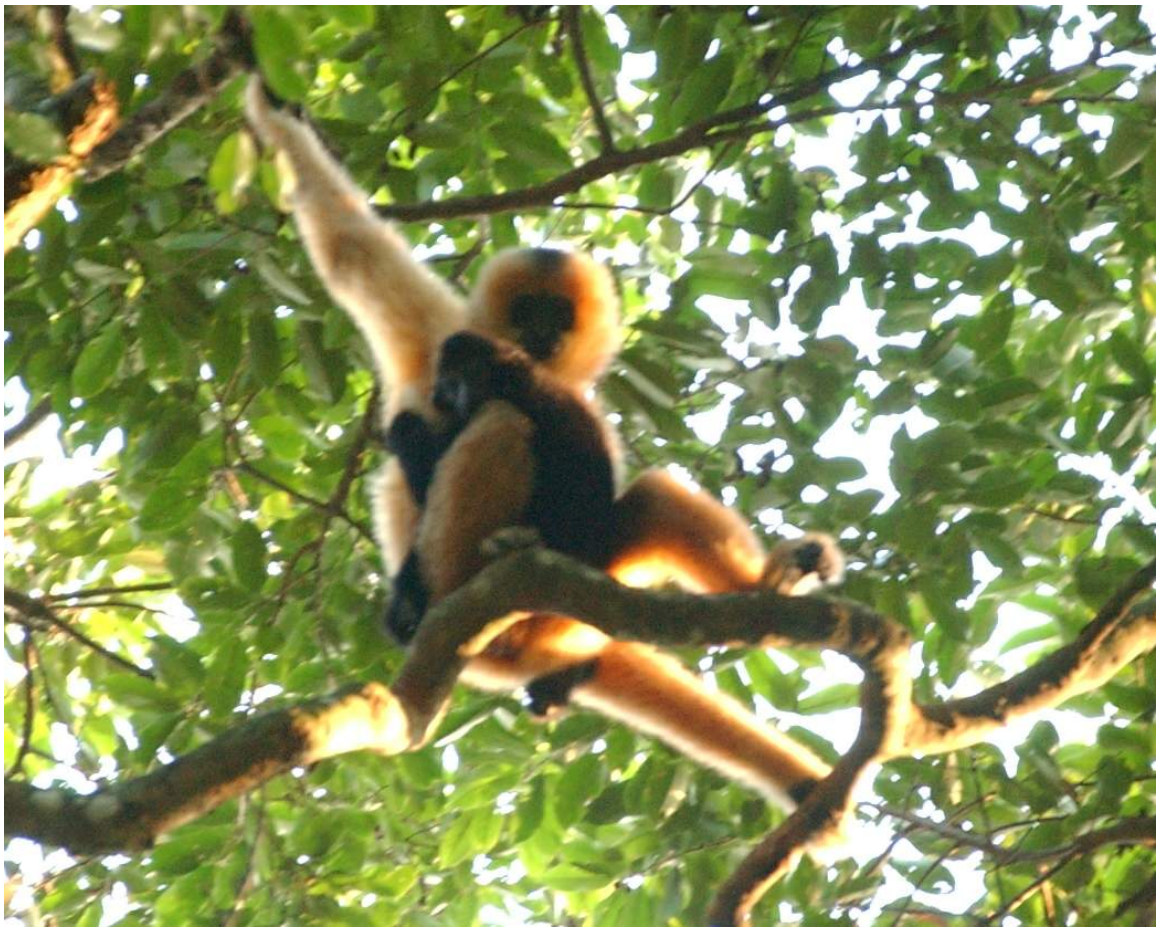
Action Plan for Implementing Co-management in the Bawangling Nature Reserve and Adjacent Communities in Qingsong Township



August 2005

Citation: Fauna & Flora International China Programme (2005)
Action Plan for Implementing Co-management in the Bawangling Nature Reserve and Adjacent Communities in Qingsong Township. Fauna & Flora International China Programme Office, Beijing

Cover photo: Enyu Jiang, An adult female of Hainan Gibbon with a baby, Bawangling National Nature Reserve, 2003

Authors: Jianfeng Zhang, Shibin Yang, Xiaoya Li

Editors: Yingyi Zhang, Lu Yan

Consultants: Weijie Deng, William Bleisch

Translators: Mark South, Minfang Gan, Na Jin

Date: 2005-08

Publisher: Fauna & Flora International China Programme Office, Beijing

Index

Acknowledgements

Very sincere thanks must be given for the institutional support of Baisha County Forestry Bureau, Baisha County government, Qingsong Township government, Hainan Provincial Forestry Bureau and Bawangling Forestry Bureau.

Thanks Hainan Ecological Environmental Ecological Education Center(HEEC) and students volunteers from Hainan Normal University who ensured the socio-economic survey have been carried out successfully.

The authors and editors would like to express their gratitude to Weijie Deng who facilitated a series of workshops for making this action plan, to Kadoorie Farm and Botanic Garden for the input in planning.

The job of editing and reviewing this plan was ably supported by reviews from: William V. Bleisch, Weijie Deng, John Fellows, Bosco Chan, Michael Lau, Xianlu Deng. Document translation from Chinese to English was done by Minfang Gan and Na Jin, and polished by Mark South. Thanks to all.

Thanks to Enyu Jiang for providing the cover photo free of charge.

Funding for the formulation and publication of the action plan was supplied mainly by the US Fish and Wildlife Service Great Ape Conservation Fund.

Thanks to all who have supported the Hainan Gibbon Conservation Project.

Foreword

Situated on Hainan Island in southern China, the main conservation targets of the 29, 980 ha Bawangling National Nature Reserve is the world's most endangered ape – the Hainan Gibbon and the old-growth tropical rainforest it inhabits. Established with the approval of China's State Council in 1980, the reserve straddles two of the island's counties, Changjiang and Baisha.

Like many reserves in southern China, since its establishment, the reserve has been facing tremendous challenges from neighbouring communities over the conservation and utilization of natural resources. Adjacent communities include 4 townships (Qingsong, Jinbo, Nankai and Qicha) with a combined population of 26, 490, most of whom are from the Li and Miao Chinese ethnic minorities. The communities are generally quite poor and rely heavily on natural resources nearby. All four townships are the subject of Hainan poverty alleviation programs and Baisha County is even recognised as one of the country's poorest counties. The over-harvest of natural resources is considered serious.

Following establishment of the reserve, measures were greatly enhanced to protect natural resources and combat illegal activities. Measures taken included excluding locals' entry into the reserve and preventing locals from damaging the reserve by activities such as hunting, logging and collecting. Unfortunately, such strict controls triggered severe conflicts between the reserve and neighbouring communities. Due to the lack of effective communication and dialogue among the reserve, the communities and the local governments, local people did not understand or support the reserve's management system. With local people wishing to utilize the natural resources, which had traditionally been theirs to use, for their community development, the reserve and the local governments faced a serious challenge: how to coordinate biodiversity conservation and local livelihood development.

To mitigate such conflicts and seek for the effective reserve management and sustainable development of local communities, the Bawangling Nature Reserve, supported by Fauna & Flora International (FFI), started to experiment with community-based conservation approaches. Due to an EU-China Natural Forest Management Project conducted in Qicha Township, the nature reserve chose to cooperate with eight adjacent villages in Qingsong Township, Baisha County to make an action plan for implementing co-management in these villages. These pilot villages lie to the northeast of the nature reserve and are closest to the gibbon habitat.

Community co-management is a quite new concept for both the reserve and local people. In addition, the reserve and local communities lack of mutual understanding and trust for a long time. The project thus decided to start with surveys and capacity building. In May 2004, the training needs assessment of reserve staff were conducted based on the current administrative structure and staffing (see Annex 1). In July 2004, FFI and the reserve carried out a participatory socio-economic survey among eight representative communities from Qingsong Township. On October 8-13, 2004, a community co-management training workshop was organized in the reserve. The workshop was attended by 24 people, including two representatives from Qingsong Township government, one from Baisha County Forestry Bureau, two from Kadoorie Farm and Botanic Garden (KFBG), one from the Bawangling Forestry Office and 18 people from the reserve. The workshop focussed on the interaction between the communities and the reserve over natural resources conservation and utilization. Through the discussion, participants realized that many of the reserve's natural resources were now at the heart of neighbouring communities' livelihoods and development. Meanwhile, conservation and sustainability of use of natural resources is

critical to the effective management of the reserve, and is a precondition for truly sustainable development of local livelihoods. It is also of common interests of both the reserve and local communities, which forms the basis for further cooperation. Local people were also recognized as key stakeholders for effective management and conservation of the reserve. The reserve realized that communities could become an important and active participants in conservation, rather than only trouble-makers, and they recognized that the reserve should cooperate with communities and encourage local people to support and participate in protection and management. The reserve should also support and assist the sustainable development of the neighbouring communities to whatever extent possible.

On October 14-16, 2004, the reserve held its first stakeholders workshop on co-management. As well as representatives from FFI and the reserve, many other stakeholders participated in the workshop, including Bawangling Forestry Bureau, Baisha County and Qingsong Township Governments, the Wildlife Conservation Center of Hainan Provincial Forestry Bureau, Hainan Provincial Land, Environment and Resource Bureau, KFBG, EU Natural Forest Protection Project and Hainan Normal University. Over three days, the stakeholders analysed the current management status and problems, looked at the socio-economic status of adjacent communities and set down specific goals, priorities and preconditions for collaborative management over the next three years.

In November 2004, based on the previous two workshops, FFI and the reserve invited local governments and a local NGO (Hainan Ecological Environmental Education Center, HEEC) to attend another planning workshop, at which participants discussed how to set out and formulate the action plan based on the achievement of the former workshops and survey. Participants also discussed the plan's objectives and the actions to be carried out in the coming three years. Following the workshop, FFI and the reserve organized a team, who went back to the eight representative communities of Qingsong Township and consulted with local people through village workshops about the measures and objectives set out in the draft action plan, and collected feedback and suggestions.

The action plan was compiled from December 2004 to August 2005. Chapter 2 was compiled by FFI, referencing the socio-economic survey report prepared by the Hainan Ecological Environmental Education Center (HEEC). All other chapters were completed by staff from the nature reserve and based on the discussions of all stakeholders. Qingsong Township government, the eight communities, Baisha Forestry Bureau and the County government provided relevant documents and information and contributed valuable comments and suggestions. Experts and scholars from FFI, KFBG, HEEC, Institute of Zoology of the Chinese Academy of Sciences, Kunming Institute of Zoology of CAS, and the Dujiangyan School of Sichuan Agricultural University provided technical support for the plan.

Due to long-existing conflicts and disputes on many issues such as utilization of natural resources and boundary of the reserve, antagonism and distrust between the 8 communities and the nature reserve existed long before the start of project, which brought many difficulties to the project implementation. With the facilitation of project, the local communities participated in the whole planning process and discussed many issues on their livelihood with the nature reserve and other stakeholders for the first time. However, it is obvious that the participation of local communities was still not ideal. The sound and interests of local communities were not sufficiently presented in this action plan. The action plan also contained some contradictory opinions/information on the use of natural resource between local villages and the nature reserve. It might stem from lack of trust between the communities and the reserve as well as their limited capability for co-management. However, the project has started the communication and cooperation between the

reserve and the local communities. It is believed that the future implementation of this action plan will certainly help mitigating the conflicts between these two key stakeholders.

FFI facilitated and supported the formulation of this action plan, but the opinions of the individual authors do not necessarily reflect the opinion of Fauna & Flora International(FFI) China Programme Office.

Fauna & Flora International(FFI)
China Programme Office
August 05

Introduction

The concept and background of community co-management

In protected areas across China, the conflict between the use of natural resources and biodiversity conservation are mainly emerged between reserves and adjacent communities. The livelihood and development of communities often relies heavily on available natural resources, a situation which may conflict with management and protection measures of reserves. Due to the strict laws and regulations on reserve management, the establishment of reserves actually restrict the development of local communities – communities often have to sacrifice socio-economic development opportunities for conservation. How to coordinate biodiversity conservation and livelihood development of adjacent communities is China's big challenge in achieving effective nature reserve management.

The traditional management style, of strict exclusion of local people from the reserve, often grew from a perception of communities as a force against conservation, and in fact gave rise to conflict over the use of natural resources. Such management has been found to be both ineffective and unsustainable. In 1995 the State Forestry Bureau began to adopt a community co-management approach in ten nature reserves selected from five provinces in the GEF Nature Reserve Management Project. That co-management approach has been popularised in China and governments at different levels have accepted and gradually adopted the approach. In the past there were no laws or regulations governing co-management, but now new laws concerning nature reserves are being formulated. The central government has collected comments and suggestions from local governments and reserves, hoping to improve the legal system and establish the legal status of co-management.

In the context used here, 'community' refers to a social group of people living in a specific geographical region who share the same or similar beliefs, customs, traditional culture, knowledge, and means of production, and have specific relations with common resources. Community co-management means that communities participate in the process of planning, decision making, implementation and evaluation of management measures adopted by reserves, with the aim of combining and balancing needs of biodiversity conservation and sustainable development of local communities. The development of community co-management also requires the participation and support of other stakeholders such as local government. Therefore community co-management is a process by which all stakeholders participate at all levels of management.

Unlike traditional models of reserve management, which to a great extent ignored the needs of communities living alongside designated reserves, community co-management allows consultation with communities and recognizes their legitimate need to live and develop. The reserves could involve communities in the planning, managing and monitoring of the natural resources, ensuring that they understand and agree with the measures put in place, thus easing conflict between reserves and communities and achieving more effective management and conservation.

The foundation of this new approach to protection and development is a kind of "real participation". Under the community-based conservation, communities are the users, managers and protectors of natural resources. The reserve should help local communities understand and analyse their constraints and advantages and help them to find new approaches to developing

themselves based on scientific and sustainable use of natural resources. However, the support and assistance of nature reserves in the sustainable development of local communities is not equivalent to the poverty alleviation. Through participating in the process of design, management and evaluation, communities become stakeholders in, and benefit from, biodiversity conservation. This encourages communities to take on the role of protectors and participate in the management and conservation of natural resources on their own initiative.

Community co-management is a new approach to reserve management for the sustainable co-existence of the nature reserve with neighbouring communities based on the concept of cooperation. Co-management itself is a long-term process, especially in areas where environmental protection awareness and development capacity are weak. Since there is no fixed model. Since each region has its own specific nationalities, cultures and socio-economic backgrounds, plan on co-management must adjust to fit their environment.

The goal, necessity and basis of the action plan

To ensure effective management of natural resources and sustainability of development of communities, reserves can formulate a scientific action plan for implementing co-management. The quality of the action plan and its implementation is an important indicator by which to evaluate the management of the reserve and the effectiveness of resource management. The action plan should define how the reserve and the community will implement co-management and conducts joint activities. The plan should be scientific, logical, effective, realistic and practical.

The plan serves the reserve's master plan by providing a practical agenda and detailed actions for undertaking and monitoring community co-management in the coming three years. The formulation, implementation, evaluation and adjustment of the plan will coordinate conservation activities and sustainable use of natural resources to benefit the ecosystem, social and economic development with the most effective use of human resources, material resources and finance.

This plan covers the period 2005 ~ 2007 and will be used for directing co-management activities of the reserve and the communities during this period. The periodic formulation and implementation of plans on co-management will finally help to achieve the long-term goal of community work set out in the master plan for Bawangling National Nature Reserve, which is to establish an effective co-management system and enhance the conservation awareness of local people.

The Master Plan for Hainan Bawangling National Nature Reserve approved by the State Council sets out the prime management goals for the reserve in the 10 years 2003-2012 as: To protect, improve and restore the tropical rainforest ecosystem and its biodiversity in the reserve; Greatly improve the habitat quality of Hainan Gibbon; To build a reserve with rich biodiversity, appropriate area and zoning, good ecological functions scientific and effective management system and harmonious development with adjacent communities; To establish and develop a co-management system and improve public awareness of environmental protection and contribute to establishing an ecological province in Hainan and to the national nature conservation cause.

The objectives of community co-management set in this Master Plan are:

1. Establish a co-management mechanism (including exchange and communication mechanisms)
2. Integrate co-management activities into the daily work of the reserve;

3. Coordinate the relationship between conservation and production and livelihood of staff from Bawangling Forestry Bureau and local communities, and support the communities in the development of economy and common wealth
4. Formulate an effective co-management network and enhance the participation of communities in reserve management and sustainable use of natural resources; promote healthy development of the socio-economy and culture of the communities; Improve the living standards and conservation awareness of staff and local people; Build a new co-independent relationship between the communities and the reserve; Carry out community co-management to integrate effective conservation and sustainable development, and to finally achieve co-management and co-development of the reserve and the communities.

These objectives serve as the basis for formulating the action plan in the coming three years. This action plan was also formulated in accordance with the following laws and regulations:

"Nature Reserve Regulations of the People's Republic of China"
"Forestry Law of the People's Republic of China"
"Wild Animal Protection Bylaw of People's Republic of China"
"Wild Plant Protection Bylaw of People's Republic of China"
"Management regulations of Forest and wildlife type of nature reserve"

General Principles for planning

1. Biodiversity conservation must be the priority.

The Hainan Bawangling Nature Reserve is a key part of Hainan's natural environment and ecosystems, and the only reserve in China focused on the conservation of Hainan Gibbon and its habitat. The reserve is also vital in ensuring the ecological security of western Hainan Island. Effective conservation of the reserve is the basis of sustainable development of adjacent communities. The action plan's guiding priority should be biodiversity conservation, especially of the Hainan Gibbon and its habitat.

The formulation of this action plan was based on the problem analysis of threats to the Hainan gibbon and its habitat specifically posed by adjacent communities. The actions in the plan also directly address the underlying causes of current problems and conflicts between biodiversity conservation and livelihood of local communities.

2. Participation of multiple stakeholders

The action plan was formulated with input from a wide range of stakeholders in the whole process, allowing each group to express their point of view and giving a feeling of empowerment and of being involved in the scheme. For example, for workshops organized by FFI and the reserve, representatives were invited from the neighbouring communities, Bawangling Forestry Bureau, Township governments, the provincial government, local NGOs and institutes. Various stakeholders also participated in the compiling and editing of this action plan, and contributed their ideas and suggestions.

3. Scheme must be practical and objective

The current situation and capacity of the reserve and local people should be fully considered during the formulation of a action plan. Community-based conservation is a long-term scheme and its objectives should be achieved step by step, Therefore a three-years plan must be practical and realistic.

The action plan was based on a good understanding of the current status of the reserve and communities, and also on an objective analysis of underlying causes of threats. The specific survey was carried out to better understand of the socio-economic status of local communities. As it is a pilot project with limited experience, awareness and knowledge of co-management, as well as limited available resources, stakeholders were realistic in setting down practical goal, objectives and actions.

The co-management is a long-term scheme and will need adjustment when the capacity of the reserve is improved and public awareness is enhanced. The plan also needs to be adaptive to address new problems and conflicts as they arise. Taking this into account, an initial 3-year plan (2005-2007) was made. We believe the process of formulating the plan also helped the reserve and the communities to improve their own capacity and awareness, and to understand how they can work with, rather than against one another.

Chapter One: Current Management Status of Natural Resources in the Bawangling National Nature Reserve

1.1 Introduction

1.1.1 Geographical location and administrative demarcation

Bawangling National Nature Reserve (between N 18°57′—19°11′, E 109°03′—109°17′) lies in the southwest of Hainan Island, straddling Changjiang Li Minority Autonomous County and Baisha Li Minority Autonomous County. The reserve is surrounded by villages of four townships (Qingsong, Jinbo, Qicha and Nankai) and 13 forest farms administered by the Bawangling Forestry Bureau. In Baisha County, the reserve borders Jinbo Forest Farm, Qingsong and Nankai Townships.

1.1.2 Area and functional zoning

The overall area of the reserve is 29, 980ha, with forestry land covering 29, 690 ha or 99.0% of the reserve. Non-forestry land accounts for 290 ha or 1.0% of the reserve. Of the forestry land, woodland covers 26, 461 ha, 89.1% of the land, sparse woodland covers 1, 124ha or 3.8%, Scrub covers 682ha or 2.3%; the remaining 1, 423ha of non-forest land, accounts for 4.8%. Actual forest cover of the reserve is 90.5%.

The functional zones of the reserve are classified as the following:

1. Core zone

The core zone covers Mt.Yajia, Hei and Futou and reaches to Dong'er Management Station in the north, Gaofeng River in the east, Nantun River in the south and Laoyajia Forest Center in the west. Altitude ranges between 350m and 1560m. The core zone covers tropical ravine rainforest, montane rainforest, montane evergreen forest and montane dwarf forest. The core zone is 1054ha, 31.2% of the reserve.

