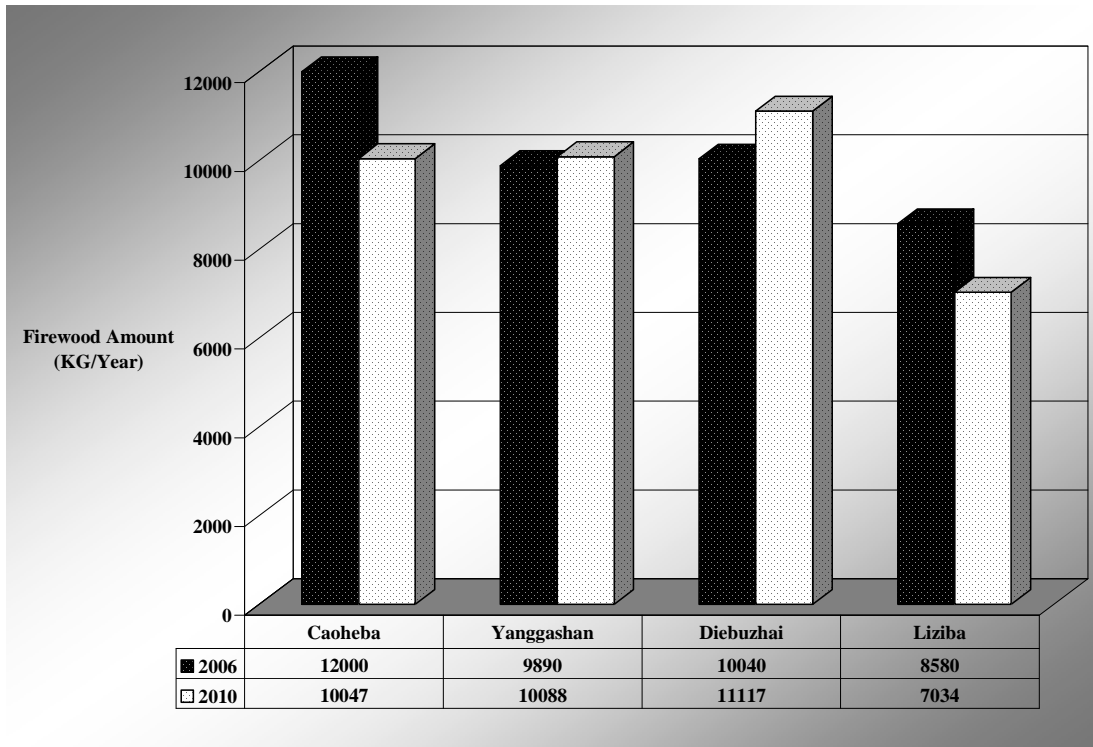


Fig.3. Changes of fire-wood consumption amount

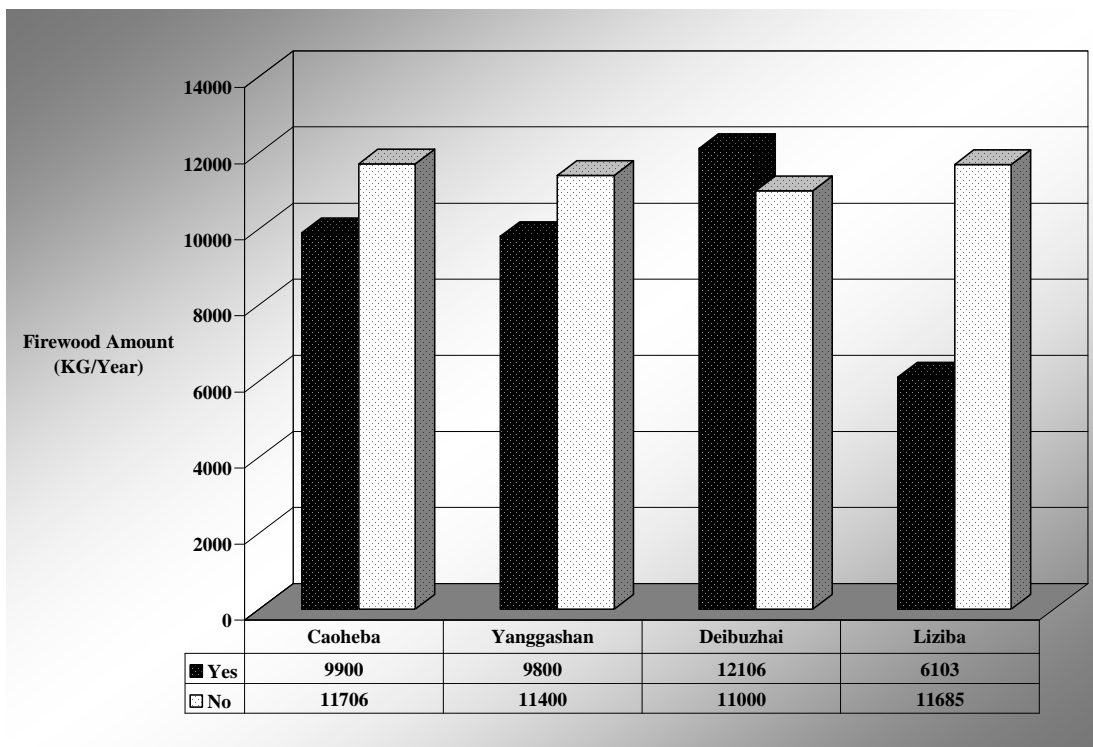


Fig.4. Contract between project household and non-project household on fire-wood

3.1.2 Impact of non-timber forest product value

A significant shrink of non-timber forest product value has been shown in Fig.5.

Comparing with Caoheba and Liziba communities, Yanggashan and Diebuzhai Communities had over 100 USD-income per year on forest product in 2006, while a big shrink has appeared in 2010, the data has dropped down to about 20 USD/per year. The decrease rate was as high as about 84%. In our household survey, when we wondered such huge change, the respondents replied us that, on the one hand, managers from BNNR Management Bureau has done a lot of education work on environmental protection, which has made them realized that the behavior of over-use forest resource near