2. Buffer zone

This is the area surrounding the core zone. It reaches to Mt. Miliu in the north, Mt. Ya in the east, and Mt. Tunnai in the south and Yajia Forest farm waterfall in the west. Worthy of protection in its own right, the buffer zone was designed to mitigate pressures exerted on the core area. The habitat here is defined as montane rainforest (including semi-deciduous seasonal rainforest, secondary forest), scrub, and natural sparse woodland. The area of the zone is 8910ha, 29.7% of the reserve.

3. Experimental zone

This is the outer ring of the reserve between the buffer zone and the reserve's boundary. Habitat here is natural sparse woodland, scrub, lower montane rainforest (mainly secondary forest) and some plantation forest, water areas and grassland. The area covers 1030ha, 35.1% of the reserve. This area sees the most human activity, and is designated for management infrastructure, multiple use and eco-tourism and implementing co-management.

1.1.3 Legal status

Bawangling National Nature Reserve Management Bureau is an independent public unit under the administration of Hainan Provincial Forestry Bureau. All of the area within the extended nature reserve boundary is state-owned forest, and is not under local administrative management.

1.1.4 Conservation targets and objectives

The main targets of conservation are Hainan Gibbon and its habitat.
The objectives are:

1. To maintain the integrity and virginity of the ecosystem, and improve the quality of degraded areas of the ecosystem
2. To protect the Hainan Gibbon and its habitat, to conserve the tropical rainforest, and to restore the endangered species and enrich biodiversity
3. To improve management system of the reserve and achieve scientific, institutional, effective management.

1.1.5 Administrative organization, personnel and finance

- In 1980 Bawangling Provincial Hainan Gibbon Nature Reserve was set up by Guangdong Provincial Government (Ref: No.199[1980]) and placed under the administration of Bawangling Forestry Bureau
- In 1987 Guangdong Provincial Government set up a police station in the nature reserve to enforce protection
- In 1988 the State Council approved the reserve as a national reserve;
- In 1992 the reserve was handed over to Hainan Provincial Forestry Bureau and given a quota of 13 staff.
- Due to the severe destruction of habitat, Hainan Provincial Forestry Bureau applied for the reserve to be extended in 2001. The State Council approved extension of the reserve to an area of 29, 980ha;
- At present the reserve is run by the management bureau of Bawangling National Nature Reserve which takes responsibility for the day-to-day running of the Management Bureau, Police Station, Dong'er protection station, Nanchahe protection station and Qingsong protection station. There are 28 employees in the reserve, including one director, one deputy director, and 26 staff of whom 11 are paid for from the central budget and 17 are paid for by Bawangling Forestry Bureau under the "Natural Forest Protection Programme". The staff are mainly engaged in routine patrols, monitoring the Hainan Gibbon and forest fire prevention.
- The legal quota of staffing is 33 employees, among which 13 should be in the central budget system and 20 in the "Natural Forest Protection Programme" budget system of Bawangling Forestry Bureau. According to the decision of Hainan Provincial Forestry Bureau in 2002 (ref: No.98[2002]), the organizational structure should include:
  (1) 28 administrative posts: 2 posts for officials—one director (this post is currently held by the director of Bawangling Forestry Bureau), one deputy director; 11 branch leader posts, consisting of one manager for each of the 5 protection stations, 3 office managers, and 3 office vice-managers. There are 15 other administrative posts;
  (2) 4 technical posts: At the moment there are 5 people with qualifications above technical secondary school, among them only 1 majored in wildlife ecology and

1 majored in animal medicine. The lowest level of education represented in the reserve is junior high school.

For many years the reserve relied on the central budget and some small fire-prevention funds to pay for the 13 staff, cover the expenses of maintenance, salaries and daily office administration. Due to the poor budget and lack of financial support from other organizations, the reserve failed to carry out self-support projects such as diversified income generating activities and eco-tourism, which could have brought more funding for the reserve management. The research and community work thus remained undeveloped.

1.2 Natural conditions and natural resources

1.2.1 Natural conditions

The altitude of the reserve ranges from 350m to 1,560m. There are three mountain ridges in the reserve –Yajia, Futou and Huangniu Ridge. The highest point is Heiling peak of Yajia Ridge at 1,560m. The mountains intersect to form three drainage areas in general; the Qicha area, Wangxia area and Baisha area.

The reserve has a tropical climate influenced heavily by the monsoon. The dry season runs from November to April and the wet season from May to October accompanied by thunderstorms and typhoons. The average annual temperature is 21.3℃, and the extreme highest temperature is 37.5 ℃. The average temperature in December is 13.5℃, with the lowest temperatures dipping to 1.1 ℃. Annual precipitation is 1, 657mm, with most rainfall in July to October. The higher the elevation, the greater the rainfall. Average relative humidity is 84.2% and fog and dew are often found at higher altitudes. In the forest the soil is wet all year round and the climate in the reserve is warm and wet, a suitable climate for the cultivation of tropical crops and tropical agriculture.

Most of the surface water in the reserve flows into the Changhua River system, but some drains into the Nandu River system. There are three main rivers in the reserve: Nanyao River, Qicha River and Nanqi River, some branches of which also flow through the reserve. The rivers in the reserve descend steeply with the largest fall in altitude being 1,500m. The Yajia Waterfall plunges 110m and the average runoff is $0.8m^3/s$, reaching $1.5m^3/s$ in the rainy season. The rivers provide hydro-electricity and irrigation for adjacent communities.

1.2.2 Biological resources

1.2.2.1 Vegetation and wild flora resources

The types of plants in the reserve are a diverse range of tropical and sub-tropical flora. Vegetation in the canopy is also diverse with aerophytes and ferns common in the tree tops. In the rainforest, trees of a variety of sizes and ages grow together. The preliminary survey of vegetation in the Bawangling reserve indicated that there was no major difference between the plants found in Bawangling and those in the rest of Hainan Island. Some trees are endemic in this reserve. Under the trees are plentiful medicinal herb plants. The complex habitat environment in the reserve provides an ideal place for wildlife to inhabit and breed. Species recorded to date include vascular plants of 220 families, 967 genera and 2, 213 species. *Cycas taiwaniana* and *Cephalotaxus mannii* (Globally Vulnerable IUCN) are in Category I of the China National Key Protected Plant Species. *Oncodostigma hainanensis*, *Alseodaphne hainanensis* (Globally Vulnerable IUCN), *Horsfieldia hainanensis*、*Heritiera parvifolia*, *Cibotium barometz*, *Ceratopteris thalictroides*, *Blechnum insigne*, *Firmiana hainanensis*, *Chunia bucklandioides*, *Semiliquidambar cathayensis*, *Castanopsis concinna*, *Madhuca subquincuncialis*, *Merrillanthus hainanensis* (Globally

Vulnerable IUCN), *Gmelina chinensis*, *Plectocomia kerrana*, and *Oryza meyeriana* are in Category II.

On April 3-8 1998, the rapid biodiversity assessment survey conducted by KFBG and its local partners recorded 94 families and 224 species of angiosperm (including 24 orchid species), 6 families and 12 species of gymnosperm, 13 families and 18 species of ferns in the BWL NR and nearby Wangxia Forest. The species recorded in the survey adds to current knowledge. Among them, 24 plant species are endemic to Hainan Island, and one is a globally endangered subspecies (*Pinus massoniana hainanensis*) and 10 are globally vulnerable species, including *Calocedrus macrolepis*, *Saccopetalum prolificum*, *Aquilaria sinensis*, *Litchi Chinenesis*, *Amoora dasyclada*, *Hydnocarpus hainanensis*, and *Illicium ternstroemioides*.

Bawangling forest is one of the three key natural tropical rainforests in Hainan. Besides timber trees, it is also rich in various non-timber resources such as medicinal, ornamental and fragrant plants.

Medicinal plants include: *Millettia reticuiata*, *Eucommia ulmoides*, *Entada phaseoloides*, *Fibraurea recisa*, *Tripterygium wilfordii*, *Alpinia katsumadai*, *Amomum longiligulare*, *Kaempferia galanga*, *Alpinia oxyphylla*, *Cephalotaxus mannii*, and *Paris polyphylla.*

Ornamental plants include: *Asplenium antiquum*, *Rohdea japonica*, *Rhapis excelsa*, *Caryota ochlandra*, *Livistona chinensis*, *Arenga pinnata*, and *Alsophila spinulosa*.

1.2.2.2 Wild land vertebrate animals resources

Surveys of the reserve have recorded vertebrates from 28 orders, with 85 families and 365 species, and insects from 14 orders, with 134 families and 2,097 species.
In Category I of the China National Key Protected Animal Species are: Hainan Crested Gibbon (*Nomascus hainanus*） (globally Critically Endangered CR), Clouded Leopard (*Neofelis nebulosa*) (globally Vulnerable VU)、Hainan Peacock Pheasant (*Polyplectron katsumatae*), Common Water Monitor (*Varanus salvator*), Hainan Partridge (*Arborophila ardens*) (globally Vulnerable VU), and Burmese Python (*Python molurus*).

In Category II of the China National Key Protected Animal Species are: Chinese Three-lined Box Turtle (*Cuora trifasciata*, Globally Critically Endangered CR*)*, Sambar Deer (*Cervus unicolor*）, Green Imperial Pigeon (*Ducula aenea*), Silver Pheasant (*Lophura nycthemera*), Red Junglefowl (*Gallus gallus*), Mountain Imperial Pigeon (*Ducula badia*), Taiwanese Frog (*Rana rugulosa*), Large Indian Civet (*Viverra zibetha*), Small Indian Civet (*Viverricula indica*), Rhesus Monkey (*Macaca mulatta*), Chinese Pangolin (*Manis pentadactyla*）, Asiatic Black Bear (*Ursus thibetanus*), Common Otter (*Lutra lutra*), Yellow-throated Marten (*Martes flavigula*), Hainan Hare (*Lepus hainanus*), Giant Squirrel (*Ratufa bicolor*), Chinese Egret (*Egretta eulophotes*）, Common Kestrel (*Falco tinnunculus*), Jerdon's Baza (*Aviceda jerdoni*）, Shikra (*Accipiter badius*), Chinese Sparrowhawk (*Accipiter soloensis*), Crested Goshawk (*Accipiter trivirgatus*), Eurasian Sparrowhawk (*Accipiter nisus*), Besra (*Accipiter virgatus*), Mountain Hawk Eagle (*Spizaetus nipalensis*)、Crested Serpent Eagle (*Spilornis cheela*)、Black Eagle (*Ictinaetus malayensis*)、Eurasian Marsh Harrier (*Circus aeruginosus*)、Barred Cuckoo Dove (*Macropygia unchall*)、Orange-breasted Green Pigeon (*Treron bicincta*)、Thick-billed Green Pigeon (*Treron curvirostra*)、Red-breasted Parakeet (*Psittacula alexandri*)、Greater Coucal (*Centropus sinensis*)、Lesser Coucal (*Centropus bengalensis*)、Collared Owlet (*Glaucidium brodiei*)、Asian Barred Owlet (*Glaucidium cuculoides*)、Brown Fish Owl (*Ketupa zeylonensis*)、Collared Scops Owl (*Otus bakkamoena*)、Mountain Scops

Owl (*Otus spilocephalus*)、Brown Wood Owl (*Strix leptogrammica*)、Silver-backed Needletail (*Hirundapus cochinchinensis*)、Silver-breasted Broadbill (*Serilophus lunatus*)、Blue-winged Pitta (*Pitta moluccensis*)、Blue-rumped Pitta (*Pitta soror*).

Bird species included on the list of Sino-Japanese Migratory Bird Protection Convention that are sometimes present in the reserve include: Cattle Egret (*Bubulcus ibis*)、Little Heron (*Butorides striatus*)、Great Egret (*Casmerodius albus*)、Chinese Egret (*Egretta eulophotes*)、Besra (*Accipiter virgatus*)、Eurasian Marsh Harrier (*Circus aeruginosus*)、Common Crane (*Grus grus*)、Common Snipe (*Gallinago gallinago*)、Swinhoe's Snipe (*Gallinago megala*)、Slaty-breasted Rail (*Gallirallus striatus*), Eurasian Woodcock (*Scolopax rusticola*)、Wood Sandpiper (*Tringa glareola*)、Common Sandpiper (*Actitis hypoleucos)*、Common Greenshank (*Tringa nebularia*)、Green Sandpiper (*Tringa ochropus*)、Grey Nightjar (*Caprimulgus indicus*)、Fork-tailed Swift (*Apus pacificus*)、Dollarbird (*Eurystomus orientalis*)、Blue-winged Pitta (*Pitta moluccensis*)、Northern House Martin (*Delichon urbica*)、Red-rumped Swallow (*Hirundo daurica*)、Barn Swallow (*Hirundo rustica*)、Red-throated Pipit (*Anthus cervinus*)、Indian Tree Pipit (*Anthus hodgsoni*)、Paddyfield Pipit (*Anthus rufulus*)、Forest Wagtail (*Dendronanthus indicus*)、White Wagtail (*Motacilla alba*)、Yellow Wagtail (*Motacilla flava*)、Brown shrike (*Lanius cristatus*)、Black-naped Oriole (*Oriolus chinensis*)、Rufous-tailed Robin (*Luscinia sibilans*)、Daurian Redstart (*Phoenicurus auroreus*)、Common Stonechat (*Saxicola torquata*)、Japanese Thrush (*Turdus cardis*)、Scaly Thrush (*Zoothera dauma*)、Siberian Thrush (*Zoothera sibirica*)、Pale-footed Bush-Warbler (*Cettia pallidipes*)、Asian Stubtail (*Urosphena squameiceps*)、Lanceolated Warbler(*Locustella lanceolata*)、Yellow-browed Warbler (*Phylloscopus inornatus*)、Mugimaki Flycatcher (*Ficedula mugimaki*)、and Asian Brown Flycatcher (*Muscicapa dauurica*).

Birds included on the list of Sino-Australian Migratory Bird Conservation Convention which are also present in the reserve include: Greater Painted-snipe (*Rostratula benghalensis*)、Golden Plover (*Pluvialis fulva*)、Little Ringed Plover (*Charadrius dubius*)、Swinhoe's Snipe (*Gallinago megala*)、Pintail Snipe (*Gallinago stenura*)、Common Sandpiper (*Actitis hypoleucos*)、Fork-tailed Swift (*Apus pacificus*)、Wood Sandpiper (*Tringa glareola*)、Common Greenshank (*Tringa nebularia*)、Great Egret (*Casmerodius albus*)、Barn Swallow (*Hirundo rustica*)、White Wagtail (*Motacilla alba*)、Yellow Wagtail (*Motacilla flava*)、and Grey Wagtail (*Motacilla cinerea*).

These wild resources are known as “Green heritage” and “Species Gene pool”, and play a very important role in China’s biodiversity conservation, especially in the protection of rainforest.. The rapid biodiversity assessment survey conducted by KFBG confirmed the reserve’s rich and unique biodiversity in China and its unique primary rainforest in Southern China. Some fast-growing natural resources with a short life cycle could be utilized and developed.

1.2.3 Landscape resources

1.2.3.1 Geographical landscapes

(1) Xian Ren Lian Dan: at the 5.5km point of the Eastern main road. Three huge stones resemble a Chinese furnace surrounded by a small stream and dense seasonal tropical rainforest.

(2) Shi Shan Qi Rong: at the 11km point of the Eastern main road. There are natural stone columns, an unusually shaped Banyan tree and some other special vegetation.
(3) E'xian Mountain: north of the 13km point of the Western main road. There is a cliff and on the top of the cliff, rock peaks stand like forest. The cliff is 500-700m high and could be developed into a rock-climbing site.

1.2.3.2 Water landscape

(1) Qicha hot spring: 4km away from the Management Bureau. Surrounded by farmland. Spring temperature ranges from 45-60°C, spring flows at 1.5m^3/h.
(2) Waterfall: at the 8km point of the Yajia main road. The waterfall is 120m high and there is a pool close to the waterfall. The pool is quite clean and could be used for swimming.
(3) Double Dragon Deep Ponds: these two deep ponds are closely linked. They are 15.5km from the Management Bureau and surrounded by ravine rainforest. There are two waterfalls falling directly into the ponds and mist floats on the ponds.

1.2.3.3 Biological landscape

Vegetation in the reserve is divided into the following categories:
(1) Ravine rainforest: close to Dongyi on the Eastern main highway. The forest canopy is dominated by figs and *Schefflera octophylla*, the lower layers mainly consist of scrub dominated by *Calamus* sp.. The plants vary diversely between different layers of the forest and woody liana plants are common.
(2) Lower montane rainforest
This type of forest, a semi-deciduous seasonal rainforest, is found mainly in the buffer and experimental zones below 600m. The forest has only one canopy layer and is dominated by *Litchi Chinenesis*, *Amoora dasyclada* and figs..
(3) Montane rainforest
Montane rainforest covers most of the reserve and grows at altitudes between 600m and 1000m asl. The rainforest remains green all year round. Mountainous rainforest is the typical vegetation found in mountainous vertical vegetation belts in tropical areas. Unlike many other typical tropical rainforests, communities of Pierre Dacrydium (*Dacrydium pierrei*) and Thinshoot Syzyguim (*Syzygium araiocladum*) are dominant in the reserve. There are three layers of tree, one layer of scrub and one surface layer of plants.
(4) Montane evergreen forest
This is found between the tropical montane rainforest and montane dwarf forest on vertical belts at altitudes between 1000m and 1400m asl. Conifers occur in the forest, including *Keteleeria hainanensis*, *Pinus massoniana hainanensis*, and *Dacrydium pierrei.*
(5) Upper Montane moss dwarf forest
Distributed around isolated peaks with altitudes of around 1, 400m or along narrow ridges. The dominant species are *Rhododendron simiarum*, *Quercus hui*, and *Pentaphylax euzyoides*.

1.2.3.4 Cultural landscape

Folk culture: People of the Li Ethnic Minority live in Jiqian Village and Wangxia Village, etc. They retain traditional lifestyles and practices, such as weaving and rice grinding, as well as their traditional folk culture.

1.2.4 Ecological function and value

(1) Supply function: the forest system in this reserve provides local communities with many basic resources including food, firewood, water, timber and medicinal materials. The reserve covers the source of the Changhua River and the main water resources of the Songtao and Shilu reservoirs, water from which is used to irrigate

acres of farmlands downstream. The reserve also covers the source of the Daguangba reservoir---which supplies water to the whole of western Hainan for industry and agriculture. The reserve plays a very important role in maintaining water supply and enabling agricultural development. It is recognised as a key protected area in the *Hainan Ecological Province Development Plan*.

(2) Buffering function: the natural system helps maintain air and water quality, adjusts the climate, and controls disease.
(3) Cultural function: local people can benefit from the spiritual richness and recreational sources of the system.
(4) Sustaining function: the system produces and sustains primary functions such as producing oxygen and forming fertile soil.

1.3 Current status of natural resource management in the reserve

Since the Country started financing the reserve's infrastructure in 1992, the reserve has been liaising with other nature conservation organizations, institutes, colleges and universities, and domestic and international experts and scholars. The reserve has also striven for financial and technical support for its community work.

1.3.1 Protection

Protection work includes law enforcement, e.g. combating illegal logging and poaching, patrolling, preventing fires and restoring forest. Bawangling nature reserve used to adopt the closure policy of prohibiting entry and any activities of local people in the reserve. In the last 2 years wildlife resource protection had some achievements through rigorous combating of illegal activities toward natural resources.

In 2003, the reserve carried out various protection work focusing on the conservation of Hainan gibbon and its habitat such as routine patrols. Forestry police and reserve staff focused on some key areas such as Nanya, Mt. Nanbao, Nanban and Dongwu in Qingsong Township, and detected and dealt with 10 illegal cases. Confiscated live animals were set free and the dead were kept as specimens.

In 2003 the reserve made major efforts in the application for reserve extension from the central government. The National Nature Reserves Evaluation Committee and the China State Council approved the application. The staffing and demarcation of the reserve boundary are underway.

In 2004 a network of resource protection was developed and strengthened. "Spring Action" and "Summer Action" combated illegal entry and activities in the reserve. Two patrol teams were established for routine patrolling of two gibbon groups. Nancha River station, Donger station and Qingsong station formed the front line of the protection network. In 2004 the reserve seized many guns, traps and other poaching facilities.

Problems:

1. Poaching still occurs: there is still poaching in the experimental zone and some areas of the buffer zone (Mt. Nanbao, Nanban, back hill of Miao Village, Nanya and Dongwu). Guns and traps are commonly used to catch wild animals.
2. Lack of administrative funding: this places constrains on the development of the reserve. The current poor capacity is a large constraint for implementing effective protection.
3. There is no effective cooperation mechanism between the reserve and the communities. The potential for the communities to participate in protection needs to be developed.

1.3.2 Scientific Research

Research activities include: inventory survey, wildlife focused survey, and survey of gibbons. The high value of this reserve in protection and research has attracted many research institutes, experts and scholars from different organizations to conduct surveys and research.

Since its establishment in 1980, the reserve, in cooperation with the South China Institute for Endangered Animals, has been carrying out a project called "Ecological Research on the Hainan Gibbon" with funding from the National Natural Science Fund. This project has helped the reserve gather basic information on the gibbons' population, behaviour, breeding and diet. This project has provided the preliminary information for follow up research projects.

Between 1984 and 1989, in cooperation with Zhongshan University, the reserve conducted a survey of vegetation and gathered initial information about various vegetation types and the distribution of important tree species.

In 1995 Hainan Provincial Forestry Bureau and Bawangling Forestry Bureau carried out a demonstration project called "The sustainable development of natural tropical forest" organized by ITTO (International Tropic Timber Organization).

In 1998 a rapid biodiversity assessment was conducted by Kadoorie Farm & Botanic Garden, with Hainan Forestry Department, South China Institute of Botany, South China Normal University and South China Institute of Endangered Animals, confirming and revealing the existence of many species of conservation importance.

In 1998 the reserve and the Hainan Wildlife Protection Station (now renamed the Hainan Wildlife Conservation Centre, HWCC) conducted a census of Hainan gibbon.

In October 2003, seven organizations, namely the reserve, Hainan Wildlife Conservation Center (HWCC), Bawangling Forestry Bureau, South China Institute for Endangered Animals, Kadoorie Farm & Botanic Garden (KFBG), Fauna & Flora International (FFI) and East China Normal University, led by Dr Thomas Geissmann of Switzerland and funded by KFBG, together conducted another census of Hainan Gibbon followed by a workshop to formulate the *Hainan Gibbon Conservation Action Plan.*

In December 2003, the Life Science College of Beijing Normal University carried out the project "Ecological Research on Hainan Partridge and Hainan Peacock Pheasant".

In December 2003, East China Normal University carried out the project: "Research on Moss Species Diversity".

In January 2004 Hainan Ecological Education Center carried out a project called "Biological Research on GALLIFORMES species"

Since March 2004, the reserve and KFBG have cooperated on a project focussed on the restoration of the gibbon habitat. The construction of indigenous tree nursery gardens has begun. In January 2005, three Ph.D. students from the Beijing Institute of Zoology, the Kunming Institute of Zoology and South China Agricultural University started research on the ecology and habitat of Hainan gibbon. Their work is funded by a KFBG scholarship.

In March 2005, the China Academy of Forestry Sciences began projects called: "The Introduction of management skills for Wildlife conservation and reserve zoning", "The Distribution of *Dendrobium* and Breeding demonstration project" and "The Ecological Foundation of Protection and Restoration of Hainan Tropical Rainforest".

The projects listed above helped the reserve to understand more about their natural resources, provided technical information for the protection and conservation of the Hainan gibbon and its rainforest habitat, and also provided some basic information on the impact of communities' living near the reserve who use its natural resources.

Problems:

1. Lack of ability to monitor and conduct research independently.
2. Lack of funding to train technical staff.
3. There is still a need for further research into the relationship between natural resources and the human communities.
4. Lack of an integrated research plan; lack of stable funding for planning.
5. No resource monitoring system or resource database.

1.3.3 Publicity, education and community work

Every year Bawangling Forestry Bureau and the reserve work together 2-3 times to promote public awareness of resources conservation in adjacent local communities. Their main means of doing this are through films, slogans and posters and publicity road shows. The promotions help local people understand the importance of establishing and protecting natural resources.

In 1996, the South China Institute for Endangered Animals and HWCC launched a publicity drive. 150 experts from all around the country signed a letter appealing to save the Hainan Gibbon, a move which gained some media coverage. In 2003 the census of Hainan gibbon and the related workshop were reported by CCTV, the Hainan Branch of the Xinhua News Agency, the Hainan Daily and the Haikou Evening newspaper. This enhanced public awareness of environmental protection, and in particular protection of the gibbons and tropical rainforest.

In May 1996, the reserve signed the *Responsibilities Statement to Protect Hainan Gibbon* with Bawangling Forestry Bureau, township governments of Qingcha and Wangxia from Changjiang County, and Qingsong from Baisha County. The heads of Changjiang County and Baisha County made televised speeches supporting protection of the Hainan gibbon and issued a public statement, which increased public awareness of preventing illegal tree felling and hunting.

In August 2004 Bawangling Forestry Bureau and the governments of Changjiang County and Baisha County worked together to confiscate guns and traps in villages and markets. On Aug 3, 2004, over 700 traps were confiscated and the following day Baisha County Police seized more than 20 guns. This new system appears to be effective in reducing the threat of hunting in the reserve.

In October 2004, funded by FFI, the reserve organized a training workshop on community co-management and capacity building for the reserve staff and adjacent communities. These activities improved communication and understanding between the reserve and its neighbouring communities and enhanced public awareness of environmental protection. This was the first step towards effective co-management.

In February 2005, KFBG produced thousands of awareness-raising Hainan Gibbon "Hui chun" and distributed them to local people (mainly in Qingsong Township and Qicha Township, Baisha County) and all subscribers to the *Hainan Daily* newspaper.

In 2005, funded by the US Seacology Fund and cooperating with East China Normal University, Hainan Normal University, Zoological Society of Paris and Shanghai Zoological Society, the reserve provided financial support to 250 poor students living in neighbouring communities. For details see Annex 2:

Problems:

1. Lack of integrated publicity plan.
2. Lack of continuous monitoring of communities, hindering understanding of the communities.
3. Difficult to work in local communities due to the lack of mechanism.
4. Lack of stable and continuous funding.
5. Lack of basic skills in carrying out community work.

1.3.4 External communication and cooperation

The reserve has established cooperation with some international organizations such as the KFBG, FFI and the French Zoological Society, and some domestic organizations such as the South China Institute of Botany, CAS, the Beijing Institute of Zoology, CAS, East China Normal University, Hainan Normal University, Hainan Ecological Education Center, the China Academy of Forestry Sciences and Zhongshan University.

More than 100 international experts and conservationists from different countries and international organizations have visited the reserve, as well as over 500 experts, staff and students from national institutes and colleges.

Problems:

1. Lack of communication with other reserves, lack of communication channels.
2. Lack of good cooperation mechanism with other organizations and institutes. The cooperation with conservation NGOs and academic institutes should be enhanced.
3. Lack of cooperative projects. The reserve needs to improve its capability in project development and application.

Chapter 2：Use of Natural Resources by Adjacent Communities

The life of human beings is closely linked with natural resources. The natural resource management of the Bawangling Nature Reserve thus affects the livelihood of adjacent communities. Local people there settled in Bawangling and started to use natural resources a long time before the establishment of reserve. To effectively conserve the natural resources in the reserve, it is necessary to know the current socio-economic status of local people as well as their ways of using natural resources in the reserve.

Over recent years, with assistance from intermediary organizations, understanding and communication between the reserve and neighboring communities has been improved.
In July 2004, funded by FFI, Hainan Ecological Environmental Education Center (HEEC, a local NGO) and Bawangling Nature Reserve cooperated in carrying out the socio-economic survey of representative communities adjacent to the reserve. The community co-management workshop in October 2004 also promoted the understanding between the communities and the reserve. In November 2004, the reserve visited 8 neighbouring communities in Qingsong Township, Baisha County and held village workshops to discuss many issues of common interest on co-management. The local governments in Baisha county and Qingsong township together with the local forestry department also provided information and documents concerning adjacent communities, which were very helpful in composing this chapter.

Based on the survey data and secondary information, this chapter intends to set out a comprehensive and concise picture of the socio-economic background of adjacent communities, especially the use of natural resources. However, due to the time constraints and the lack of secondary information caused by long-term neglect of the neighboring communities, the information we collected is limited. Despite our best efforts to ensure the accuracy and objectivity of our information and analysis, we must admit that we can only base our study on the limited information we have, which is not as complete as would have been ideal. Also, some information collected in 2004 is already out of date. With the reformation of the taxation system in rural areas as well as the implementation of several development projects, some of the problems tabled by villagers have already been solved. To better understand the communities and more effectively harmonize the relationship between community development and biodiversity conservation, more in-depth research should be carried out.

2.1 Methodology of the community survey

Cooperating with the FFI, HEEC recruited 14 student volunteers from the Hainan Normal University, and built up a survey team with 4 members from HEEC, 14 student volunteers, 3 staff from the nature reserve and 2 project officers from FFI. FFI delivered training courses on the theory and methodology of Participatory Rural Appraisal (PRA) from July 22nd to 25th 2005. The survey team thus exercised the PRA tools in villages near the management bureau of the reserve over the next 2 days. From July 28th to 31st, the survey team split into 4 sub-teams, and did the survey in 8 villages - Zhizai, Yitiao, Kunbao, Nanye, Zibao, Xinfeng, Miaocun and Xinqing - in Qingsong Township, Baisha County as well as two villages in Qicha Township, Changjiang County.

The selection of villages to be surveyed was based on their geographical location and their impacts on the natural resources of the nature reserve. First, we directly picked out the villages

closest to the nature reserve. Then, according to nature reserve staff experience, we selected other villages whose populations most frequently enter the reserve. Although the focus of the survey was Qingsong Township, we also chose two villages in Changjiang County to see how villages in different areas related to the reserve. As the action plan is only aimed at communities in Qingsong Township, the information from these two villages is not included in the data presented.

Beside having interviews in public sites, the team also visited 68 households among which 12 are in Zhizai, 15 in Yitiao, 3 in Kunbao, 4 in Nanye, 11 in Zibao, 9 in Xinfeng, 7 in Miaocun and 7 in Xinqing. The survey covered subjects of both genders and various ages and economic levels.

Differing from the traditional 'question-answer' survey method, the PRA method required surveyors to debrief, learn and elicit suggested solutions from the subjects. This method encourages residents to think about and better understand their community's situation. Participation is the key characteristic of the PRA method. While external surveyors normally only enquire, summarize and impose a conclusion on their subjects, PRA allows subjects to provide their own analysis and conclusions.

In gradual development since the early 1990s, PRA has been widely used in rural areas, and has become an important tool for nature conservation. This survey used many PRA devices including semi-structured interviews, community historic records, ichnography & resource maps, season calendars, and family trees. Semi-structured interviews allow the interviewee to answer open-ended questions, which can be adjusted during the interview as it develops. Community historic records allow surveyors to understand the historic changes on natural resources over time. Ichnography & resource maps are drawn by community residents to show their understanding of the natural resources available around their community. Season calendars show how communities use different resources at different times of year. Family trees help show how a community's population are related to one another.

2.2 Geographic location, regionalism and nature status

Qingsong Township is in the southwest of Baisha County and in the mountainous eastern area of Bawangling. The township borders Nancha to the east, Changjiang County to the west, Guangya to the north and Nankai Township to the south, covering a total area of 276.5 km^2. There are 6 mountains of different size in the township. Qingsong Township's 6 Village Committees govern 28 villages, 38 village teams and a government-run farm. The Township has a total population of 8, 330, including 1, 470 households. Of the 8, 330 population, 7,560 are registered as farmers (provided by county government).

There are 8 villages close to or adjacent to the nature reserve. These are Zhizai, Yitiao, Kunbao, Nanye, Zibao, Xinfeng, Miaocun and Xinqing. These villages were all surveyed using PRA (See Graph 1 for relative locations)

These 8 natural villages are governed by two Administrative Village Committees. Yitiao Village Committee governs Yitiao, Kunbao, Nanye, and Zhizai. Qingsong Village Committee governs Xinfeng, Miaocun, Xinqing and Zibao. Each Village Committee is made up of one secretary, one deputy secretary, one female representative, and one security director. The natural villages are managed by a village head and deputy head. All the officers mentioned above are nominated by the administrative village committees. Village heads and deputy heads were directly elected by villagers for a three-year term. The Qingsong Township Government is based in Yitiao Village, where there is also a police station, and financial department.

Originating in the Bawangling Nature Reserve, the Nanba rivulet, and Nankai and Nanhuo rivers are all branches of the Nandu river - the largest river on Hainan Island. The Nanba rivulet flows through Zibao, and the Nanhuo river flows through Miaocun, both provide water for their respective communities. The climate here is tropical monsoon. The dry season lasts from November to April, while the rainy season runs from May to October, with most rainfall occurring July to October.

Figure 1: Relative location of nature reserve and adjacent communities of Qingsong township.

All the villages shown on Figure 1 are located around the nature reserve. Following Bawangling's expansion, all the villages, except Kunbao, border directly with the reserve's boundary. Miaocun, Xinqing, Xinfeng and Zibao are located in the foothills of Futou Mountain. Futou Mountain itself is in the nature reserve's core area, closest to the gibbons' habitat. According to the villagers of Miaocun, the gibbons' calls can frequently be heard in the village. Yitiao, Nanye and Zhizai border the northeast of the nature reserve, quite far away from the core area.

The communities are usually surrounded by rice paddies and dry farmland including fruit orchards and rubber plantations. Nearby hillsides feature natural pine trees, rubber trees and human affected montane rainforest. The collective forest areas owned by Miaocun and Zibao

have been contracted to Zhizai Rosin Factory (ZRF), for the planting of rubber trees. Since the expansion of the nature reserve, additional woodland owned by ZRF (a state-owned company managed by the Bawangling Forestry Bureau) has been included in the experimental zone of the reserve.

2.3 Ethnicity, population and culture

According to the data provided by the township government (please refer to Table 1), there are a total 574 households with 2, 822 persons in the 8 target villages[1].

Table 1: Population and ethnicity of target communities

Community	Zhizai	Yitiao	Kunbao*	Nanye	Zibao	Xinfeng	Maiocun	Xinqing	Total
Population	710	519	517	190	232	113	329	212	2822
Household	138	106	105	36	55	25	64	45	574
Average capita/household	5.1	4.9	4.9	5.3	4.2	4.5	5.1	4.7	
Ethnicity	Li	Li	Li	Li	Li	Li	Miao	Li	

*The above data from Kunbao village was obtained during our interview, the government has not reserved the related files.

Among the 8 villages, Xinqing and Xinfeng immigrated from Nankai Township in around 1971. The other villages all have much longer histories. Miaocun, for example, originally founded by people from Guangxi and Yunnan Provinces, has a history of more than 200 years. Zibao has experienced several changes. The old Zibao village was located on Wangpao Mountain, but moved to its current position after a fire decades ago. Because of an increase in the village's population, Zibao split into 2 sub-villages.

Except Miaocun, where most of the villagers are ethnically Miao, more than 98% of residents in the other villages are considered Li, with very small population of Han Chinese. Li people cannot understand the Miao language, but some Miao people can understand Li's. Intermarriage between Miao and Li ethnicities is unusual.

All the women of Li and Miao minority possess the same rights as men, including the right to speak openly, to make decisions and the right to education. Women mainly take charge of housework, looking after the old people and children, crop planting and picking wild plants. Men take charge of the more physically demanding agricultural work including rubber cutting and picking, cow herding and plowing. Women and men cooperate on uprooting, fertilizing, and reaping crops.

Traditional culture and life style are partly preserved in the Li and Miao villages, this includes the celebration of several traditional ethnic festivals, as well as following traditional ways of life such as cutting and burning to clear land for agricultural use, hill planting, harvesting wild plants and hunting. In most villages, residents said hunting used to be a key part of their lives but has

[1] The population data collected during the survey records 2844 persons in 558 households. The difference with the data provided by the government might stem from the different dates of survey.

decreased in importance and is now seen as a way of generating supplementary income, or even just entertainment. But people in the villages still have respect for the hunters as before. The government has issued a hunting ban and has been gradually confiscating guns, but villagers, especially from the older generation, have been generally unwilling to give up their weapons.

Leisure activities in the village still follow some traditional pastimes, but influence from outside is also strong. The main pastimes in the village are chatting, listening to the radio, singing karaoke, playing cards, watching TV and playing drinking games. However most of the people's time is taken up with farming and working, so leisure time is limited. In Xinqing and Xinfeng there are not many TV sets and the main activities are drinking and chatting. Sports activities are organized during festivals in which villagers are enthusiastic to join. Traditional embroidery is popular among Miao women but was not found to be popular in other villages. Although ethnic villagers preserve their traditional dress for special occasions, they do not wear traditional costume every day.

2.4 Current status of socio-economic development

Most of the villages governed by Qingsong Township are close to the nature reserve. According to materials provided by the Basha County administration, the main source of income for villages in the Township are rubber planting and agriculture, with some animal husbandry. Qingsong Township's economic level is lower than other townships in the county. The 8 target villages around the nature reserve have similar incomes to other villages in Qingsong Township. However, the income levels of Xinqing and Xinfeng villages are relatively lower than the other 7 villages by about 100-200RMB (12-25 US $, 1 US $ = 8 RMB) because they are immigrants with poor soil.

The community's incomes are directly influenced by local economic plans and policies. In Baisha county, policies relevant to forestry resource conservation and local livelihood include the Grain-to-Green Program (*tuigenhuanlin*), forest restoration, establishment of eco-villages, the processing of forest produces and related industrial development, eco-poverty alleviation demonstration projects, anti-wild animal trade and other projects (see annex 3).

Among the 8 target villages, Zhizai began implementing the Grain-to-Green project in 2002, converting agricultural hill land into forest. Families implementing the project receive 150 kilograms of rice and grain and RMB 20 (2.2 US $) yearly for each 1 Mu (1 Mu = 667 square metres) converted. So far 30 Mu have already been replanted as forest.
Since 2002 a poverty alleviation education program has been implemented, with the government subsidising villagers school fees. In 2004 the government covered 20 per cent of each child's fees.

Zibao and Xinfeng have developed bio-gas projects, with farmers receiving subsidies of RMB300-700 to construct the necessary facilities. Xinqing operates a rubber sapling poverty alleviation program in which villagers could buy saplings for RMB1 each, much less than the market price of RMB10. Zhizai has a project to supply clean tap water to the village. Kunbao has carried out a betel nut palm program for over 100 Mu in 2002, with betel nut palms provided free by the government. In Nanye the government supplied building materials for the construction of family homes in the village. Since 2005, six Qingsong Township livelihood development projects have been running in the communities around the nature reserve. Most notable is an exemption from farm tax covering the whole of Hainan Province, and an exemption from specialty farm tax since 2004.

The nature reserve's conservation policies have also had significant impact on adjacent communities. According to villagers, before the reserve was established deforestation was unrestricted. Although the reserve was established in 1980, deforestation in the reserve was only prohibited from 1992 onwards. Use of wood from the forest outside the reserve now also needs to be approved by local forestry bureau. Between 2001 and 2004, several gun confiscations took place. In August 2003, the nature reserve boundary was enlarged, and patrols and management were strengthened. Some villagers claimed that they did not know where the new boundary is and some villagers do not accept the former boundary either.

2.4.1 General situation of community infrastructure

2.4.1.1 Transportation and communication

Roads connect Yitiao, Nanye, Kunbao and Zhizai with the county seat, Baisha, but roads are often in bad condition. There are no regular buses taking villagers to Baisha, so they usually travel by motorbike, tractor or pay for a lift. Zibao, Xinfeng, Xinqing and Miaocun are surrounded by mountains on all four sides, with only one common main road to township center and a few footpaths linking them to each other. The main road is a clay road and can become impassable during the rainy season.

Miaocun has one hill path and an unsurfaced road leading from the village to the main road. Money collected from Miaocun residents is used to pay for maintenance. The lack of funds prevents better road paving from being laid.. Motorbikes are the most common vehicles used for travel between the villages. Motorbike ownership varies greatly - the ownership rate in Miaocun is 90% while it is only 20% in Xinfeng.

In order to improve the villages' transportation links, the township government has started to improve the main road connecting four villages inside with the township center in Xitiao. A cement surface is to be laid on the road in October.

So far none of the villages are covered by a mobile phone network. Landlines, which were installed around 2003-4, cover Yitiao and other 3 surrounding villages, the other 4 villages are not connected. Telephone charges are RMB0.8 per minute for inter-province calls with a monthly line rental of RMB13. Having a telephone line installed costs around RMB150-200 per set. In Zhizai, 20 families have telephones, there are 47 families with telephones in Kunbao and 8 in Nanye. However, most people rarely use their phones, and some telephone connections have been shutdown. The township government plans to build a mobile phone mast in 2005, at that time the mobile signal will cover Yitiao and surrounding 3 villages.

Although television sets are not widespread in Xinqing and Xinfeng, TV sets and radio are very popular in the other 6 villages. Most families in Yitiao, Kunbao, Zibao and Zhizai have their own TV sets and 80 per cent of families in Miaocun have TVs and acoustics. However in Xinqing only 5 families, 11 per cent of all families in the village, have TVs, and in Xinfeng ownership falls to just 2 or 3 families - 7-10% of all families in the village. TV and radio are the main channels available through which villagers can access news and information.