around could lead to serious ending for not only them but also their offspring. On the other hand, with the development of CBCM projects, more and more people focus their interests on crop planting, livestock breeding or searching job from outside. Their livelihood has been greatly diversified, that is way they did not keep their eyes on potherb or herb collecting. They would like to search for them only when their family need.

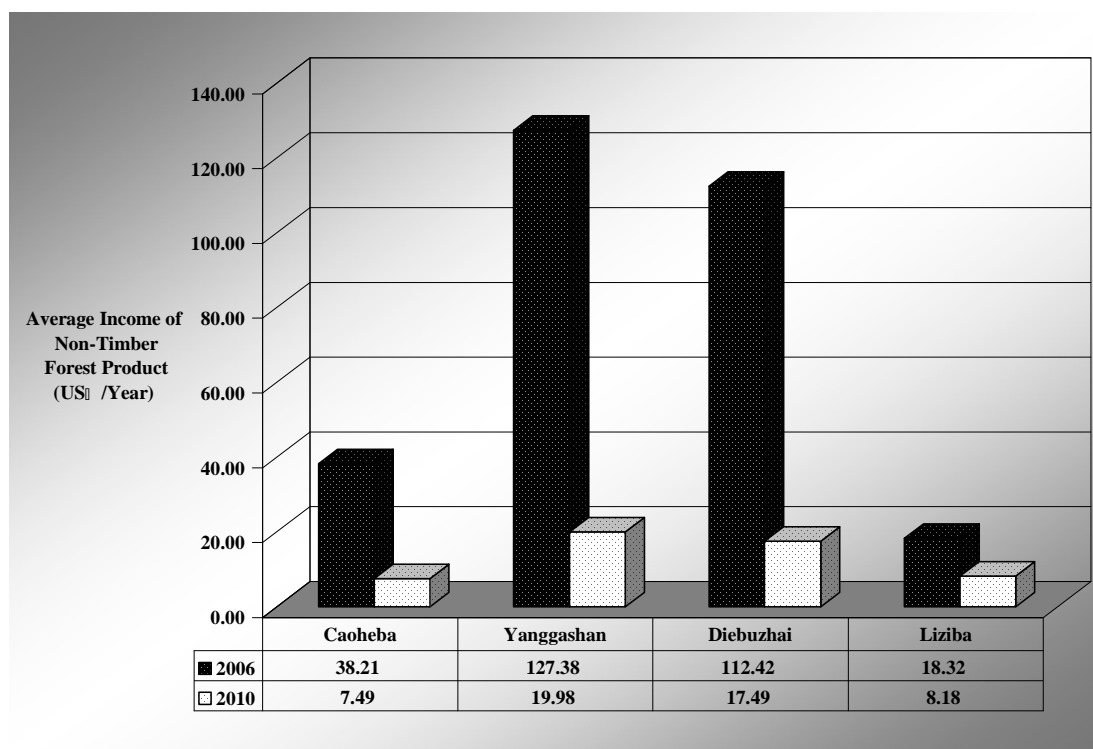


Fig.5. Changes of non-timber forest product value

Similarly, the values of non-timber forest product have been contrasted between project household and non-project household (Fig.6). The results definitely indicated that households in project have consumed less non-timber forest product than non-project households. In other words, we could conclude that non-project households have a higher dependency of forest resource for livelihood.