Although there are postmen and postal delivery services in each village, there are no post offices. People must go to the ward government to send letters.

2.4.1.2 Electric power and drinking water

Since 2002, all 8 target villages have had electricity. The drinking water situation is different in each village. All families in Zibao and Xinfeng have access to clean, unpolluted tap water, piped

from the Nanmen River in Mt. Futou. Used water is drained onto the village's farmland, and back into the river. Some sewage enters the river through this process. Because the water is less than before, sometimes the villagers have to fetch drinking water by themselves. Kunbao and Nanye also have tap water projects, but due to the water shortage, it is sometimes necessary for villagers to fetch water elsewhere.
Zhizai and Yitiao have also completed tap water projects.

Water used by Miaocun comes from forest in the nature reserve to the north of the village. There are also some wells drilled by villagers in the past. Miaocun started its own tap water project in 2005 and it has finished by the time this action plan is written.

Drinking water in Xinqing comes from a rivulet in the nature reserve. Due to problems with the piping of the water, only some parts of the village have access to tap water and most villagers have to collect and carry water from a pool higher up the mountain, others depend on their own wells. According to Mr. Zhang, the head of the village, water keeps decreasing and drying up, so it would not be reliable to pipe water from higher up the mountain. However, the village has still commenced a tap water project, completed on 25th Mar 2005.

2.4.1.3 Housing

At present, there are three main types of housing in the villages: tile roofed bungalows, corrugated-iron roofed brick/clay houses and grass-roofed brick/clay houses/huts. The grass-roofed brick/clay houses are the most traditional and have low construction costs. Most villagers aspire to live in the more modern tile-roofed bungalows. In all the villages, high schools and elementary schools are tile-roofed bungalows or storied buildings.

There are still 12 households in Yitiao living in grass-roofed huts and 4 in Kunbao. There are few bungalows in Xinfeng (total 3) and Xinqing (total 10) with the remaining 30 households are still living in traditional huts. Due to the lack of sties, pigs roam freely around the villages. The only washroom is in the village clinic.

Nanye has no grass-roofed huts any more. Families in Miaocun almost all live in tile-roofed bungalows with special sties, washrooms, bathrooms and cement flooring.

2.4.1.4 Market

Generally speaking, market and trade play an important role in the rural economy. In the target communities, produce and forest products are mainly traded through Qingsong Township, Guangya and Qifang markets. Some businessmen will go to the village to purchase produce, but villagers don't want to run such businesses on their own.

Common produce sold by the villagers includes corn, tapioca, sugarcane, rubber, a little venison and some medicinal plants. As farmers, villagers are able to supply their own vegetables, fruits, livestock, leading to a large degree of self-sufficiency. Only necessities such as electrical appliances, meat, oil and salt need to be purchased externally.

There are canteens in every village. In Yitiao, there are 7 canteens, 1 veterinary clinic, 1 food market and 1 motorbike repair shop; in Zhizai, there are 2 canteens, and1 rice-flour shop; in Miaocun, there are 2 canteens, one of which also sells meat and rice-flour; in Xinqing, there are 4 canteens, 2 shops specializing in pork and fish, and 1 rice-flour shop.

2.4.2 Community service system

2.4.2.1 Elementary education in schools

At present, most people in the 8 villages only received a primary school education (including those who graduated normally and those who did not), few graduated from middle or high school. So far, there are 7 high school students in Zhizai,5 or 6 in Yitiao, 3 in Xinqing, 1 or 2 in Nanye, Zibao, Xinfeng and Miaocun, and none in Kunbao.

At the moment nearly all children in the villages receive a primary school education. Participation in middle school is low, according to the villagers, 80 per cent of students in Zibao and Xinfeng attend middle school, but few children in Miaocun and Xinqing do so with many dropping out during their first 2 years of study. This in turn leads to lower high school enrolment. Based on the data provided by the schools, only 10 per cent of students continue their education through high school.

There is one primary school, the Qingsong central school in Yitiao, one primary school in Zhizai, and one primary school in Xinqing. The Qingsong primary school was established with Japanese sponsorship. There is a middle school in Yitiao, called the Qingsong middle school, it is the only one in the township. For detailed information on these local schools please refer to the table 2.

Table 2: Detailed information on community schools

Name	No. of Students	No. of Teachers	No. of Classes	Grades Taught
Qingsong middle school	367	15	6	Junior level 1 to level 3, Two classes each level
Central school	300	13	7	Pre-education grade – grade 6 One class each grade
Zhizai primary school *	164	6	6	Grade 1 to grade 6, One class each grade
Qingsong primary school	276	7	6	Grade 1 to grade 6, One class each grade
Total	1107	41	25	

*Zhizai primary school will be merged into a central school soon.

Before 2005, with the support of province's poverty alleviation program, expenses were RMB 88 per semester for each primary school pupil and RMB 156 per semester for each middle school student. Without the support of this program, primary school fees were RMB 156 per semester, while middle school pupil's fees were more than RMB 300 per semester. Due to the policy of 9-year compulsory education, only high school students should pay tuition which makes the education charges of high schools much more expensive.

The education poverty alleviation program had a duration of 3 years from 2002 to 2004, in which 20% of education charges excluding books are covered by the government, leaving 80% to the student's family. Generally, students have to lodge when studying at Qingsong middle school, and boarding costs are about RMB 10-20 per week. From 2005, Primary and Middle school students in Hainan Province are exempt from textbook charges, and pupils in these communities are only required to pay RMB 5-7 for exercise books each semester. An additional insurance fee of RMB 20 is voluntary. The middle school students are only required to pay RMB 20 for lodging and RMB 37 for incidental expenses.

Understanding that education can improve their children's ability to earn money and improve living standards, most villagers are keen to support their children's education. Despite this, there is still a high dropout rate, mainly due to families' economic situation. Most pupils from these communities are 13-16 years old by the time they finish their primary school education. From primary grade 5 onward, because girls seem to enjoy studying more than boys, there are more girls than boys in school. Some parents complain that the standard of education offered at the schools is poor and worry about the security of their children on the way to school due to bad conditions in the rainy season. If money was not a factor, many say they would like to send their children to better schools elsewhere.

Our interviews with children showed they were rarely taught about the natural environment or conservation and most did not know the location of Bawangling Nature Reserve or the relationship between the nature reserve and their own lives. In the central school, nature studies are taught from grade 4 and middle school students said their teacher had mentioned something about the nature reserve. The heads of local schools complained they were constantly challenged by a shortage of teachers and funds.

2.4.2.2 Sanitation and medical care

Sanitation and medical care are very limited and basic in the communities. There is 1 township-level hospital in Yitiao, one internal hospital at the rosin factory, and one clinic in Xinqing staffed by only one healthcare worker. There are no formal clinics in Zibao, Miaocun or Xinfeng, although Xingfeng does have a small private clinic opened by a graduate from basic nursing school. Medical facilities in the village-level clinics are very basic, but the medical charges there are quite high. The communities still have a strong tradition of using "Nanyao" (Chinese traditional medicine) to treat illnesses and the picking and cultivation of herbs used for medicines is still popular.

The sanitary, or otherwise, conditions in the villages are also affected by the villagers' traditional ways of life. Livestock are mostly allowed to wander freely and there is no infrastructure in place for processing garbage. As a result rubbish builds up around the village. Due to the lack of sanitation, natural decomposition is relied upon to break down human and livestock excrement. The discarded rubbish and decomposing human and animal excrement combines to create an unsanitary environment. This unsanitary environment is one reason why disease amongst poultry and livestock, and people, is not uncommon.

2.4.2.3 Popularization and service for agricultural technology

The main sources of information for villagers, including agricultural information, is TV and radio. Villagers know there are agriculture technicians in the township, but so far the technicians have not delivered any training to them, resulting in a lack of awareness of modern farming methods. Information about protecting forestry and water resources has been broadcast to the villages, but some villagers reported that, aside from this, there has been no formal training relating to forestry or agriculture. According to the township government, however, training had been provided to

village delegates who were then supposed to return to their communities and pass on what they had learnt.

According to villagers in Xinfeng and Miaocun, no technical information or economic benefits were included in the poverty alleviation program, and they had not heard of "3 go to the countryside", a project to provide technical skills, education and health awareness. When there was an outbreak of disease amongst villagers' poultry and livestock, they were unable to contact the farm technicians to get help. Villagers in Miaocun said the poverty alleviation program had provided rubber tree saplings, but had not included training in how to look after the plants. Some of the villagers found the saplings had been attacked by termites badly, and because of lack of awareness of how to treat this problem, half the saplings were wiped out. Some villagers were not even aware of the saplings' value as a crop and burned them as firewood. Although there is no systematic training, villagers often exchange-farming knowledge between themselves, and most of the villagers' agricultural skills are learned in this way.

2.4.3 Status of community livelihoods

2.4.3.1 Economy income

According to our interviews, farming accounts for the largest proportion of the eight villages' labour force. As well as engaging in agriculture, some villagers also run their own canteens or mills or go outside the village to find work to increase their income. There are 2-5 canteens and mills in each village. Few villagers take part in the buying and selling of produce.

The main crop is rice with tapioca, corn, sugar cane, jicama (*Pachyrhizus erosus*), rubber and fruit (mango, banana, betel nut etc) also being farmed as cash crops. The cultivation and collection of fungus, medicinal plants, rattans and palm leaves from the forest provides an important supplementary income. The raising of poultry and livestock is mainly for villagers' own consumption although surplus meat can be sold. There are 1 or 2 families in each village specializing in breeding ducks and pigs.

Most of the villagers who leave the communities to work are young women who travel to big cities to work in the service industry, often in restaurants. 40 per cent of the young men and women in Yitiao travel outside the village to find work. Most males do agricultural work - there are more than 20 villagers planting watermelons in Wenchang with a salary of RMB 200-300 per month (the employer covers food and housing). Nearly 100 people of Kunbao's villagers work elsewhere, and in Nanye, 10 villagers work outside the village. In Miaocun, the village's men are more willing to stay at home, female middle school graduates account for most of the villagers who earn their money outside the community. These women generally work in restaurants, but rarely stay away for more than 1 year. They often return at peak farming seasons to help in the village. More than 10 people from Xinqing work outside the village, including women working in restaurants and men working as builders in big cities.

2.4.3.2 Type and status of soil utilization

According to the figures provided by township government, there are 1912 Mu of paddy and dry fields,5840 Mu of rubber, and 1348 Mu of tapioca across the 7 villages (not including Kunbao). The average land holdings per capita are paddy and dry field - 0.82 Mu, rubber tree - 2.5 Mu and tapioca - 0.58 Mu (for details see table 3).

Table 3: Land use pattern in target villages*

Community	Yitiao	Zhizai	Nanye	Zibao	Xinqing	Xinfeng	Miaocun	On Average
Population	519	710	190	232	212	113	329	
Households	106	138	36	55	45	25	64	
Paddy fields (Mu)	430	480	167	260	145	134	296	
Rubber tree field (Mu)	1100	1450	726	828	528	408	800	
Tapioca field (Mu)	240	520	138	245	90	60	55	
Paddy field per household (Mu)	4.1	3.5	4.6	4.7	3.2	5.4	4.6	**4.3**
Rubber tree field per household (Mu)	10.4	10.5	20.2	15.1	11.7	16.3	12.5	**11.4**
Tapioca field per household (Mu)	2.3	3.8	3.8	4.5	2.0	2.4	0.9	**1.6**
Paddy fields per capita (Mu)	0.8	0.7	0.9	1.1	0.7	1.2	0.9	**0.9**
Rubber tree field per capita (Mu)	2.1	2.0	3.8	3.6	2.5	3.6	2.4	**2.3**
Tapioca field per capita (Mu)	0.5	0.7	0.7	1.1	0.4	0.5	0.2	**0.3**

*Data from Kunbao Village lacking

According to data collected during the interviews, the most common crops include rice, sugar cane, corn, tapioca and rubber trees. Betel nut palms, fruit trees and vegetables are planted around the houses. Because of the increasing population, although food supply is not currently a problem, the paddy field per capita is limited. Interviews from all the villages reported that fruit growing was unpopular due to the lack of agricultural knowledge and poor financial returns.

Dry field crops varied from year to year depending on price fluctuations and which crops offered the best returns. Because of transport problems in Miaocun, Xinqing, Xinfeng and Zibao, sugar cane could not be taken out of the village, so villagers did not plant any. Sugar cane was grown in the other 4 villages. Because tapioca and sugar cane can be harvested within 1 year of planting the returns are fast making them a popular cash crop with villagers. The dual planting of rubber trees and tapioca was adopted by most families during the first few years of rubber planting.

Rubber trees have been planted in all 8 villages, but the number of trees, harvesting time scale and income they provide vary greatly. Rubber can only be harvested 7-9 years after planting. How early rubber can be harvested and the quantity produced depends on how well the trees are looked after. Among the 8 communities rubber planting has been practised longest in Miaocun. According to our survey there are more than 10 families with a yearly rubber income of RMB 5-6,000, 3-4 families have 200-400 individual plants with an annual rubber income of around RMB 10-20,000. In Zhizai, Zibao and Nanye, rubber planting has been going on for more than 7 years.

Most rubber trees have been producing rubber for more than 2 years, and a few have produced for more than 10 years. Generally, families have 1-2 Mu (1 Mu = 677 square meters) of rubber plantation with 35–100 individual trees, producing around 1-2 sheets of rubber daily, worth 10-20 RMB. The rubber income reportedly accounts for 40% of these villages' total income. Most rubber trees in Yitiao started to produce rubber in 2004. Output was limited, and only a few families are able to claim a rubber income of more than RMB10,000 a year. In Xinfeng and Xinqing, rubber planting only began 3-5 years ago. At the moment no more than 5 families' rubber trees are producing rubber.

Currently all the villages are expanding their rubber plantations. Since 2003, the market price of rubber has increased sharply, and villagers hope planting more rubber trees to increase their income. Because the price of rubber seedlings can be as much as RMB 10 per individual plant, villagers want the seedlings to be provided at a subsidy under the governments' poverty alleviation program. As a result of the exemption of farm tax and farm special tax, together with the rising prices brought by farm produce, enthusiasm for planting has increased as has demand for more agricultural land.

2.4.3.3 economic income and expenses

According to the information provided by the township and county government, the average annual income in 2003 for all eight villages, except Kunbao, was RMB1550 (about 194 US$)per capita. From the community survey we got a basic understanding of the economic income and expenses of each household unit.

The following data was collected from a typical family in Zhizai. Although this family's income level was above the average for the village, this family was selected because of the completeness of income and expenses' data. By working out expenses and sources and quantities of income (see Table 4), we tried to better understand the link between the natural resources in and around the nature reserve and villagers lives. The family has 6 members: 2 parents, 1 child who farms in the village, 2 children working outside the village and 1 child studying in Qingsong middle school. The main sources of income were mostly from agriculture with some extra income provided by harvesting wild plants from the mountains. This situation is representative of the majority of families in the village.

Table 4:The total income of a representative family in 2003

Income type		**Unit price (RMB)**	**Quantity**	**Annual Cash income (RMB)**	**Remarks**
Produce or forest products consumed	**Rice**	1.2-1.6 RMB/kg	About 1000kg from 2 units of field	1200-1600	Good water supply was necessary; only a little surplus for sale
	Corn	1.2 RMB/kg	50kg from half of unit field	60	
	Cattle	1500-2000 RMB/per animal	Not for sale	0	Herd kept in forest in the nature reserve

	Firewood	Uncertain	Not for sale	0	Collected from the forest
	Wild herbs and vegetables	Uncertain	Not for sale	0	Picked around the fields and forest
	Timber	Uncertain	Not for sale	0	Collected from the forest in and around the reserve
Produce or forest products for sale	**Rice**	1.2-1.6 RMB/kg	Partly for sale	100	Good water supply was necessary; only a little surplus for sale
	Tapioca	200 RMB/ton	9tons from 6 units of field all for sale	1800	
	Rubber	10RMB/kg	200 individual plants in 5 units of field	6000	Growing in the family run plantation
	Yizhi (Fructus Alpinae Oxyphyllae**)**	20 RMB/kg	10kgs	200	Collected from the forest in and around the reserve
	Palm leaves	1 RMB/kg	500kgs	500	Collected from the forest in and around the reserve
	Rattan	1.4 RMB/kg	Only a few	30	Collected from the forest in and around the reserve
	Pigs	500-1000 RMB/ individual	Only 1 pig for sale	500－1000	Kept in a sty or free-ranging in the village
	Wild animals	Uncertain	Seldom	Uncertain	Hunted from the forest in and around the reserve
	Labor export	Uncertain	2 children work outside the village	1400 combined sent back to the family	
Expenses (refer to table 5)	**Seedlings, pesticide, fertilizer**	1000			
	Education expenses	800			

	Commodity expenses	6000			
	Sub-total	7800			
Gross income (RMB)		**11, 790-12, 690 (without the income from hunting）** **10, 390 - 11, 290 (excluding the income of labor export)**			
Net income (RMB)		**3, 990 - 4, 890 (without the income from hunting)** **2,590 – 3, 490 (excluding the income of labor export)**			

* The income provided by hunting was uncertain, however according to the survey we have a rough price list. Cobra RMB 100/kg, king cobra RMB 240 /kg (highest), mountain boar RMB 24/kg, Chinese three-striped Turtle RMB 20,000-24,000 /kg (extremely difficult to find, only 1or 2 are caught in the wild annually). Though there was no income from cattle breeding, wild herbs and vegetables, firewood or timber collecting, none of these require a financial outlay and so do not represent a loss.

Table 5:The total expenses for an average family in 2005

Expense type	**Annual expenses**
Rubber saplings	RMB3.5-10/individual plant, generally RMB300 / unit of field
Seedling, pesticide, fertilizer	1 unit area of tapioca requires 25kg of fertilizer and pesticide is required 2-3 times annually. Fertilizer expenses for rubber work out at around RMB2.5 for each individual plant. Fertilizer expenses for corn and rice are unknown. The annual total expenses for an average family were around RMB1000.
Other commission charges	Since 2004, there have been no expense on selling sugar cane production.
Education expenses	RMB176 for annual primary school charges, about RMB300 for annual middle school charges plus RMB20 per week for room and board. High school charges were unknown.
House building	A license is required to fell trees in the forest. The cost of getting 50 joists from forest is about RMB300. The average cost of building a house is about RMB15,000 to 20,000.
Daily expenses and medical care	Pork: RMB20-30/kg; lard: RMB12-14/kg; lighting electricity: RMB0.6 /unit. Medical expenses are comparatively high. Most families spend around RMB500 (including medical care expenses) monthly
Wedding expenses	According to information from one man, wedding guest are expected to spend around RMB1,500 on a gift. The cost of holding a wedding feast was around RMB5,000-6,000
Taxation	From 20th Mar 2004, no farm tax has been levied. From Jan 2005, no special farm tax has been levied.

The family expenses shown above covered a family of 6 with four members living in the village. Excluding the income provided by the two children living away, the four-members family's gross annual income was around RMB 10, 390-11, 290 (US$ 1299-1411), averaging RMB 2598-2823 per capita (US$ 325-353). After deducting expenses the family net income was approximately RMB 2590-3490 (US$ 324-436), RMB 648-873 per capita (US$ 81-109). The main crops were rubber, sugar cane and tapioca, together providing 60-75per cent of the total income. Harvesting from the forest represented 15%-25% of the total income, with other sources accounting for 10%-15%. The direct income from natural resources accounted for at least 20% of the total income.

2.4.3.4 Types and character of livelihoods

There are two clear characteristics of the communities' livelihoods. Firstly, income was mainly generated through farming and relied on soil resources. Secondly, although resources from the forest were not the main source of income, they were essential to the lives of villagers, for example firewood and timber. Communities collected wild medicinal plants and other forest plants for sale, which has been a local custom for a long time. Families harvest herbs from the forest during periods when their farms are not producing, considering this an important source of income. According to the calendar drawn up as part of the survey, idle periods occurred before the lunar new year (end of January), after the lunar new year (end of February), after spring ploughing (end of April to May).

2.5 Utilization of natural resources

The ways villagers used natural resources were various. Some resources were sold for cash while others were necessary for the villagers' own lives. The use of resources was different among the villages and also changed depending on the season.

2.5.1 Hunting

According to our survey, hunting around the villages and in forest further away was common. Most villagers were able to use traps, snares and guns for hunting. People said hunting was a traditional craft, which could not only provide meat but also extra income. According to villagers, in the past there were plenty of wild animals in the forest and hunting was easy. But in the last 5 years, the number of animals has decreased. The central government has enacted a hunting ban and outlawed the possession of guns, which has resulted in a reduction in hunting. It was clear that most people had never seen the gibbons, and those who had seen them said it was very rare to see them now. In Miaocun, villagers said they traditionally avoided hunting gibbons because older people said there was a kind of spiritual relationship between humans and gibbons. In Li villages, some people said they were unaware of the gibbons' existence, while others said they could not be hunted, mentioning a legend that hunters who killed a gibbon would go blind. In Zibao, people said some villagers have hunted gibbons. In Yitiao, one elderly villager said gibbons could fetch RMB 20 just 30 years ago, but now could be worth as much as RMB 10,000.

Villagers in Yitiao said they would hunt certain animals (frog, mice, snake and wild boar) on the hills during particular seasons. Due to its high value of RMB 20,000/kg some hunters would go in search of Chinese Three-lined Box Turtle, but rarely found their prey with only 1-2 turtles being caught during the year. Villagers also said that animals were harder to find because the forest had been cut down. Even if cleared land was replanted with rubber trees, the animals would not return, they said. Other villagers said that because farm work had become more time-consuming and poultry and livestock were readily available, most people had no real need to go hunting.

During the survey in Zibao and Xinfeng, people said that in the past there had been plenty of wild animals in the forest, such as wild boar, civets, muntjak and Sambar deer, pangolins, snakes,

squirrels and various birds. Although in the past villagers were keen to hunt in the forest, over-hunting has made animals more scarce and harder to find. Most people now they only see trails and droppings of animals, but rarely the creatures themselves. Over recent years, villagers said, hunting by local residents had decreased, but some protected species were still hunted by people from outside and from other villages. These hunters usually worked at night, and although the trade was technically illegal they could easily find buyers for their prey.

Villagers in Miaocun said there were wild boar, squirrels, civets, partridges, 3 or 4 kinds of pheasants, turtles, Sambar, birds, snakes, hares, and other animals living in the hills. These could all be hunted for food and trade, but, although hunting was a tradition in the village, villagers said they preferred to spend time planting rubber. Hunting would generally only be done if an order was placed for a specific animal by businessmen. Shotguns have been confiscated by the government since 2001, but some people still kept guns illegally. Gun shots were heard occasionally from the forest and a man carrying a gun was witnessed during the socio-economic survey.

2.5.2 Collecting non-timber forest products

During the survey, many villagers reported harvesting fruits, vegetables and medicinal plants from the forest. These naturally occurring plants were seen by most as a 'free' source of income as no cultivation or preparation was required. It was reported that most areas from which villages collected plants were outside the nature reserve with only a few inside. The harvest of medicinal plant particularly, including fungus, rattan and palm leaves, has increased over the last 20 years along with demand. Villagers also said Katsumada Galangal, rattan and palm leaves are still abundant but some plants such as Ling Chih and Sharpleaf Galangal have become scarcer in recent years. Orchids are the worst affected. Although plentiful 5 years ago, intensive harvesting in the last 2-3 years means the plants are now hard to find.

In Yitiao and Zhizai, people usually go into the hills in May to collect Katsumada Galangal, and Sharpleaf Galangal. Few people collect palm leaves, or white or red rattan. They only collected the seeds of Katsumada Galangal and Sharpleaf Galangal, but not integrated with the roots, and just a few people collected the stems of Katsumada Galangal. According to villagers these medicinal plants only grow amongst the roots of trees and are impossible to cultivate artificially.

Although in Miaocun and Xinqing the collection of palm leaves, Ling Chih and wild fruits are traditional activities, now the practise is only followed to meet purchaser's needs. They doubted that the purchasers have paid the related management staff for it was not allowed to go into the hills in the day time. With most purchasers being related to the Zhizai Rosin Factory, there is year round demand for wild-harvested produce.

2.5.3 Timber needs for building

From our survey, timber was necessary for the building of houses. According to tradition, coffins should also be made out of big wooden boards. The renovation of old houses, extending small properties and construction of new houses means there is a constant demand for timber. However, deforestation was restricted 5-6 years ago, when people were required to pay for licenses to fell trees. As a result, people started to find substitutes for timber used in buildings, but some unapproved felling does still occur.

In Yitiao, Zhizai, Zibao and Xinfeng, people said timbers were only required for joists and to provide the framework to buildings. The most common building materials are now bricks and tiles.

In Miaocun, management of timber mainly relies on villagers' self-regulation. Restrictions on felling have been imposed to protect water resources and avoid unnecessary logging. The felling of trees is only approved by the government for construction, with strict rules on the quantity and location of timber to be taken. Villagers felt that now that the government has stopped tree felling in the collective forest, they should also stop tree felling. Illegal felling was reported in Zibao, Miaocun and Xinqing where the licensed felling quotas are insufficient. The timber is stolen one tree at a time about once every 1-2 months.

2.5.4 Firewood collection

Firewood is a necessity for all the villages in the area. According to our survey, the annual firewood demand was approximately 2000 kg per family (5-10 tractor loads, equivalent to 35-40 kg every 2-3days), the demand was much higher when the family used the firewood as fuel for wine making. It was reported by local people that firewood is collected from trees and deadwood on the surrounding hills, and generally people go to their family run plantation for, firewood (in Xinqing, this is the so-called "old land" with land certificate). Some villagers said that generally it is not necessary for them to collect firewood from the nature reserve.

Besides collecting firewood for fuel, some villagers have started using alternative sources of heat. Some families use electricity for cooking. The use of bio-gas is promoted in Zibao, and Xinfeng with 4 families using the gas in each village. Bio-gas is being heavily subsidised by the government to promote its use. The environmental benefits and cleanliness of the gas is also being publicized by the government. In Zibao 5-6 families were using coal gas for fuel.

2.5.5 Influence of planting

Previously, the majority of forest-clearing was done to make way for the planting of tapioca, corn and rice. Now rubber planting is the main reason for deforestation. Besides rubber trees, hillside plots are also planted with coconut, betel nut, jackfruit, banana, papaya, longan, guava, bamboo and other tree crops.

In Zibao and Xinfeng, old people said deforestation in the surrounding hills had started after 1949 and had been at its worst in the 1980s, but had slowed in the last 5-6 years under government imposed restrictions.

In Yitiao and Zhizai people said clearing land was too much work and so was rarely done. Only the income offered by rubber planting could spur villagers to clear land to make way for plantations.

Yitiao and Xinqing are all very close to the nature reserve, and fields on the surrounding hillsides have been cultivated to differing extents. According to regulation set out in 1980, land with a slope of more than 25 degrees is defined as part of the nature reserve. Before the nature reserve was established, villagers were encouraged to fell the trees. According to policies in place before 1992 the deforested land can be claimed by people who cleared it. At that time, tree felling had extended to the mountain top, and most of the lands around or below the middle line had been totally ploughed for rubber tree, tapioca and other crops. In Miaocun, the boundary with the nature reserve was demarcated around 1998 and 1999 without any markers. Villagers knew where the boundary lay because some village elders were involved in the process. According to villagers, the forest was much better now than before the nature reserve's establishment. However, most villagers, including the head of village, were not aware of the nature reserve's expansion.

2.5.6 Herding in the forest

6 of the 8 villages surveyed mentioned the practice of herding cattle in the forest. Cattle are used for ploughing and afterwards are moved to the forest to prevent them from trampling the crops. Villagers check on the livestock once a week and bring them back to the fields after the harvest, but few people herd many cattle in the forest. Villagers in Yitiao and Nanye especially complained about the restrictions the nature reserve has placed on the herding of cattle in the forest. Land available for cultivation is much scarcer in these 2 villages than elsewhere, so cattle are usually grazed on grassy mountain slopes. Due to the lack of management, cattle often entered the nature reserve, which resulted in increasingly permanent presence in the reserve of people looking for their livestock, even to the extent of huts being build within the reserve. However, according to the nature reserve regulations, machetes are outlawed in the reserve, as is the building of huts; two measures which have caused great resentment.

In some villages, especially in Nanye cattle herding has decreased due to the protection of mountains and purchase of mechanised ploughing machinery. In Miaocun, cattle rustling occurred frequently, so herding was also reduced.

2.6 Conservation and management of natural resources

2.6.1 Relationship between community and natural resources

From our survey, we can see that communities rely highly on natural resources. The traditional culture of local communities also influence the management model and use style of natural resources. According to the survey, the concept of "close to the mountains so rely on the mountains" was popular among the villagers. People living close to the mountain took the resources supplied by the mountain and forest for granted, mastering the methods of taking firewood, medicinal plants, timber, wild animals and other resources from the forest. In the workshop, participants listed the types and uses of the natural resources obtained from the forest (see Table 6).

Table 6: Types and uses of the nature resources in the communities

Natural resources utilized	Utilization methods	Objectives
Wild plant		
Katsumada Galangal	Collecting fruits and harvesting stem for medicinal use	Sell for market
Palm leaves	Ripe leaves for making "Zongzi"-a Chinese traditional food	Self consumption or sell for market
Pepper root	Root for medicine	Sell for market
Ling Chih	Whole plant for medicine	Sell for market
Wild banana	Core as feed or vegetable	Self consumption or hog feed
Olive	Edible fruit	Sell for market
Yellow, white and red rattan	Cutting whole rattan for making furniture	Sell for market

Sharpleaf Galangal and Hainan Amomum	Collecting fruit for medicine	Self consumption or sell for market
Millettia speciosa	Dig whole plant for medicine	Sell for market
Chinese Eaglewood (*Aquilaria sinensis*)	Timber tree or collect fungus on cuts for medicine	Sell for market
Potherb	Collect leaves, whole plant or root	Self consumption and a few for sale
Mountain ginger	Dig root for medicine	Self consumption or sell for market
Mixed woods	Firewood	Self consumption
Bamboo	Cut old-growth bamboo for housing	House and fence building or sell for market
Buerger Maple, Fragrant Rosewood, Hainan Alseodaphne, , Hainan Bushbeech, *Litchi Chinenesis;* Hainan Homalium,	Timber tree and roots can also be used	Self consumption for building houses, making furniture and coffins, or selling to the furniture factory
Wild animal		
Red Giant Flying Squirrel, Himalayan Palm Civet, Wild pig, Civet, Small Indian Civet,	Capture by gun, trap, snare and net	Self-consumption or sell in market
Red Jungle Fowl, Silver Pheasant	Shooting, trapping	Self consumption
Chinese Three-striped Box Turtle, snake, lizard	Capture by hand and smoke	Sell in market
Sambar, *Muntiacus muntjak*	Trapping, shooting	Sell in market
Squirrel, hill rat, wild boar, porcupine, hedgehog	Trapping	Self-consumption, few selling
Macaque	Shooting, trapping	Sell in market
Bee	Get honey by cutting trees or digging, for food or medicine	Self-consumption or sell in market
Land resource		
Land	Cultivation and planting	Support income

Villagers also have their own unique method of managing and protecting their natural resources. All the villagers expressed their sentimental attachment to the forest's previous flourishing health and abundance of wild animals. They recognize that water supply becomes less reliable as the forest is destroyed. It was reported that some self-imposed regulations were in place for the use of certain resources. For example, only collect dead wood for firewood, not living branches or trees; only collect the fruits of Katsumada Galangal and Sharp-leaf Galangal rather than the whole plant; be aware that killing the plant would decrease yield in succeeding years; and in hunting, do not target young animals, or mothers nursing young, to ensure the future generations.

Although the communities have been aware to an extent of the importance of management and conservation of their natural resources, some of their traditional methods of exploiting resources, such as deforestation for planting, hunting, collecting forest produce and chopping firewood, coupled with decreased supply and increased demand through rising populations and desire for development, have resulted in severe damage to the natural resources, degradation of the forest and a fall in the numbers and variety of wild animals. It has also led to a degradation of the eco-environment, such as the reduction of water available to villagers, which directly affects their living standard and prospects for the future. In the training workshop on co-management, the reserve staff and representatives from Qiongsong Township identified the current problems of natural resource use in the reserve, and they proposed measures for improvement (Table 7):

Table 7: Existing problems and measures for improvement on resources utilization

Resource	**Problems**	**Way of improvement**
Wild boar	Excessive hunting has led to a significant fall in numbers	Hunting boar can be allowed outside the nature reserve as pest control if they destroy crops. Boar within the nature reserve should gain more protection. Domestication can cut down the need to hunt.
Red Junglefowl	Uncontrolled hunting has severely depleted the population	Enhance protection of those in the nature reserve, hunting should be strictly forbidden.
Bees	Digging and burning to get honey destroys the forest. With no limits on honey collection, bee species have declined	Limiting honey collection and rotating sites where honey is collected. Promote bee keeping in the villages
Beautiful Cliffbean (*Millettia speciosa***)**	If anyone sees the plant they will dig it up.	Agricultural planting could reduce the taking of the plant from the wild
Bamboo	No standard management, uncontrolled chopping and clearing	Restrict the time and quantity of harvesting under a structured management plan
Palm leaves	Unrestricted stripping of leaves	Set a management plan specifying location, quantity and timing of harvest
Katsumada Galangal	Disorderly harvesting resulting in the decrease of supply	Harvesting should have set limits, the fruit collection should be restricted and the utilization of stems should be limited from

		utilization of stems should be limited from June to August.
White and yellow rattans	Disorderly collection	Picking should be limited to specific locations, and the quantity should be restricted.
Hainan Amomum and Sharpleaf Galangal	Uncontrolled collection	Planting in the secondary forest, and limited harvesting
Ling Chih	Disorderly harvest, people collect it wherever they find it	Collection should be systematic and the number of collectors should be limited; planting should be increased.
Olive	Disorderly collection	Collection should be limited to a specific location and harvesting should be done without damaging the trees.
Fragrant Rosewood	Extremely limited in quantity, nearly all fragrant rosewood has been collected	Agricultural cultivation and planting should be increased.
Chinese Eaglewood	Most of the mature trees have been illegally felled	The protection of the saplings should be strengthened
Other medicinal plants and herbs	Because of uncontrolled harvest, the quantity has decreased sharply	Controlled harvesting should only be allowed in the experimental zone. Markets should be inspected to check what produce is on sale and patrolling in the core area should be increased

For various reasons, the communities still follow traditional ways to use natural resource in and around the reserve. Better management and conservation of natural resources, and ensuring their sustainable use by the surrounding communities, are significant challenges for the communities and the nature reserve. Protection of natural resources not only relates to the conservation of local flora and fauna, but also is inextricably linked to the long-term sustainable developments of the local communities.

2.6.2 Conflicts with nature reserve from the communities' view

Because of their shared location and common, but often conflicting, interest in the area's natural resources, there is strong interplay between the reserve and neighbouring communities. The communities' use of natural resources directly influences the management of the nature reserve and its efforts for the conservation of natural resources. The establishment of the nature reserve limited the communities' use of natural resources, this in turn reduced villagers' immediate income and, in the short term, restricted community development. However, in the long term, efficient management of natural resources can ensure the sustainable development of local communities.

From the survey of the 8 villages, we gained particular understanding of the communities' views of the nature reserve (Table 8), and the conflicts arising. We also got to understand the problems

encountered during the livelihood development and the villagers' own suggested solutions. People must note that the following information only reflects some villagers' thoughts and ideas, and these are sometimes controversial and even contradictory. They are not a definitive plan of how to solve the problems between the reserve and the communities. Through the villager's own ideas we can get a better understanding of their conservation consciousness, their perception of the existing problems and also a clearer idea what they want and expect from a reserve management plan. The process of carrying out the survey itself is also valuable in promoting cooperation and co-development of communities and the nature reserve.

Table 8:The nature reserve in the communities' view

The nature reserve in the communities' view	**The villagers' proposed solutions**
The villagers generally thought the nature reserve and the Bawangling Forestry Bureau were the same. They did not know why the nature reserve had been set up and many believed its only role was to contest land and natural resources with the residents.	Publicizing and explaining the objectives of the nature reserve.
The villagers generally thought the reserve's regulations were too rigorous. The reserve's boundary limits, patrolling by special staff, banning of machetes, prohibition of unapproved deforestation, medicinal plants collection and hunting in the nature reserve as well as the prohibition of hunting wild animals in the surrounding villages and village inspections, were all unpopular.	Publicizing and explaining the details and reasons behind the management of the nature reserve.
Some villagers thought the establishment of the nature reserve was good for controlling deforestation and protecting water resources	Natural resources in the nature reserve should not be touched and used.
Some villagers thought the boundary had not changed since it was first set in 1998-1999. Although there were no marker stones, villagers generally knew the boundary which had been agreed by village elders.	The approval of timber collection for coffins and limited collection of rattan in the reserve were expected.
Some villagers thought the boundary between the nature reserve and villages was not clear. Villagers had not been involved in establishing the boundary and many still didn't know where the boundary lay or that all land above the 25% degree belonged to the nature reserve (regulation of 1980)	Villagers thought the nature reserve should discuss the setting of the boundary with them, not just impose it upon them. The nature reserve and the communities' leaders should sit together, and discuss the boundary to reach a mutually acceptable conclusion.
Some villagers thought the nature reserve was set up in 1980 and expanded in 1990 to include some already cleared land. When the boundary was modified in 1998, some villagers lost land without any compensation.	Compensation should be paid to the villagers for the loss of logged forest and cleared land to the reserve.
Some villagers thought the nature reserve only covered the mountains and did not know the reserve had expanded.	Clearly define the reserve's boundary and set up stones designating the boundary.
Some villagers thought the way to increase income was	The nature reserve should restore as much

increasing their land holdings and increasing rubber planting. Land in the nature reserve can not be used for planting, so it was viewed as an obstacle to economic development.	land as possible to the residents for planting and economic development.
A few villagers thought management of the nature reserve was weak in the 1980s, but much stricter in the 1990s, the hunting of squirrels and other animals that was allowed before was banned in the 1990s. Forest clearance was allowed before 1972, but with the establishment of the nature reserve in 1980, forest clearance on the hills was not allowed; and in 1992, forest clearance and herding were totally banned.	The collection of timber for coffins, collection of rattan and forest clearance for rubber planting, as well as hunting outside the nature reserve and hunting of wild boar should be approved.
A few villagers thought: the nature reserve's staff were not good mannered when executing the regulations and laws.	Staff should be courteous and polite when dealing with villagers.
A few villagers felt the confiscation of guns by township police in 2001 conflicted with their traditional hunting customs.	
A few villagers did not trust the policies of the nature reserve because of how they had been enforced in the past.	Policies enacted by the reserve should ensure the protection of villagers' land and property rights. Policies should be provided to promote and reward the protection of the forest to reduce consumption of natural forest resources.
A few villagers knew nothing about the nature reserve and thought it had no bearing on their lives.	

In our survey, some villagers also expressed some other conflicts on the use of natural resources
1. The villagers of Zhizai had land disputes with the Rosin Factory. The Rosin Factory proposed the protection of wild *Pinus latteri* and said the habitat of the pines should not be used anymore. If pine seeds take root on cropland and grow into trees, it would decrease the villagers' land.
2. Yitiao was encircled by Zhizai, Kunbao, Nanye and other villages. A large population on a limited area of land created competition for land and a potential land shortage. Yitiao also had no family run plantations or areas to herd cattle so that cattle often enter into the reserve.

2.6.3 Recommended solutions

According to the survey, the communities identified development problems encountered and gave explanations and possible solutions of their own (for details, please refer to the following table 9). Although the problems were not always directly related to the use of natural resources, they are all closely related to the communities' economy and developments of village society. The villagers' understanding and support or opposition to the reserve's policies hinges on the effect those policies have on their own socio-economic situation. Although the problems listed here may not be a complete catalogue, they truly reflect the villagers' understanding and demands for their own development.

Table 9: Solutions proposed by villagers to the problems encountered in community development

Extent	Rank	Problem	Reason	Possible solutions
Very serious	①	Lack of land	Land is limited, and the population is too great. People expect to be able to plant more rubber tree and other corps and this is not always possible.	No solutions are currently available. Although some proposed the nature reserve return some land back, but they also thought this is extremely unlikely.
Quite Serious	②	Lack of funds	Funds are not adequate to buy more expensive rubber seedlings; the loan was hard to obtain for husbandry.	1. Buy cheaper rubber seedlings 2. Villagers could cultivate rubber seedlings themselves 3. Obtain assistance from government poverty alleviation program. Seedlings were much preferred to cash
	③	Transportation	The roads are poor, and very muddy after rain. The roads are dangerous but there is not enough money to pay for improvements.	1. Raise funds, and get villagers to provide labor themselves 2. Obtain funding from the government
Serious	④	Children's education	Poor economic status leaves some villagers without enough money to support their children's education	1. Obtain assistance from poverty alleviation program of government 2. Take a loan 3. Obtain help from the public
	④	Market controls	Due to market controls, rubber cannot be sold to other townships. The price was RMB10/kg in Qingsong township, but RMB11~14 /kg in other townships	No solutions are available presently.
Common	⑤	Tap water project	The government may not have enough time to spend on it and funding was not adequate	Use water from the well or river
	⑥	Lack of training on farming technology	No agricultural training by experts, villagers have little knowledge of the markets they are supplying.	Organize training, strengthen the promotion of technology and information.
	⑦	Lack of medical infrastructure	No medical clinics and the surrounding medical clinics' were expensive	Set up clinics with affordable charges, and ask the government to provide special support for treatment of outbreaks of disease.