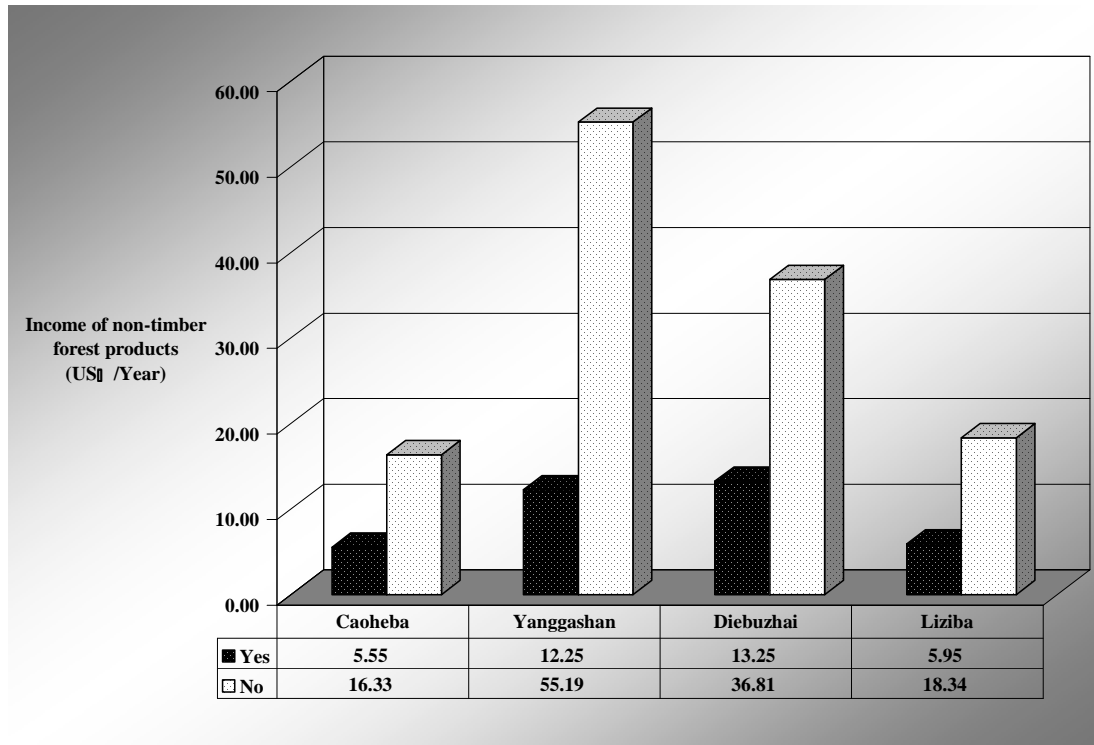


Fig.6. Contract between project households and non-project household on forest-product

3.1.3 Impact of livestock breeding amount

During 2006 to 2010, three communities have increased their livestock breeding amount, with more than 50% of increase, while the data in Liziba community the average amount has decreased to 2.41 heads/ per household (Fig.7). Same differences are shown in project household and non-project household. The households with support of CBCM project obviously hold more livestock than others (Fig.8). In fact, according to the differences of environmental situation, the livestock breeding project has been carried into execution in Caoheba, Yanggashan and Diebuzhai communities. Based on the appropriate geographic condition and long history of tea planting in Liziba community, CBCM project has been designed to mainly focus on scalization of local tea planting with little attention to livestock breeding. The decreasing livestock amount has completely explained the project impacts. Such livestock projects have received remarkable effect on household livelihoods, meanwhile, it also facilitate the livestock breeding transform from nomadic grazing to raising livestock in barns. However, such kind of development method has intensified the forest resource dependency. So tea planting method seems to be a more environment-friendly design.

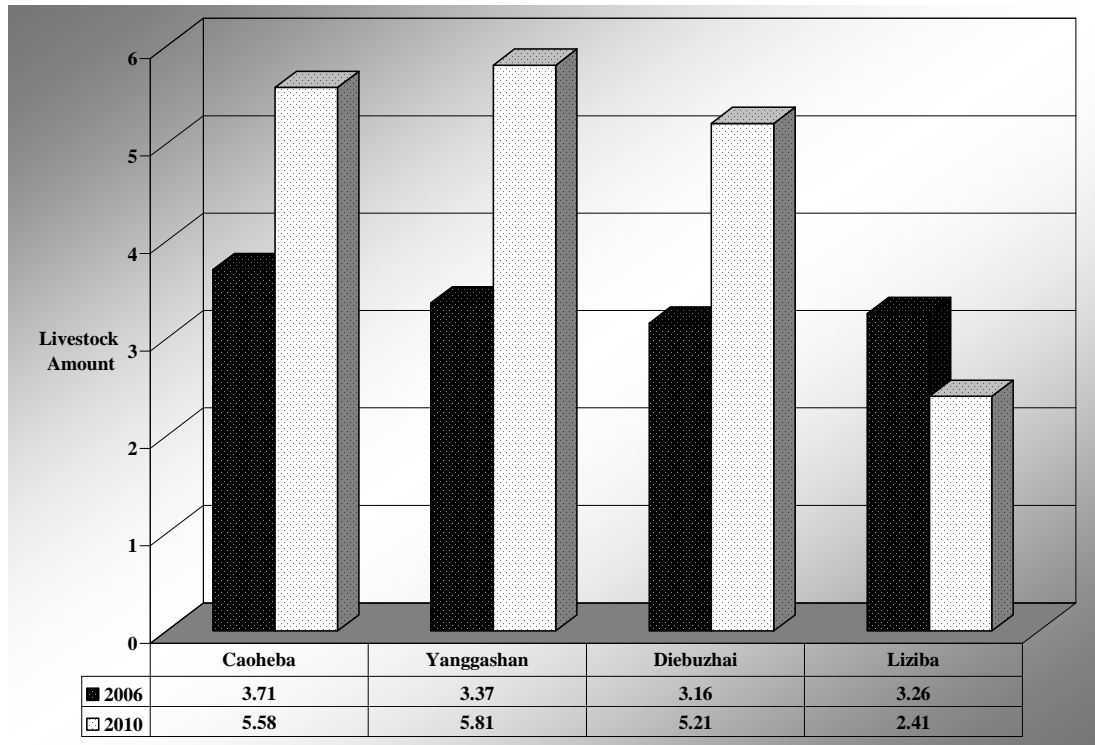


Fig.7. Changes of livestock breeding amount

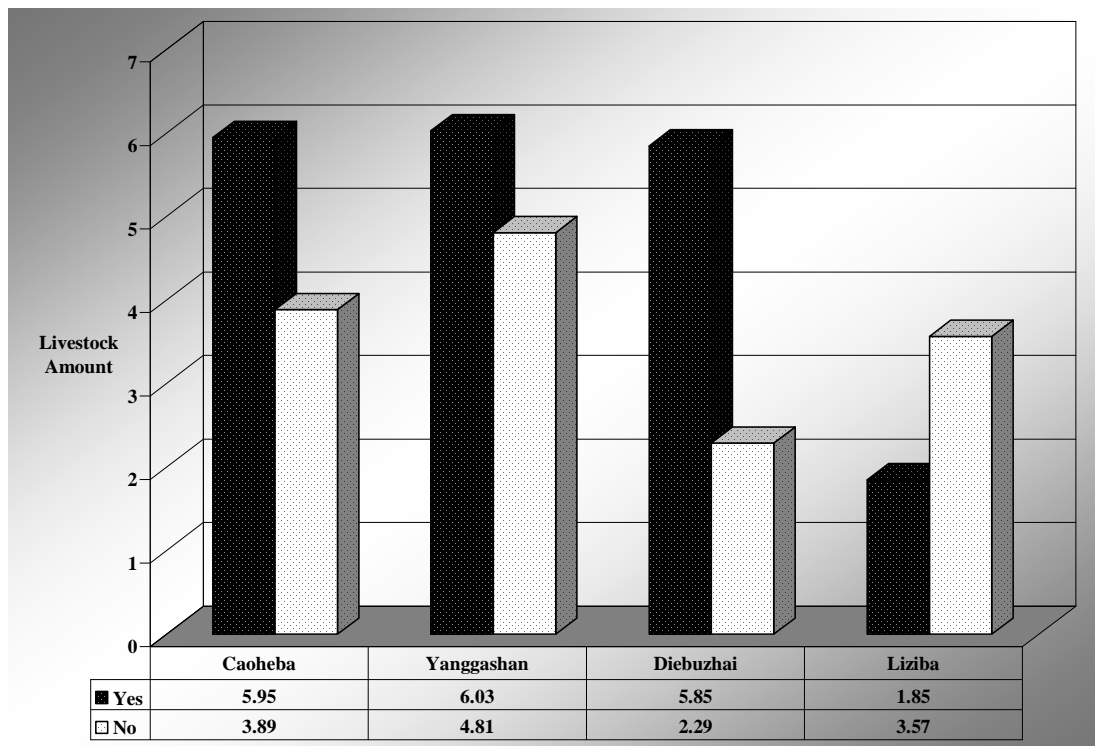


Fig.8. Contract between project households and non-project household on livestock

3.2 Equality of CBCM

Since our took use of random sample method in 2010 survey, the statistic data of participation rate in Fig. 9 could reflect the participation percentage of CBCM project.

“Yes” in Fig.9 means the respondents have take part in some CBCM projects or they are CBCM committee members. On the contrary, “No” means the respondents have not participated in any CBCM projects. The figure surely proved that the participation rate was as high as about 80%.