Chapter 3: Evaluation and Countermeasures

3.1 Key stakeholder analysis

As conservation of the Hainan Gibbon and its habitat requires a long-term and effective mechanism to ensure support and cooperation from the various stakeholders, a co-management system is one of the best options for Bawangling Nature Reserve. Bawangling Forestry Bureau, adjacent communities and relevant local governments have all expressed their common desire to develop both the reserve and the communities.

During the Stakeholders Workshop, the stakeholders were defined as any organization, institutes, groups and person who have interests or are effected by "effective management and conservation of the Bawangling Nature Reserve". Interests here were specifically focused on the effective management and sustainable use of nature resources in and around the reserve.

As part of a workshop, participants identified the following as key stakeholders in the reserve: local adjacent communities, Bawangling Forestry Bureau (including its subordinate rosin plant and forestry companies), local governments, provincial administrative departments and some other external organizations.

3.1.1 Local adjacent communities

For a long time, the communities have used local resources by clearing land, cultivating crops, harvesting farmed and wild produce, and grazing animals. To gain further income, some villagers hunted wild animals, logged illegally and cleared wild forest for cultivation. Since governments strengthened protection and raised awareness of the reserve, more villagers have come to accept the idea that protecting the environment is also an effective way of safeguarding the future of their communities. At the co-management workshop, participants discussed the impact of reserve management on communities and, conversely, the communities' impact on effective management. The results are shown in the following table 10.

Of all the stakeholders, local people are key to effective management, and ethnic communities have already made many sacrifices for biodiversity conservation. Enforcement of the reserve has affected the communities negatively in the short term with local people surrendering some development opportunities and traditions and having to adapt to a changed lifestyle. For example villagers are no longer allowed to hunt, clear forest or fell trees in the reserve as they were previously allowed to do. Because of their remoteness and poor transportation and communications, villagers have traditionally relied heavily on natural resources. How they used these resources had and has a direct bearing on the reserve and its conservation efforts. For instance, the overuse of some natural resources e.g. medicinal plants, illegal hunting and logging for market or agriculture will obviously undermine the conservation of Hainan gibbon and its habitat.

In the long term, establishment of the reserve and biodiversity conservation guarantee the ecological security and sustainable development of the communities. The reserve can also help support the sustainable development of local communities by introducing new ideas, technologies and some job opportunities, within its capacity.

The positive impact of villagers on the reserve must also be recognized and strengthened to further their contribution to biodiversity conservation. Establishing a good system to involve local

communities in the management of the reserve will motivate the active participation of local villagers in conservation and realize co-development of the reserve and local communities.

Table 10: Interactions between the communities and effective conservation of the reserve

Intensity of the impact	**The impact of "effective conservation" on the communities**		**The impact of communities on "effective conservation"**	
	Positive	**Negative**	**Positive**	**Negative**
High	Ensures long-term clean water supply for the communities; reduces harm from pests and secures the harvest of crops	1. Changes their lives and customs, and restricts activities such as hunting and using resources gathered from the forest. 2. A lot of land has been claimed by the reserve which villagers can no longer use for agriculture.	1. Villagers can participate or assist in protection of the reserve by self-policing against infringements of the reserve. 2. Locals can also help with fire-prevention, patrolling the reserve, and rescuing wild animals. 3. Locals can help in publicity of conservation	1. Illegal hunting, logging, and clearing of the forest to plant rubber tree and cassava. 2. Unsustainable, intensive use of resources such as the over-collecting of medicinal plants and grazing.
Medium	1. Can provide employment opportunities and development through protecting wildlife resources and developing tourism. 2. Promote sustainable grazing, harvesting of wild plants and hunting of some wild animals. 3. Introduce technologies and agricultural products into communities to allow villagers to earn more money. 4. Assist communities in designing and planning the use of natural resources and introducing development programs.			Grazing in the reserve destroys young trees and plants and affects the restoration of vegetation.
Low			1. The communities can provide agricultural products for the reserve staff; 2. The communities can assist with infrastructure construction.	

3.1.2 Bawangling Forestry Bureau

Previous to 1994, Bawangling Forestry Bureau (BFB) was a forest farm operating for timber production. In 1994 Hainan province issued a ban on the logging of natural forests, forcing the Bureau to adjust its business. The bureau invested 19, 126,000 RMB in developing the production of forest by-products and began to operate sustainable forestry. The Bureau has three main industries: 1. Rosin and rubber processing, 2. Tropical fruits, 3. Hydroelectric stations, which have become the main source of income.

The Bureau has made great contributions to the development and protection of the reserve. In the 1970s, the field survey in the Bawangling forest discovered the existence of Hainan gibbon which led to the setting up of the reserve. The reserve was aimed at the conservation of gibbons and their habitat, and was administrated by the Bureau. In 1992, to strengthen reserve management, Hainan Provincial Forestry Bureau took over and in 2002 the general director of BFB was accredited as the head of the reserve.

After the logging ban in 1994, to solve unemployment problems, BFB focused on the development of resources, and paid less attention to biodiversity conservation and sustainable development. The resulting production activities without scientific planning had major impact on the effective management of the reserve. Results of a stakeholders' analysis of Bureau management and effective protection of the reserve are listed in the table 11 below:

According to this analysis, the Bureau has provided a lot of support for the reserve through law enforcement, combating illegal activities and providing employees for the reserve. In turn, the reserve has provided the Bureau with sustainable resources such as water, pine trees and tourism, and the high biodiversity gives the Bureau great potential for further development. However the relationship is not purely symbiotic and there are some conflicting interests. The reserve restricts the Bureau's use of resources to some extent while the Bureau impacts negatively on conservation by running and developing businesses in the reserve.

3.1.3 Local governments of Qingsong Township and Baisha County

The responsibilities of Qingsong Township Government and Baisha County Government are:

1. Charging taxes and other fees. Formulate and implement socio-economic development plan;

The township government plays an important role in steering the socio-economic development of the target communities.

2. Poverty alleviation
3. Disaster prevention and livestock disease prevention
4. Environmental protection: promoting awareness of biodiversity conservation amongst local people
5. Providing education and public health services: the Baisha County and Qingsong Township help promote the conservation of resources and environmental protection, both of which help effective conservation of the reserve.

Table 11: The relationship between the Bureau and effective conservation of the reserve

The impact of BFB on effective conservation		**The impact of Effective conservation on BFB**	
Positive	**Negative**	**Positive**	**Negative**
1. Assisted the reserve with law enforcement and combating illegal hunting and logging, enabling the reserve to effectively protect natural resources 2.Some employees of the Bureau work for the reserve and participate in protection.	1. Nancha River hydroelectric station caused the loss of water and land; 2. Noise pollution with turbines operating 24 hrs a day; 3. Electrical wires across the forest are a danger to gibbons and other wild animals and have effectively reduced the potential gibbon range substantially 4. The ranges of gibbons and other animals altered due to production activities of BFB in the forest; 5. Unauthorized tours and increased garbage affected the movement and development of wildlife in the reserve	1. The biodiversity conservation protects water resources and safeguard revenue from the hydroelectric station;	1. Some electrical cables for the hydroelectric station were buried underground leading to increased costs 2. Effective conservation will limit the number of the tourists.

Since local governments are responsible for planning, implementing and managing the socio-economic development of the communities, as well as promoting environmental protection, they play a direct and important role in the effective protection of natural resources. Effective conservation would be impossible without support from the local governments. In turn, effective management of the reserve can provide ecological security for local economy. Results of the analysis of the relationship between local governments and effective protection of the reserve is shown below as Table 12.

Table 12: The relationship between local governments and effective protection of the reserve

The impact of local governments on effective conservation		**The impact of effective conservation on local governments**	
Positive	**Negative**	**Positive**	**Negative**
1. Carried out the Public Ecological Forest program, Grain-to-green program for forest restoration and effective environmental protection. 2. Detected and dealt with cases of illegal logging and wildlife trade which supports the reserve management 3. Developed tropical wild flower industry and carried out environmental poverty alleviation programmes, developed integrated forestry to improve the local communities' standard of living and reduce their reliance on natural resources.	Some development programs supported by the government increased the demand for agricultural land, forest may be cleared to make way. Also damage to streams and surrounding forest through hydro schemes, etc.	1. Protection of the forest safeguards the water supply for local communities. 2. Biodiversity conservation and ecological integrity form a good base for the development of local economy. 3. Protection of the forest may bring opportunities for community development though tourism development. 4. Bring broader public support, nationally and internationally, from representatives of the millions of people who value the existence of nature. E.g. through NGOs and private, corporate, government, and multilateral sponsors.	Protection will restrict the unsustainable use of natural resources and reduce local people's income, in the short term some of the additional financial burden will be passed on to the local governments.

3.1.4 Other governmental departments at provincial and national levels

The governmental departments at provincial and national levels influence policy-making and implementation in the project area concerning socio-economic issues and environmental protection. These departments have direct or indirect impacts on the effective conservation of the reserve through relevant authorities. For example, Hainan Provincial Forestry Bureau and Finance Bureau are in charge of how the reserve is run and funded, their support directly influences the financing, staffing and management of the reserve. The development and protection of Bawangling Reserve could enhance development throughout Hainan by helping maintain the ecological balance and environmental security of the whole province.

3.1.5 Other organizations and institutions

The reserve has established a long-term cooperation with many national and international organizations and institutes, including FFI, KFBG, HEEC, Hainan Normal University and Institute of Zoology of CAS. The cooperative programs help the reserve with funding and by introducing new management model, knowledge and skills on natural resource management.

3.1.6 Results of stakeholder analysis

1. The impact of effective conservation on stakeholders

The key stakeholder affected most by effective conservation is local people; secondly is the Bawangling Forestry Bureau, township and county governments; Affected least are the provincial and national departments and external organizations.

2. The impact of stakeholders on Effective conservation

The stakeholders with the greatest impact on the effectiveness of conservation are local people and their village committees. Bawangling Forestry Bureau, county and township governments, environmental protection, forestry and finance departments have medium impacts. Other groups and organization have the least impact.

3. Comprehensive analysis of all stakeholders

In general, local people, county and township governments, and the Bawangling Forestry Bureau are the most important and key stakeholders. Environmental protection and forestry departments at the provincial level as well as international organizations (such as FFI) are also stakeholders for effective conservation and sustainable use of natural resources.

3.2 Problems analysis

3.2.1 Problem tree

During the Co-management Workshop in October 2004, all stakeholders reached the common view that the main problem of the reserve management is "The tropical rainforest eco-system in the Bawangling Nature Reserve is being destroyed and the gibbon and its habitat were under great threats". Participants further discussed the underlying causes of this problem. Considering the purpose of making an action plan on co-management with target communities, the reserve and Bawangling Forestry Bureau analysed the impacts specifically posed by local communities and underlying causes in the following workshop in November 2004. Three main direct reasons from the local communities that result in the above problem were finally identified: illegal hunting, illegal logging and the unsustainable use of natural resources (see problem tree for details).

3.2.1.1 Illegal hunting:

Illegal hunting was considered to be the biggest challenge to effective protection. The existence of a wildlife consumption market motivated some villagers to poach for money, but some also did it for food for themselves as well. The possession of guns and other hunting equipments by some villagers also makes poaching possible, although local governments had made many efforts to confiscate guns and other hunting facilities in the market. Cooperation and communication between the reserve and local governments needs to be strengthened to get support in getting rid of illegal markets.

The law enforcement of the reserve in tackling poaching is still insufficient and ineffective, of which one main reason is the insufficient support from higher level administrative departments. Though the reserve is now four times its original size, there are still only 28 employees charged with protecting it. The organizational structure is incomplete and the management system is unsound. Responsibilities are not clearly defined and staff morale is low, leading to ineffective conservation. A lack of communication and co-management mechanism between the reserve and its neighbouring communities has been a major failing in the joint prevention of illegal hunting. The reserve lacks relevant capacity in how to conduct community-based conservation.

As part of villagers' traditional way of life, hunting is still considered a legitimate source of food. Awareness of environmental protection among local villagers is poor. Due to constraints on personnel, finance and capability, the reserve failed to conduct effective awareness promotion.

In general root causes of illegal hunting include (please refer to problem tree for reasoning):

(1) Insufficient communication and cooperation between the reserve and local governments
(2) Incomplete and unsound management structure within the reserve administration
(3) Insufficient support from higher level governmental departments
(4) Lack of co-management mechanisms and communication between the reserve and the communities
(5) Lack of co-management capacity

3.2.1.2 Illegal logging

Illegal logging was mainly considered to be the result of weak law enforcement and timber consumption for market and self-use. Some villagers sold the timber to boost their income and other used the wood for construction of buildings, furniture or coffins. This reflected the lack of awareness of laws and protection amongst local villagers, as well as their need for supplementary income and their own demand for timber.

The low incomes and lack of alternative means of livelihood for local communities were partly the result of the poor education level and lack of necessary knowledge.

Some villagers took trees from the forest for construction and coffins not only because they could not afford timber or other alternative materials, but also because of the traditional custom and culture.

The root causes of illegal logging are (please refer to problem tree for reasoning):

1. Insufficient communication and cooperation between the reserve and local governments;
2. Incomplete and unsound management of the reserve administration
3. Insufficient support from higher level governmental departments
4. Lack of communication and co-management mechanism between the reserve and the communities
5. Lack of co-management capability of the reserve
6. Low level of education and low development capability of the communities.

3.2.1.3 Unsustainable use of other resources

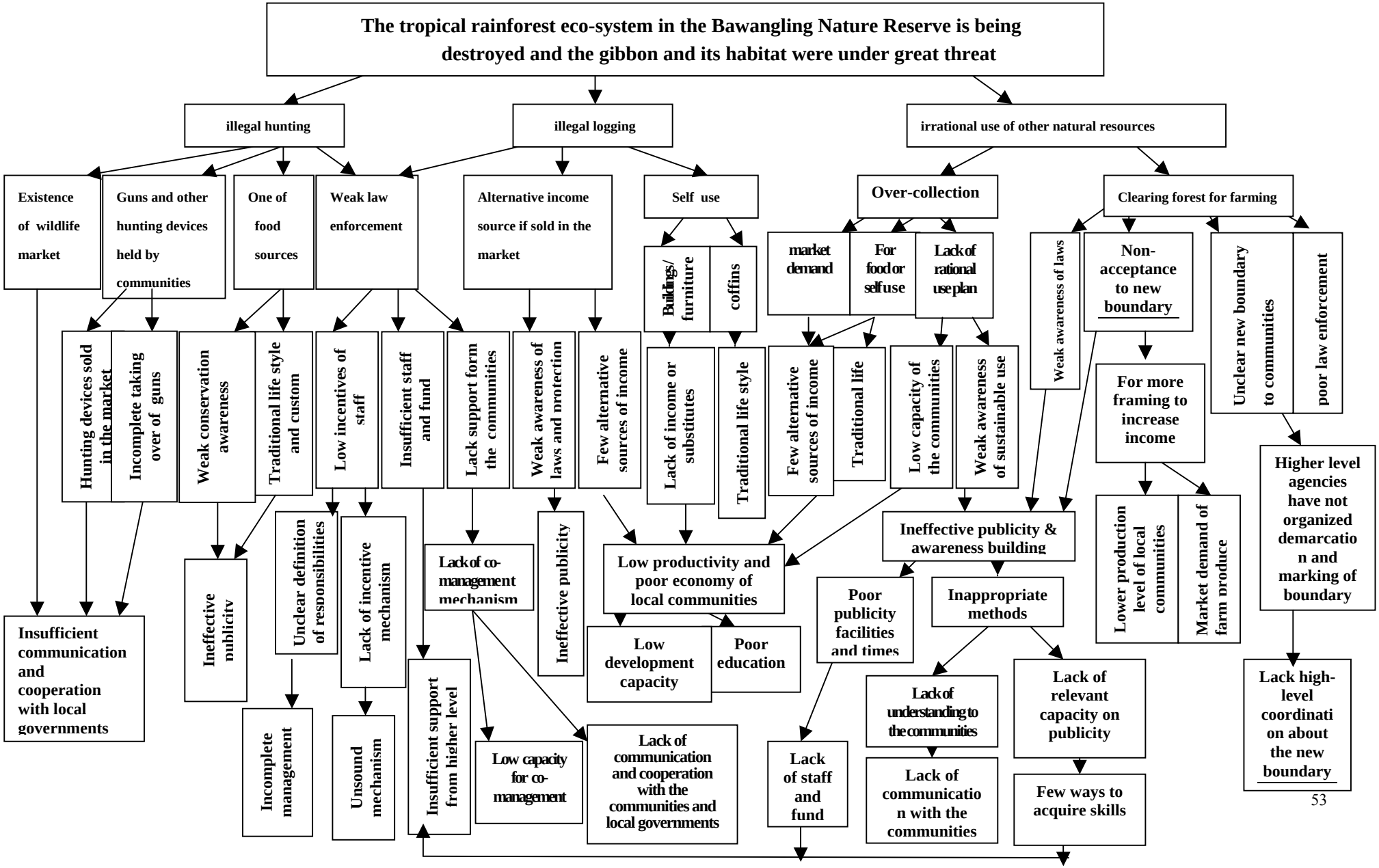
The unsustainable use of resources mainly refers to the over-collecting of other natural resources and the destruction of the forest for farming.

Over-collection is common for many reasons. Firstly there is a market demand for resources, e.g. medicinal plants, and local people needed to supplement their incomes. Secondly local people use the resources for food and medicine because they can be attained, essentially, free of charge. Thirdly, communities have no plan for the sustainable use of resources and lack protection awareness.

There were four main causes of the few cases of forest clearing for farming: poor law enforcement, weak awareness of laws, poorly defined boundary of the extended reserve, and rejection of the new boundary by some villagers. Because of their heavy reliance on agriculture, local people believe the best way to increase their income is to possess more land and plant more crops. Because of this local people are unwilling to accept the new boundary as it limits the availability of land which could be used for agriculture. Regarding the unclear boundary, there is a lack of coordination between higher level departments, which leave the new boundary poorly defined.

In general the underlying causes of the unsustainable use of resources are (please refer to problem tree for reasoning):

1. Lack of sufficient communication and cooperation between the reserve and local governments
2. Incomplete and unsound management of the reserve
3. Insufficient support from higher level governmental departments
4. Lack of communication and cooperation between the reserve and the communities, and lack of co-management mechanism
5. Lack of co-management capability of the reserve
6. Low level of education and low development capability of the communities
7. Problems concerning the new boundary


The tropical rainforest eco-system in the Bawangling Nature Reserve is being destroyed and the gibbon and its habitat were under great threat
illegal hunting
illegal logging
irrational use of other natural resources
Existence of wildlife market
Guns and other hunting devices held by communities
One of food sources
Weak law enforcement
Alternative income source if sold in the market
Self use
Over-collection
Clearing forest for farming
Hunting devices sold in the market
Incomplete taking over of guns
Weak conservation awareness
Traditional life style and custom
Low incentives of staff
Insufficient staff and fund
Lack support form the communities
Weak awareness of laws and protection
Few alternative sources of income
Buildings/ furniture
coffins
market demand
For food or self use
Lack of rational use plan
Weak awareness of laws
Non-acceptance to new boundary
Unclear new boundary to communities
poor law enforcement
Lack of income or substitutes
Traditional life style
Few alternative sources of income
Traditional life
Low capacity of the communities
Weak awareness of sustainable use
For more framing to increase income
Higher level agencies have not organized demarcation and marking of boundary
Insufficient communication and cooperation with local governments
Ineffective publicity
Unclear definition of responsibilities
Lack of incentive mechanism
Lack of co-management mechanism
Ineffective publicity
Low productivity and poor economy of local communities
Ineffective publicity & awareness building
Lower production level of local communities
Market demand of farm produce
Poor publicity facilities and times
Inappropriate methods
Low development capacity
Poor education
Incomplete management
Unsound mechanism
Insufficient support from higher level
Low capacity for co-management
Lack of communication and cooperation with the communities and local governments
Lack of staff and fund
Lack of understanding to the communities
Lack of communication with the communities
Lack of relevant capacity on publicity
Few ways to acquire skills
Lack high-level coordination about the new boundary

3.2.2 Underlying Causes

During the problem analysis, the following reasons were presented many times: poor law enforcement of the reserve, low productivity and lack of alternative income in local communities, ineffective publicity of the reserve on environmental protection, poor awareness of laws, conservation and sustainable use amongst local villagers.

Due to insufficient support from high level government, especially after the expansion of the reserve, the reserve lacks necessary staffing and funding. This also resulted in inadequate management, poor definition of responsibilities and tasks, and finally insufficient and ineffective law enforcement.

In recent years, even though local governments have made great efforts and carried out many development programs, communities have remained under-developed with continuing poor levels of education and low productivity. The communities heavily rely on the cultivation of crops and lack other alternatives. Because of these factors, together with the motivation from the wildlife market and poor law enforcement, some villagers used irrationally the natural resources in the reserve and a few even hunt and log illegally in the reserve.

Considering specifically the impacts posed by the local communities, the root causes for the problem –"The tropical rainforest eco-system in the Bawangling Nature Reserve is being destroyed and the gibbon and its habitat are under great threats" were identified as follows:

1. Lack of communication, understanding and cooperation between the reserve and neighbouring communities; lack of co-management mechanisms
2. Deficient communication and cooperation between the reserve and local governments
3. Poor education level, working skill and awareness of laws, conservation and sustainable use of resources in local communities
4. Insufficient support from the high-level government results in the lack of funding and staffing as well as poor high-level coordination on the new reserve boundary.
5. Reserve staff lack skills and knowledge for co-management
6. Incomplete management system and unsound mechanisms are used to run the reserve

3.3 Strategy analysis

3.3.1 Lack of communication, understanding and cooperation between the reserve and neighbouring communities; lack of co-management mechanisms

Without dialogue, understanding and cooperation, the reserve failed to understand the negative and potential positive impacts on reserve management. It also results in a lack of participation and support of local communities in conservation.

The countermeasures will be:
1. Increase awareness of laws and regulations and the basic knowledge of co-management amongst local communities
2. Set up a co-management committee and co-management groups
3. Enhance the communication with the communities on its use of natural resources and conduct specific surveys on the use of natural resources
4. Formulate a natural resources protection and development plan for the co-management areas

3.3.2 Deficient communication and cooperation between the reserve and local governments

Local governments play an important role in the effective conservation of the reserve. Communication and cooperation with local governments will help unite all forces in combating the wildlife market, poaching, logging and other illegal activities that deplete the natural resources.

The countermeasures will be:

1. Unite local governments in combating the markets that sell wildlife and hunting equipment.
2. Cooperate with some government departments to remove all guns from the communities in accordance with the law
3. Enhance the awareness of environmental protection in the communities with the assistance from local governments

3.3.3 Poor education level, working skill and awareness of laws, conservation and sustainable use of resources in local communities

The communities' lack of work skills and alternative sources of income, causes them to use natural resources unsustainably, undermining effective conservation of the reserve. The communities could raise alternative income while supporting effective conservation by working as patrol staff or guides, or by supplying services to tourist groups, for example, by leasing vehicles. Development of commence and making and selling ethnic handicrafts could be another options. However, the local communities should consider the potential impact on biodiversity conservation in the reserve when they look for alternative incomes. The alternative livelihood causing no impact or less impact should be the priority.

Education is another great concern and requires more funding and assistance from the government and other social support organizations. Implementing education projects by local communities is an important, efficient and effective way of local education improvement. Other ways of improving local education should be considered.

The countermeasures will be:

1. Secure support from governments and other social support organizations to assist the education of local communities
2. Invite experts to deliver training on advanced new working skills to improve productivity
3. Develop a sustainable commerce and handicraft industry
4. Provide jobs to villagers such as patrol staff or guides
5. Enhance publicity on relevant laws, biodiversity conservation and sustainable use of natural resources in local communities

3.3.4 Insufficient support from the high-level government results in the lack of funding and staffing as well as poor high-level coordination on the new reserve boundary

Since the extension of the reserve, many relevant issues have not been properly addressed, such as demarcation of the new boundary, financial problems and staffing quota. It has affected the conservation of the reserve. The reserve could report more frequently about these problems to high-level governmental departments, especially the issue of the new boundary.

The reserve could look for more funding from other channels. Besides the funding mainly from the government, the reserve could also seeks technical cooperation and funding from domestic and international organizations. Poor human resources could be improved by training the current

staff with integrated capabilities. For further development the reserve needs to employ new staff with backgrounds in ecology, environmental protection and computer technology.

The countermeasures will be:
1. Reporting to high level departments for more funding and staff as well as the support on solving boundary problems
2. Secure cooperation with, and funding from, domestic and international organizations
3. Train current staff and establish a good staffing mechanism
4. Recruit new staff with backgrounds in ecology, environmental protection and computer technology

3.3.5 Reserve staff lack the skills and knowledge of co-management

The reserve lack the capacity to establish co-management mechanisms. The reserve can seek support from external organizations to learn the knowledge and skills for co-management.

The countermeasures will be:
1. Report problems and difficulties to the high-level governmental departments
2. Organize co-management training
3. Visit and study other reserves which already operate effective co-management and learn from their experiences

3.3.6 Incomplete management system and unsound mechanism used to run the reserve

At present there is only one administrative office, one police station and three management stations in the reserve but responsibilities are not clearly defined. We should increase reports to the high-level departments and leadership on current problems and difficulties. We should gradually improve reserve management, reserve staff incentive and punishment mechanisms.

The countermeasures will be:
1. Liaise with the leadership and report the reserve's problems and difficulties.
2. Establish and improve a reserve staff incentive and punishment mechanism.
3. Establish and improve co-management.
4. Set up more functional departments and improve management structure.
5. Promulgate various management rules and regulations.

.

Chapter 4: Co-management Objectives

4.1 Long-term goal

The long-term goal of co-management in the reserve and eight adjacent communities in Qingsong Township is to effectively conserve Hainan gibbon, its habitat and the tropical rainforest ecosystem, and to develop livelihoods of the local communities in a sustainable way.

4.2 Objectives for the coming three years

The objectives in the coming three years of co-management are: to establish a sound co-management mechanism, to improve the conservation and development capability of the reserve and the communities, and to clearly define the new reserve boundary.

1. Establish a sound co-management mechanism.

With the facilitation of external organization, a co-management committee will be established and consists of representatives from the communities, and county and township governments, as well as representatives from the reserve. The responsibilities, rights and obligations of the reserve and the communities will be clearly defined. The demand of local communities for natural resources will be surveyed. The committee will coordinate the planning of sustainable use of natural resources. The committee will work to address and mitigate the conflicts between the conservation and utilization of natural resources. The work of committee should contribute to the effective management of the reserve and securing the ecological security of the local communities.

2. Improve the conservation and development capacity of the communities and the reserve

To accomplish this objective, the current human, financial and technological resources of all key stakeholders should be effectively integrated and utilized. Experts will be invited to deliver training to staff to improve the reserve management, agricultural training and education for local people on environmental protection. External communication and exchange visits should also be enhanced. All these actions are to improve the conservation and development capacity of the reserve and adjacent communities.

3. Clearly define the reserve boundary

Due to several reasons, villagers still do not know exactly where the new nature reserve boundary is. Representatives from the communities also expressed willingness to know the new boundary during the workshop. The reserve also encountered many villagers who broke the regulations of the reserve because they did not know or accept the boundary. It is thus necessary to further define and publicize the boundary for better conservation of natural resources in the reserve. To accomplish this objective, the reserve and co-management committee need to promote communication with the communities on the new boundary and to ensure everybody knows where it is and why it has been set there.

Chapter 5: Co-management Action Plan

Based on the current available resources and capabilities of key stakeholders, 9 priority actions were designed by the key stakeholders themselves to achieve the co-management objectives in next three years:

A). To establish an effective co-management mechanism
Priority actions include:
1. Publicize co-management initiatives amongst key stakeholders
2. Identify co-management areas and personnel, and establish a co-management committee and groups
3. Conduct a target survey on the utilization of natural resources in the co-management area
4. Formulate a conservation and development plan for the co-management area.

B). Capability and awareness building for the reserve and the communities
Priority actions include:
5. Carry out environmental education in the communities
6. Conduct training on co-management for the reserve staff
7. Deliver training on new work skills for the local communities

C). To clearly define the new reserve boundary
Priority actions include:
8. Organize specific publicity activities focusing on the boundary issue
9. Organize stakeholders to visit and mark the boundary

5.1 Establish an effective co-management mechanism

All workshop participants believed the first and most important step in co-management was to establish an effective co-management mechanism. The reserve was always lacking in communication with the communities and as a result did not have a good and complete understanding of the communities' needs and their utilization of natural resources. To establish a sound co-management mechanism all stakeholders should fully understand, communicate and discuss with each other and establish mutual trust.

Action 1: Publicize co-management initiatives amongst key stakeholders
[**Objective]**
To make the stakeholders (including the communities and local governments) understand and accept the basic concept, principles, objectives and effects of co-management.

[Justification]:
Publicity is needed because the conservation awareness of the communities is low and there is a lack of understanding of what co-management means.

[Activities]:

- With the participation and assistance of Baisha County Forestry Bureau and Qingsong Township Government, the reserve will take the lead in organizing a publicity team to print and distribute publicity material to local communities. The publicity will also adopt multiple means including newspaper, radio and TV.
- Local Village Committees will be motivated to introduce co-management to local people at villager meetings or with films and images, illustrating the importance and benefits of

co-management, encouraging villagers to participate in the implementation of the plan. Some experts and scholars will be invited to give talks about co-management.

[Terms of implementation]:
5 days each in Dec 05, Apr and Oct 06, Apr and Oct 07

[Implementation units]:
40 people: BWL Forestry Bureau (2), BWL NR Management Bureau (4), Qingsong protection station (6), Baisha County Forestry Bureau (1), Baisha County government (1), Qingsong Township Government (2), Yitiao Village Committee (2), Qingsong Village Committee (2), 2 representatives from each of the 8 villages (2x8=16), external experts (5)

[Budget]:
Total 262,500 RMB, of which:

Travel costs: 24,600 per unit x 5 units = 123,000 RMB
Accommodation: 3,300 per unit x 5 units = 16,500 RMB
Allowance: 10,100 per unit x 5 units = 50,500 RMB
Meals: 10,000 per unit x 5 units =50,000 RMB
Materials: 2,000 per unit x 5 units =10,000 RMB
Video materials: 2,000 per unit x 5 units = 10,000 RMB
Publicity: 500 per unit x 5 units =2,500 RMB

[Indicators for evaluation]:
Records and pictures of the publicity activities. More than 50% of local people should have a basic understanding of co-management.

Actions 2: Identify co-management areas and personnel, and establish a co-management committee and groups
[Objective]:
To understand the interests and current situation of key stakeholders and any conflicts among them; to arrive at consensus on co-management areas and pertinent organization and groups through negotiation; to establish a co-management committee and groups and identify relevant personnel.

[Justification]:
The reason is the current lack of communication, coordination and cooperation mechanisms on the use of natural resources among the reserve, local governments and adjacent communities.

[Activities]:

The reserve will invite stakeholders including Baisha County Forestry Bureau, Qingsong Township Government, representatives from the communities, heads of Village Committees and co-management experts to attend a workshop held in the Qingsong Township. The participants will analyse and evaluate adjacent communities, consult the communities and local governments, and reach a final agreement on the setting of co-management areas and the groups involved. Analysis and evaluation will cover the geographical location of the communities, the pressure that the communities exert on resource protection and reserve management, the attitude of the communities to co-management, the impression of the communities on the reserve and their attitude to reserve boundary and property rights of natural resources.

- The heads in Village Committees will hold village meetings to gather opinions, and introduce the ideas of conducting co-management and establishing the co-management committee and finally invite villagers to join the co-management committee.
- The reserve will invite stakeholders for an official meeting to establish the co-management committee and co-management groups in each community. The stakeholders will confirm the standing committee, organizational structure, the responsibilities, running, objectives and work schedule for the co-management committee and groups.

[Term of implementation]:
5 days each in Jan 06 and May 06

[Implementation Units]:
40 people in total: BWL Forestry Bureau (2), BWL NR Management Bureau (4), Qingsong protection station (6), Baisha County Forestry Bureau (1), Baisha County government (1), Qingsong Township government (2), Yitiao Village committee (2), Qingsong Village committee (2), 2 representatives from each of the 8 villages (2x8=16), external experts (5)

[Budget]:
105,000 RMB in total, of which

Travel costs: 24,600 per unit x 2 units = 49,200 RMB
Accommodation: 3,300 per unit x 2 units = 6,600 RMB
Allowance: 10,100 per unit x 2 units = 20,200 RMB
Meals: 10,000 per unit x 2 units =20,200 RMB
Materials: 2,000 per unit x 2 units =4,000 RMB
Video materials: 2,000 per unit x 2 units = 4,000 RMB
Publicity: 500 per unit x 2 units =1,000 RMB

[Indicators for evaluation]:
Workshop minutes and any tables, graphs or diagrams produced at the meetings. The signed agreements.

Action 3: Conduct a target survey on the utilization of natural resources in the co-management area
[Objective]:
To acquire information about the type, quantity and distribution of natural resources that could be used in the co-management areas.

[Justification]:
Because of lack of communication between the reserve and the communities, the reserve knows little about the current situation of utilization of natural resources by local communities and how the natural resources could be used sustainably.

[Activities]:

Activity 1: Based on the above actions, conduct additional PRA survey and field research in the co-management communities to understand their social and geographic situation and the utilization and management of natural resources so as to identify the type of natural resources that play important roles in local livelihood and production.

[Term of implementation]:
4 days each in Aug 06 and Dec 06

[Implementation Units]:
38 people. BWL Forestry Bureau (1), BWL NR Management Bureau (4), Qingsong protection station (6), Baisha County Forestry Bureau (1), Qingsong Township government (1), Yitiao Village Committee (2), Qingsong Village Committee (2), 2 representatives from each of the 8 villages (2x8=16), external experts (5)

Activity 2: Organize a resource survey team to conduct baselines surveys of the natural resources that are important to the communities' livelihood. Discuss the feasibilities, ways and intensities of using those resources and possible solutions for achieving sustainable use of resources**.**

[Term of implementation]:
20 days of field survey each May 06 and Nov 06

[Implementation Units]:
24 people. BWL Forestry Bureau (1), BWL NR Management Bureau (2), Qingsong protection station (6), Baisha County Forestry Bureau (1), Qingsong Township government (1), Yitiao Village Committee (2), Qingsong Village Committee (2), representatives from villages (4), external experts (5).

[Budget]: total 306,000 RMB, of which
Travel costs: 118,800 in total, of which
Activity 1: 21, 400 per unit x 2 units = 42, 800 RMB
Activity 2: 38,000 per unit x 2 units = 76,000 RMB

Accommodation: 12,600 RMB in total, of which
Activity 1: 3,000 per unit x 2 units = 6,000 RMB
Activity 2: 3, 300 per unit x 2 units = 6, 600 RMB

Allowance: 72,000 RMB in total, of which
Activity 1: 7,000 per unit x 2 units = 14,000 RMB
Activity 2: 29,000 per unit x 2 units = 58,000 RMB

Meals: 53,200 RMB in total, of which
Activity 1: 7, 600 per unit x 2 units =15, 200 RMB
Activity 2: 19,000 per unit x 2 units =38,000 RMB

Field survey equipments: 49, 400 RMB (Activity 2)

[Indicators for evaluation]:
Survey reports on the current use of natural resource (including land); the database of resources use (including professional tables and graphs)

Action 4 Formulate a natural resource conservation and development plan for the co-management area
[Objective]:
To formulate a detailed agenda for the conservation of natural resources in the co-management areas as well as the sustainable development of local communities

[Justification]:

The communities do not have good plan on the sustainable use of natural resources, and there are conflicts between the use of resources and biodiversity conservation between the reserve and local communities.

[Activities]:

- The co-management committee and relevant experts will discuss and rank factors affecting co-management, including communities' demand for natural resources, current use and conservation status of resources, constraints on development, and existing conflicts and solutions.
- Divide the co-management areas into different functional regions and draw up different sustainable use and development plans for different regions; discuss the sustainable ways of using resources that can be used in the co-management areas; discuss the detailed rules and regulations on the management of these resources.

[Term of implementation]:
5 days each in Jul 07 and Sep 07

[Implementation Units]:
40 people in total: BWL Forestry Bureau (2), BWL NR Management Bureau (4), Qingsong Protection Station (6), Baisha County government (1), Baisha County Forestry Bureau (1), Qingsong Township government (1), Yitiao Village Committee (2), Qingsong Village Committee (2), 2 representatives from each of the 8 villages (2x8=16), external experts (5)

[Budget]:
104, 800 RMB in total, of which

Travel costs: 24, 600 per unit x 2 units = 49, 200 RMB
Accommodation: 3, 300 per unit x 2 units = 6, 600 RMB
Allowance: 10,000 per unit x 2 units = 20,000 RMB
Meals: 10,000 per unit x 2 units =20,000 RMB
Materials: 2,000 per unit x 2 units = 4,000 RMB
Video materials: 2,000 per unit x 2 units = 4,000 RMB
Publicity workshop: 500 per unit x 2 units = 1,000 RMB

[Indicators for evaluation]:
The plan is approved by local governments and the forestry departments.

5.2 Capacity and awareness building for the reserve and neighbouring communities

It has been revealed during the problem analysis that the promotion of relevant capability and awareness in the reserve and local communities will be the basis for implementing co-management. Actions should be taken to improve the management capabilities of the reserve, and the conservation awareness and capabilities of sustainable development among local villagers.

Action 5: Carry out environmental education in the communities
[Objective]:
To enhance the communities' understanding of relevant laws, regulations, the reasons for conservation and the basic concepts of sustainable development.

[Justification]:

The knowledge of resource conservation in the communities is poor and the communities lack awareness of laws, conservation and sustainable development. The publicity of the reserve was formerly ineffective.

[Activities]:

- Invite some experts and scholars to give lectures about nature reserves, conservation and sustainable development.
- Organize a publicity team to go to communities and explain the laws and regulations concerning wildlife conservation; use posters and slogans; encourage villagers to take part in wildlife conservation.
- Print and distribute publicity materials explaining the basic points of environment protection and the relevant laws and regulations; seek help from newspapers, radio stations and TV to increase publicity.
- Organize extracurricular activities e.g. contest on knowledge, composition and drawing on wildlife conservation in the primary and middle schools; Organize local students to set up and participate in a "Wildlife Conservation Volunteers Action".
- Set up advertising boards, publicity windows and publicity photos in local communities.

[Term of implementation]:
4 days each in Apr, Oct 2006 and Apr, Oct 2007

[Implementation Units]:
20 people in total: BWL NR (9), Qingsong Township government (2), representatives from villages (2), Baisha Forestry Bureau (2), Baisha Educational Bureau (2), external experts (3)

[Budget]:
140,000 RMB in total, of which
Travel costs: 15,000 per unit x 4 units = 60,000 RMB
Accommodation: 3,000 per unit x 4 units = 12,000 RMB
Meals: 5,000 per unit x 4 units =20,000 RMB
Experts fee: 4,500 per unit x 4 units = 18,000 RMB
Publicity materials: Printing materials 20,000 RMB
Publicity windows making: 8,000 RMB
Publicity boards: 2,000 RMB

[Indicators for evaluation]:
The number of local people who understand about conservation and relevant laws increases by 10% annually; The number of people involved in illegal cases decreases by 20% annually.

Action 6: Conduct training on co-management for the reserve staff
[Objective]:
To improve the capabilities of reserve staff on conducting community co-management.

[Justification]:
The reserve staff currently have limited channels through which to acquire knowledge and skills on carrying out co-management in local communities.

[Activities]:

- Invite external experts and scholars to train reserve staff and guide their work on the job for improving their relevant knowledge and skills.

- Organize delegations consisting of representatives recommended by the reserve, local governments and communities and confirmed by the Co-management Committee to pay learning-visits to other reserves where co-management have been conducted; Exchange experiences with and learn from other nature reserves.

[Term of implementation]:
3 days each in Apr, Oct 05 and Apr, Oct 06 and Apr, Oct 07

[Implementation Units]:
13 people in total: BWL NR (10), external experts (3)

[Budget]:
186,000 RMB in total, of which
Travel costs: 10,000 per unit x 6 units = 60,000 RMB
Accommodation: 800 per unit x 6 units = 4, 800 RMB
Meals: 5, 200 per unit x 6 units =31, 300 RMB
Materials: 2,000 per unit x 6 units = 12,000 RMB
Experts fee: 3,000 per unit x 6 units = 18,000 RMB
Field study trip cost: 10,000 per person x 5 person = 50,000 RMB

[Indicators for evaluation]:
The number of participants and frequency of training. The number of participants in the exchange visits to other reserves and relevant reports

Action 7: Deliver training on new work skills for the local communities
[Objective]:
To improve the knowledge of local villagers on sound agricultural sciences as well as the market, for diversifying the livelihood and increasing their income.

[Justification]:
Agricultural productivity is currently low and communities lack knowledge on modern agricultural sciences. Local livelihood still rely heavily on natural resources which exerts great pressure on the reserve.