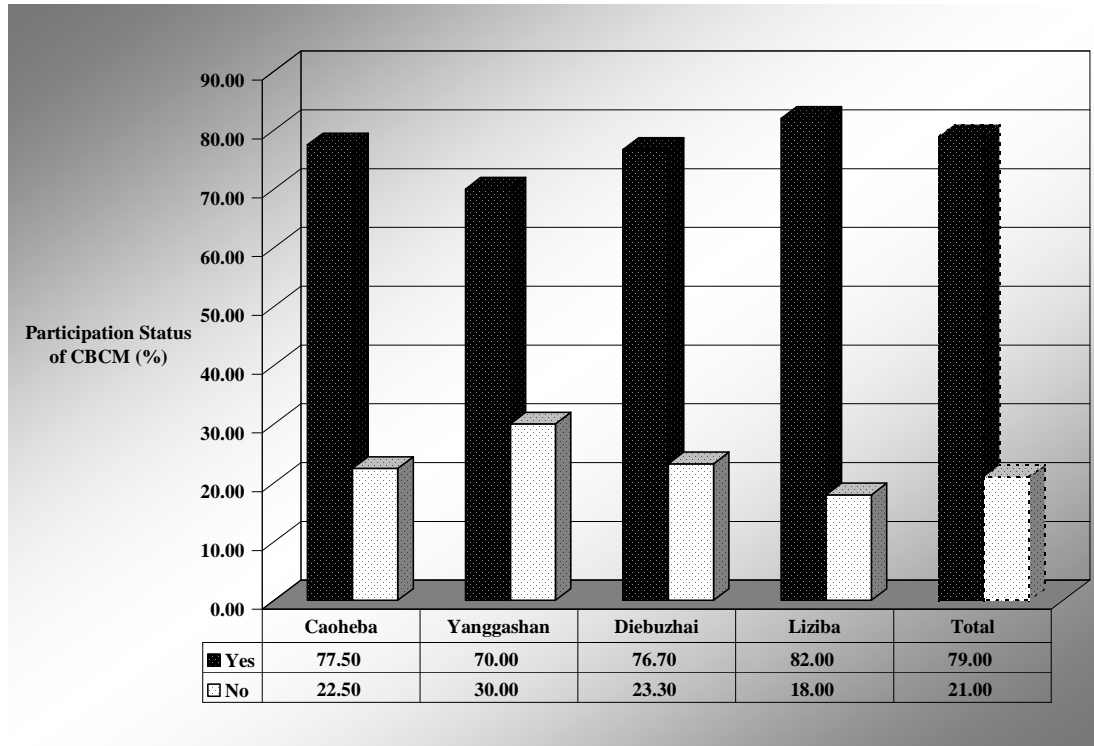


Fig.9. Participation rate of respondent in CBCM projects

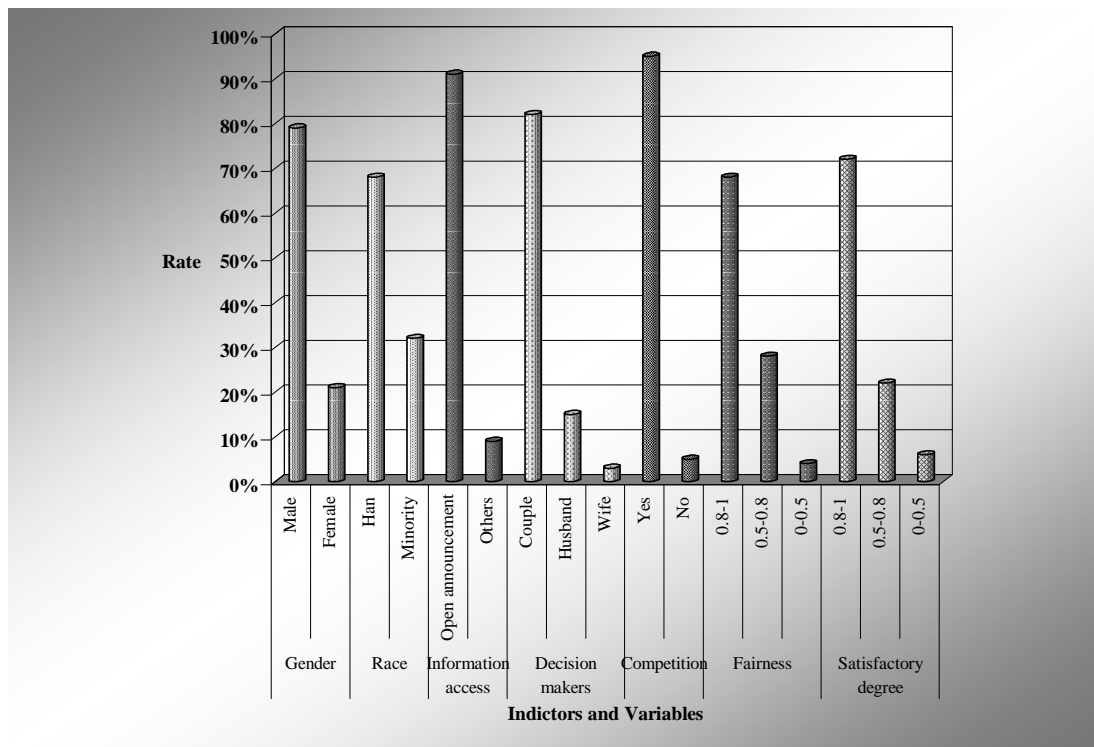


Fig.10. Statistic analysis on sub-indexes

Furthermore, among all the project participating respondents, we have calculated a group of parameters for equality analysis, including proportion of gender, proportion of minorities, information obtaining approach, equity of project participation test, competition of project participation, and satisfaction of project participation (Fig.10). Men have taken a much high rate for project participation than women, and percentage of Han participators is above two times than minority participators. However, we can not arbitrarily judge that there are serious sexual and racial discrimination in project participation with big unbalance between men and women, Han and minority villagers. In fact, based on our survey, over 80% of households have fair decision making rights, husbands and wives jointly decide whether and how to join CBCM projects, less than 18% of the decisions are made by husbands themselves, and few women have their independent decision making rights in the families. Furthermore, except Diebuzhai Community in which there are 32 Tibetan households and 2 Han households living, the rate between Han and minority villagers (including Tibet and Muslim) in Caoheba, Yanggashan and Liziba Communities respectively are 19%, 54%, 7%. Thus, the total rate between Han and minority participators (68%: 32%) is absolutely a reasonable result.

In addition, we have also investigated the following questions in our survey: what is the way of project information accessing, is there any competition in project join, how do you think the fairness in project join, and what is your satisfaction degree to the local CBCM committee work. The statistical data shows that, about 90% respondents indicated that they got to know the project information through open propagandism which was organized by local CBCM committee. And the overwhelming majority addressed that there is competition between the project applicants. The committer would do some household interviews to evaluate whether the applicants own such capability to accomplish the project task, and it also helped to figure out the problems or difficulties in project execution. Meanwhile, we let the respondents mark their perception on project fairness and satisfaction from 0 to 10. Almost 70% of respondents considered that the projects they have taken have a fair participation circumstance, and they were satisfactory with the work organized by their local CBCM committee.

3.3Sustainability of CBCM

No development project and organization could last for a long time expect it brings profit or benefit to participators and organizer. CBCM project and CBCM committee work in a similar way. In order to identify whether CBCM project benefits the participators, we test it from perspective of household income changes. Fig.10 and Fig.11 have absolutely approved the significant of CBCM project, which belongs to the contribution of local CBCM committer members. Comparing with the data in 2006, the household income level has been improved at least 13.6% for Yanggashan Community (In order to compare the two group of income data from different years in a more objective way, we have eliminated the impact of inflation and exchange rate

float factors during our data calculation process.). The huge amelioration has taken in Liziba Community with an impressive progress—101% increase. Of course, we can not easily contribute such success to CBCM project itself, however, Fig.11 has definitely identified the differences between project households and non-project households. Participators in Caoheba Community has 423.13 USD/per year higher income than non-project household, 1255.56 USD/per year in Yanggashan, 750 USD/per year in Diebuzhai, and 1483.33 USD/per year in Liziba. Therefore, at least we could prove that CBCM project do make a positive affect on local community's income level.

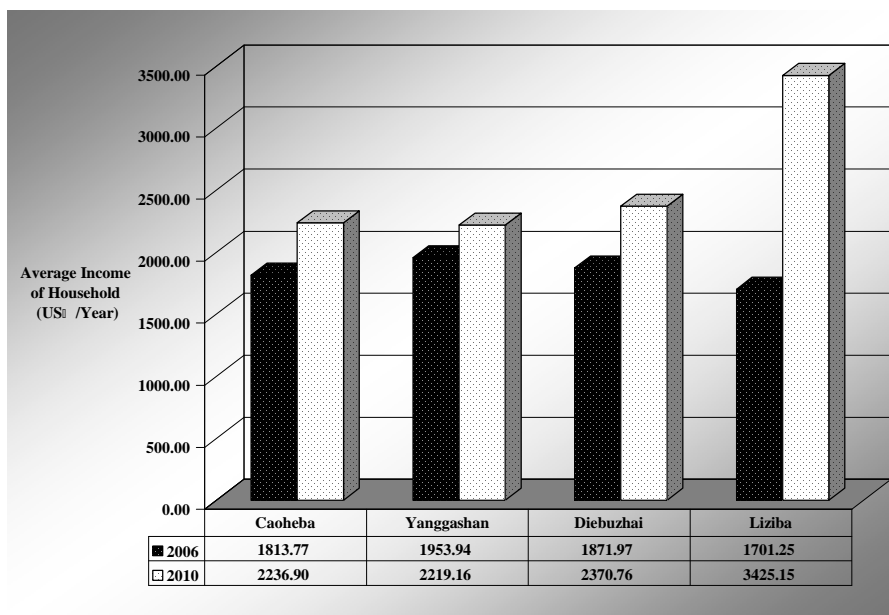


Fig.10. Changes of household income

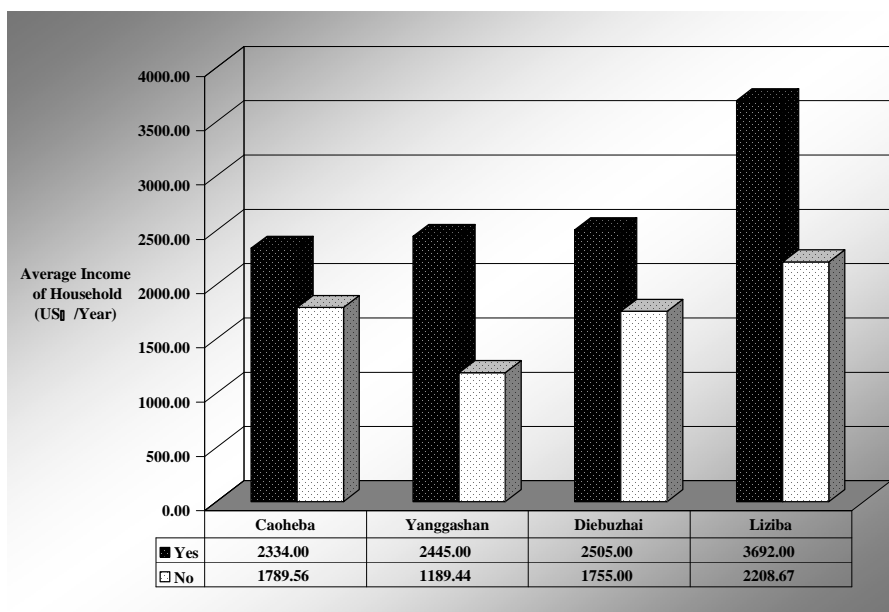


Fig.11. Contract between project households and non-project household on household income

4. Discussion

Inconsistent relationship between forest resource protection and livelihood development makes no sense to either governance or communities villagers. Therefore, to establish a harmonious relationship is the core of common resource management. From the survey, we found that the residents of the community, who live on the forest edge, are surely aware of the importance of forests for their life, and thus they own a clear awareness of resource protection. Thus, in recent years, the number of illegal logging cases in our research villages has been almost reduced to zero; moreover, as for the large amount of firewood consumption, the villagers also hope to reduce their demand through the transformation of energy-saving stoves. Therefore, people own their rights to satisfy their basic forest resource demand. The advancement should be made on how to let the energy-saving technique in more widely use and searching for other substitution way of environmental energy source.

While as for the community, the current limited protection policies have obviously affected the local economic development. The problems of community poverty are still not resolved. And the behaviors of resource destroying with the purpose of solving livelihood problems are quite difficult to forbid, so to improve the living conditions of local residents is the most urgent wish and need, and it is also regarded as a necessary means to achieve the goal of forest resource conservation.

Our survey shows that the introduction and implementation of CBCM projects have firstly gradually helped the villagers to set up new means of production and ways of life which should be more independent and less dependent on forest resources. Thereby it has helped to reduce the cases of deforestation, such as the transformation of energy-saving stoves instead of traditional old fireplace heating, which has largely reduced the consumption of firewood; What's more, it has helped to reduce people's loss which is caused by the introduction of relevant restricted policies for forest resource using, therefore, the living conditions have been improved and it has helped to perfect the relevant policies; Thirdly, the contact between local residents and the outside world has been intensified. Owing to the projects, local people's information channels and views of life have been greatly broaden and diversified, and it helps to set up foundation for the further development of the residents; finally it helps to improve the relationship between the protection department and the community, and it also helps local villages to realize the role transform from "by managers" to "manager". The local residents could be respected as the main body of forest resource protection which helps to decrease negative and oppositional emotion. In this way, local residents could actively fling themselves into conservation project, and realize the real goal of protection.

The implementary status of our case village with CBCM projects is a microcosm of Baishuijiang co-management mechanism. Through investigation, we summarize the the implementation of CBCM project and its impact on local villagers are as follows:

The CBCM mechanism in BNNR has been basically formed. Under the vigorous advocacy and strong support from Baishuijiang Management Bureau, local co-management committee and management department have jointly developed a set of community resource management plans, project implementation measures, the identification ways of project responsibilities and interests, the co-management conventions, co-management committee working system rules. The appearance of these documents and rules has help to settle down an institutional basis for CBCM mechanism and its maturity, standardization, systematization.

From the perspective of information efficiency, the function of information collection and diffusion of co-management mechanisms are still far from efficiency. The establishment of co-management mechanisms has facilitated to build up a communication platform among the protection management authorities, government departments and community residents. Based on this platform, protection authorities or government departments lead the community residents to join all kinds of training, information and technical guidance, and local community residents reflect their public opinion and willingness. All of these activities should be implemented through such CBCM committees, and it is supposed to act as a "transmit" hinge. However, in terms of the present status quo of such mechanism's operation, such mechanism do not brought into play fully. It is supposed to be an information-open system. However, the failure of CBCM project in Diebuzhai has identified the CBCM mechanism is at the semi-open stage. The failure of project has caused by ignorance of traditional Tibetan culture. The establishment of Diebuzhai CBCM Committee had not got the support of their patriarch, who owns the traditional management power in local community. Gap appeared between the director of village and the patriarch. Thus, the adherents of patriarch were unsatisfied with the committee, and they also insisted that their wishes have been ignored too. Without the support of the villagers, such semi-open CBCM mechanism could not last for long, and the project has stopped at halfway. To establish a open and transparent mechanism can efficiently avoid such mistake, and it is the way to realize information efficiency.

From the incentive compatibility point of view, the CBCM projects, to some extent, have caused incentive incompatibility. For example, the implementation of the sheep breeding project in the protected areas has made such mistake. Some of the project participators still take old way of raising sheep— nomadic grazing, and it has severely damaged the vegetation of farmlands, because sheep gnawed into pepper tree frequently and it has directly reduced the production of pepper to other households. At last, such project ended in failure with an irrational project design. While the further reason of failure is because lack of the necessary project design review process which did not take full consideration of the local people's lifestyle, and it is also in lack of scientific project management and project application process. In addition, as for the project designers, local co-management mechanism badly needs rural community workers who have got not only good community management skills but also biological knowledge for protection work. Lack either of skills will often let the project run in the

opposite direction.

From the perspective of resource distribution, the employment mechanism of co-management is not established, which leads to unreasonable distribution of human resources. The current election of community resident representative in co-management committee is always designated by appointment and removal system under the guidance of management bureau. Phenomenon of village leaders playing the role of community resident representative in local co-management organization is widespread. According to our random household survey, among 200 households questionnaires, there are 181 villagers expressed that they do not know the committee member's appointments process, and more than 80% of the interviewees hope to establish an open electoral system in the village. The vacancies of personnel arrangement regulation is not conducive to encourage local community residents to join the co-management work and to form of a democratic system, especially for those who have a good knowledge of manage their village. In addition, almost all CBCM committees are short of funds, that is why current co-management organization can hardly support its project on implementation for long. For example, the forest patrol team does not have sufficient funds for patrol equipments, which will negatively affect the quality of patrol mission. To broaden fund channel and diversify fund sources is the feasible way to solve the problem, such as to search fund from indigenous or external NGOs, to seek for cooperation chances with academic organizations or official department, to participate in project application from foreign government, and so on.

From the perspective of incentive mechanism design, there is a vacancy of incentive distribution system in Baishuijiang CBCM mechanism. As a lack of incentive allocation regulation, both co-management committee members and co-management cooperative household, their reward from participation of co-management projects is in low level. Thus, it hardly inspire the enthusiasm of the participants. For example, local community residents who help the co-management organization to do the mountain patrol work, regardless of hot and cold weather, the subsidy for them is only 10 CHY/per person/per day; According to the regulation of BNNR Management Bureau, their stuff who have join the co-management project can not get additional subsidies or bonuses for the work. It means that no matter how much work you have done, the reward for the stuff is the same. Thus, there is a serious unbalance between responsibility and rights for CBCM committee members. We can not always except volunteers accomplish their work perfectly without any rewards. It will exhaust the enthusiasm of committee members at last. So properly rewards should be given to the CBCM Committee members, such as priority of joining CBCM projects, bonus for hard work, basic subsidy for forest patrol and so on. At the same time, the relative encouragement rules should be set down publicly, which helps committee members and villagers give public supervision on gainers.

5 Acknowledgments

This work was under the help of Center of Community Rural Development and Biodiversity Protection (CRDBP), Lanzhou University. Especially many thanks will give to Prof. Wei Huilan who is director of CRDBP and professor in School of Economics of Lanzhou University. We also thank relative officials of Gansu Baishuijiang national natural reserve, who helped us to make this investigation possible.

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