[Activities]:
- Invite experts to train communities in sound agricultural science to improve their productivity and gain added value from their crops.
- Train craftsman and help them to promote the products in the market

[Term of implementation]:
3 days each in Mar, Jul 06 and Mar, Jul 07

[Implementation Units]:
14 people. BWL NR (3), Qingsong Township government (2), representatives from villages (4), external experts (5)

[Budget]
136,000 RMB in total, of which:
Travel costs: 18,000 per unit x 4 units = 72,000 RMB
Accommodation: 2,500 per unit x 4 units = 10,000 RMB
Meals: 2,500 per unit x 4 units =10,000 RMB
Experts fee: 6,000 per unit x 4 units = 24,000 RMB

Materials: 5,000 per unit x 4 units = 20,000 RMB

[Indicators for evaluation]:
Increased income in the pilot communities.

5.3 Definition and acceptance of the new boundary of the reserve

Although the extended boundary has been approved by the State Council, the reserve still needs to communicate sufficiently with the communities and coordinate well with local governments. The reserve should not only make local villagers understand the exact location of new boundary but also arrange for them to accept it.

Action 8 Organize specific publicity activities focusing on the boundary issue
[Objective]:
To make the communities understand and accept the new boundary and to improve their awareness of where the boundary lies and why it has been positioned there.

[Justification]:
The communities do not know where the new boundary lies and are unwilling to accept it.

[Activities]:

- Communicate with Qingsong Township Government, Baisha County Government and the Village Committees concerning the new boundary and understand existing problems and conflicts.
- Organize publicity and education about the boundary, relevant laws and regulations, and illustrate the necessity and reasons for the extension, with the assistance of local governments and village committee.

[Term of implementation]:
3 days each in Mar, Jul 06 and Mar, Jul 07

[Implementation Units]:
12 people in total: BWL NR (3), representatives from villages (4), external experts (5)

[Budget]:
66, 400 RMB in total, of which
Travel costs: 8,000 per unit x 4 units = 32,000 RMB
Accommodation: 1, 600 per unit x 4 units = 6, 400 RMB
Meals: 2,000 per unit x 4 units = 8,000 RMB
Materials: 5,000 per unit x 4 units = 20,000 RMB

[Indicators for evaluation]:
70% of villager know where the boundary lies and accept its new position.

Action 9: Organize stakeholders to visit and mark the boundary
[Objective]:
To clarify the boundary and let communities know its exact position.

[Justification]:
There is currently no clear demarcation of the boundary and communities are unaware of and/or are unwilling to accept the extended boundary.

[Activities]:

- The co-management committee will organize a survey of the boundary on its geography, physiognomy and land property rights, and clearly identify the exact position of the boundary through discussion with local governments and the communities.
- Stone markers will be bought; Organize people to mark the boundary.

[Term of implementation]:
3 days each in Aug and Dec 07

[Implementation Units]:
12 people in total: BWL NR (6), representatives from villages (4), external experts (2)

[Budget]:
52,000 RMB in total, of which
Travel costs: 8,000 per unit x 2 units = 16,000 RMB
Accommodation: 3,000 per unit x 2 units = 6,000 RMB
Meals: 5,000 per unit x 2 units =10,000 RMB
Materials: 10,000 per unit x 2 units = 20,000 RMB

[Indicators for evaluation]:
Positioning of demarcation stones on schedule;70% of villagers know and accept the new boundary.

Chapter 6: Logical Framework of Designed Actions

Root Causes	Objectives	Action	Indicators for evaluation
Deficient communication and cooperation between the reserve and local governments	Establish a sound co-management mechanism (Enhance the communication and cooperation between the reserve and local government)	Action 1 ： Publicize co-management initiatives amongst key stakeholders	Records and pictures of the publicity activities. More than 50% of local people could have a basic understanding of co-management.
		Action 2： Identify co-management areas and personnel, and further establish co-management committee and groups	Workshop minutes and any tables, graphs or diagrams produced at the meetings. The signed agreements.
		Action3： Conduct a target survey on the utilization of natural resources in the co-management area	Survey reports on the current use of natural resource (inc. land); the database of resources use (inc. professional tables and graphs).
		Action 4: Formulate a conservation and development plan for the co-management area	The plan is approved by local governments and the forestry departments.
Lack of communication, understanding and cooperation between the reserve and neighbouring communities; lack of co-management mechanism	Establish a sound co-management mechanism (Enhance the communication and cooperation between the reserve and local communities)	Action 1 ： Publicize co-management initiatives amongst key stakeholders	Records and pictures of the publicity activities. More than 50% of local people could have a basic understanding of co-management.
		Action 2： Identify co-management areas and personnel, and further establish co-management committee and groups	Workshop minutes and any tables, graphs or diagrams produced at the meetings. The signed agreements.
		Action3： Conduct a target survey on the utilization of natural resources in the co-management area	Survey reports on the current use of natural resource (inc. land); the database of resources use (inc. professional tables and graphs).
		Action 4: Formulate a conservation and development plan for the co-management area	The plan is approved by local governments and the forestry departments.

Poor education level, working skill and awareness of laws, conservation and sustainable use of resources in local communities	Improve the conservation and development capacity of the communities and the reserve	Action 5：Carry out environmental education in the communities	The number of local people who understand about conservation and relevant laws increases by 10% annually; The number of people involved in illegal cases decreases by 20% annually.
		Action 7：Deliver training on new work skills for the local communities	Increased income in the pilot communities.
Reserve staff lack the skills and knowledge of co-management	Improve the conservation and development capacity of the communities and the reserve	Action 6：Conduct training on co-management for the reserve staff	The number of participants and frequency of training. The number of participants in the exchange visits to other reserves and relevant reports.
Insufficient support from the high-level government results in the lack of funding and staffing as well as high-level coordination on the new reserve boundary.	Clearly define the reserve boundary	Action 8：Organize specific publicity activities focusing on the boundary issue	70% of villager know where the boundary lies and accept its new position.
		Action 9: Organize stakeholders to visit and mark the boundary	On schedule positioning of demarcation stones;70% of villagers know and accept the new boundary

Chapter 7: Schedule and Budget

Objectives	Actions	Implementation Units	Annual Budget (RMB)			Schedule (Quarterly)											
			2005	2006	2007	2005				2006				2007			
Establish a sound co-management mechanism	Action 1	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, community representatives, external experts and organisations	52,500	105,000	105,000				√		√		√		√		√
	Action 2	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, community representatives, experts on co-management		105,000						√	√						
	Action 3	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, relevant technical staff and experts		306,000							√	√	√				
	Action 4	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, Co-management committee, external experts			104, 800										√	√	
Improve the conservation and development capacity of the communities and the reserve	Action 5	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, community representatives, Baisha Educational Bureau, external experts		70,000	70,000						√		√		√		√
	Action 6	BWL NR, external experts and organisations	62,000	62,000	62,000		√		√		√		√		√		√
	Action 7	BWL NR, Baisha County Forestry Bureau, Qingsong Township government, Co-management committee, external experts		68,000	68,000					√		√		√		√	
Clearly define the reserve boundary	Action 8	BWL NR, Qingsong Township government, Community representatives		33, 200	33, 200					√		√		√		√	
	Action 9	BWL NR, Qingsong Township government, Community representatives			52,000											√	√

Annexes:

Annex 1: Report of Training Needs Assessment (TNA) in the Bawangling National Nature Reserve

1 Background and Objectives

According to the work plan of Hainan project of Fauna & Flora International (FFI) in 2004, independent consultant Mr. Weijie Deng visited Bawangling National Nature Reserve and adjacent communities throughout May 16 to May 21, 2004. He also visited Hainan Ecological Environment Education Center (HEEC)， one of FFI's important partners in Hainan Province. The objectives of this trip includes:

1. To get to know and identify the current organizational structure and personnel of the nature reserve, especially current status of capacity of staff.
2. To analyze and identify objectives and aims of the management of Bawangling National Nature Reserve, especially prioritized actions in next three years;
3. To analyze the gap of capacity for implementing these objectives and to identify necessary training activities;
4. To prioritize training needs in 2004-2005, based on the analysis of capacity and requirement for the position of the staff;
5. To share and revise the output of this analysis, with the leadership of Bawangling National Nature Reserve and FFI project manager.

In addition, in order to promote effective cooperation and communication between FFI and other international agencies working in Bawangling National Nature Reserve, we took the opportunity to communicate with staff from Kadoorie Farm and Botanic Garden (KFBG) on gibbon conservation.

2 The Procedure and Approaches of TNA

Weijie Deng organized and facilitated the nature reserve staff to discuss their training needs with a participatory approach through the following steps:

3 Result of Evaluation

3.1 The Training Needs of Bawangling National Nature Reserve

3.1.1 The Organizational Structure and Personnel Capacity of Bawangling National Nature Reserve

There are three directors for the Bawangling National Nature Reserve, including a director and two vice directors. Tasks include administration, field patrolling and monitoring and law enforcement, but without any specific management division. The administrative vice director is responsible for administrative management, human resource management, patrolling, monitoring etc. The other vice director is only responsible for the forestry police station and enforcement. All forestry policemen have been dispatched to different protection stations in the reserve. Although financial management is part of administrative management, in reality it is directly managed by the director.

Figure 1 shows the organizational structure as well as personnel allocation and individual capacity of the staff of Bawangling National Nature Reserve.

Figure 1: The Organizational Structure and Personnel Allocation of Bawangling National Nature Reserve

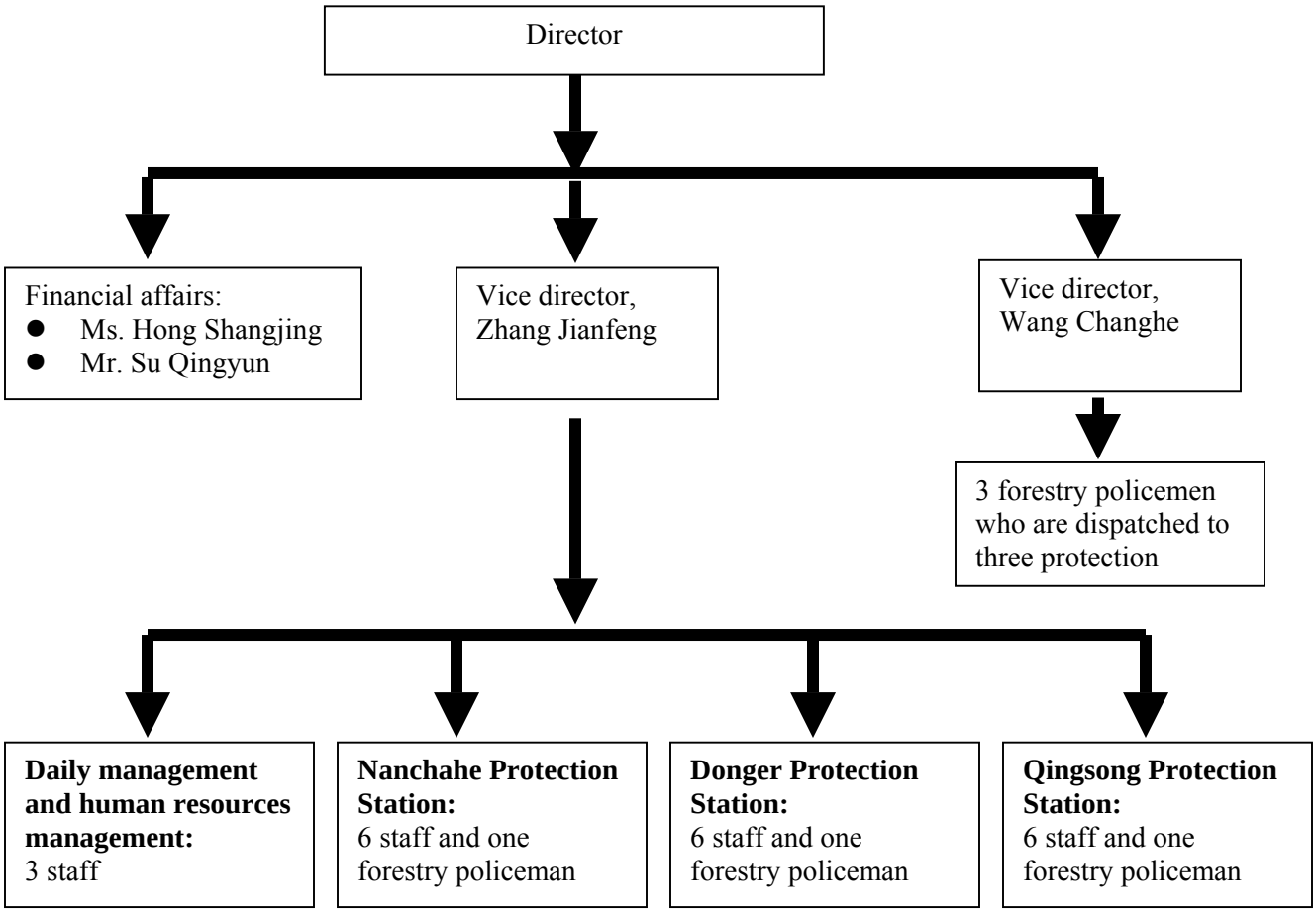


Figure 1 and discussion revealed that there are 28 staff in Bawangling National Nature Reserve, among which only two are females. Among all the staff, only one staff (Vice director Jianfeng Zhang) has background in professional wildlife conservation. 7 members have been working in the reserve for more than 10 years and 21 members were recruited in 2002 or 2003. 5 members once participated in the training on community survey supported by GEF Project. At least 11 members have not yet been trained in any aspect of nature reserve management. Although the conservation target species of Bawangling National Nature Reserve is the Hainan Gibbon, only 3 staff have working experience in gibbon monitoring. Among 4 staff who have computer skills, only one is working on management, the other 3 graduated from law colleges and are working in the police station.

In 2003, all staff participated in the training courses on field census of the Hainan Gibbon sponsored by Hong Kong Kadoorie Farm and Botanic Garden (KFBG) and in the follow-up field survey.

3.1.2 Main Tasks and Capacity Gaps of Bawangling National Nature Reserve in the following three years

Currently, there is no management plan for Bawangling National Nature Reserve. However, group discussion revealed that the main tasks that should be undertaken by the reserve in the following three years(2004-2007) include:

- To contact relevant universities, to select some postgraduate students to work in the Bawangling National Nature Reserve, on the purpose to improve the capability of the reserve;
- To seek financial support from Chinese government and international agencies to build five protection stations in the reserve and purchase some research and monitoring equipments and anti-fire facilities;
- To develop management plan for Bawangling National Nature Reserve;
- To conduct pilot work such as community education, (School) children education, integrated development of community, and community-based management of the nature reserve in adjacent communities;
- To monitor the phenology of flora and to study its relationship with the range of Hainan Gibbon;
- To carry out and improve population monitoring of Hainan Gibbon and macaques, to safeguard 13 individuals of the Hainan Giboon;
- To develop the organizational structure of the nature reserve, to set up necessary divisions, especially to clarify the relationship between Bawangling National Nature Reserve and Bawangling Forestry Bureau.

However, as Figure 1 reveals, the current capacity of Bawangling National Nature Reserve is not adequate. Although there are 28 staff in the reserve, only a few have relevant capability on conservation, which include:

- Wildlife conservation: 1 (Jianfeng Zhang)
- Taxonomy of Plant: 1 (Qing Chen)
- Population monitoring of the Hainan Gibbon: 3 (Zhaoli Zhou etc.)

To this end, the following problems should be noticed for conservation work:

- The construction of infrastructure will be mainly funded by government and potential international organizations. However, financial support from Chinese government cannot be certain and the reserve doesn't know how to apply for funds from international organizations;
- Lack of capacity and knowledge to independently make the management plan for the reserve;
- Serious lack of the knowledge and skill for working in local communities, including community education, children education, integrated development of communities, and community-based management;
- Lack of knowledge, skills and necessary equipments to monitor phenology;
- Lack of enough capability to monitor the population of Hainan Gibbon;
- Lack of necessary knowledge and skills for field work, such as maps and first aid;
- Lack of the capacity of collecting, analyzing and using information;
- Lack of familiarity with laws and regulations related to conservation;
- Serious lack of knowledge of the classification of common fauna and flora in the reserve;
- Lack of capacity of basic skills of GIS and its application to the management of nature reserve

To effectively implement the necessary tasks for Bawangling National Nature Reserve in the following three years (2004-2006), the above capacity gap should be addressed to meet the needs of management.

3.1.3 Training Needs of Bawangling National Nature Reserve in the Next Three Years

Based on the work plan, current institutional and individual capacity of Bawangling National Nature Reserve in the next three years, as well as the opinions of the staff (14 reserve staff

participated in the discussion), the training needs of Bawangling National Nature Reserve in the next three years are identified as follows:

- How to seek financial support from international organizations?
- How to effectively conduct environmental education in local communities?
- How to conduct community-based management?
- The classification of common plants and animals in Bawangling National Nature Reserve;
- How to effectively monitor phenology and population of the Hainan Gibbon?
- Basic skills of field work, such as reading maps and first aid;
- How to effectively collect and analyze information on conservation?
- How to apply GIS to the management of nature reserve?
- How to make a practical management plan for Bawangling National Nature Reserve?

To summarize, the training needs of Bawangling National Nature Reserve in the next three years should focus on the following themes of three aspects:

- The technology, knowledge and skills on:
  1. Classifying common plants and animals in tropical areas;
  2. Monitoring floral phenology in tropical areas;
  3. Monitoring population of the Hainan Gibbon.
- The knowledge and skills of nature reserve management, which include:
  4. Information collection and analysis, such as Participant Rapid Appraisal;
  5. Project development and management;
  6. Integrated conservation and development;
  7. Participatory management of nature reserve;
  8. Formulating a management plan for the nature reserve;
  9. The application of GIS to the management of nature reserve;
- The knowledge and skill of community participation, which include:
  10. The knowledge and skill of environmental education in local communities;
  11. The knowledge and skill of children education;
  12. Community participation in conservation management of the nature reserve;
  13. Management of tourism development

In addition, Bawangling National Nature Reserve had great interest in tourism development, and has conducted some relevant activities. The challenge faced by the reserve is how to harmonize tourism development with Effective conservation of nature reserve. It is suggested that Bawangling National Nature Reserve should have training on management of eco-tourism as soon as possible, so that the tourism development in the reserve and adjacent areas can be managed effectively. In this case, the training needs of Bawangling National Nature Reserve in the next three years will at least include 14 themes at three aspects.

3.1.4 The Prioritized Training needs of Bawangling National Nature Reserve during 2004-2005

Based on the discussion of the staff and suggestions of Vice director Jianfeng Zhang, the following themes were identified to be the priority training needs of Bawangling National Nature Reserve during year 2004-2005:

1. Development and management of international cooperation projects;
2. Environmental education in local communities, especially to children;
3. Community participation in conservation management;
4. Classification of regular plants in tropical areas;

5. Monitoring phenology and population of Hainan Gibbon;
6. Field work and survival skills (Reading maps and first aid);
7. Collecting and analyzing information (Participant Rapid Assessment);
8. Making management plan for the nature reserve;
9. GIS technology and nature reserve management.

Annex 2: Seacology Foundation Donation information:

School (total no. of funded students)	Village	No. of students receiving donations
Central Primary School, Qingsong Township, Baisha County (30）	Yitiao Village, Qingsong Township	12
	Kunbao Village, Qingsong Township	15
	Nanye Village, Qingsong Township	3
Qingsong Township Primary School, Baisha County (50）	Miao Village, Qingsong Township	10
	Team 1, Zibao, Qingsong Township	6
	Team 2, Zibao, Qingsong Township	6
	Xinqing Village, Qingsong Township	10
	Xinfeng Village, Qingsong Township	4
	Team 1, Damai, Qingsong Township	7
	Team 2, Damai, Qingsong Township	5
	Villagers Committee, Qingsong Township	1
	Nanye Village, Qingsong Township	1
Zhizai Primary School, Qingsong Township (31）	Zhizai Village, Qingsong Township	8
	Team 1, Zhizai, Qingsong Township	6
	Team 2, Zhizai, Qingsong Township	6
	Team 3, Zhizai, Qingsong Township	8
	Zhizai Rosin Factory, Qingsong Township	3
Wangxia Xincun Primary School, Qicha Township, Changjiang County (139）	Dayaxin Village	113
	Dayanlao Village	15
	Dayan Villagers Committee	8
	Xincun Elementary School	3
Total	**250**	

Annex 3: **Relevant policies and plans concerning the protection and use of forestry resources in Baisha County**

1. Forestry programs (the County Forestry Bureau):
Master Plan for Baisha County Ecological County Construction, Baisha County Ecological Commonweal Forest Construction and Plan, Baisha County Plan to Quit Farm Soil for Forest, Baisha County Plan for the Development of Forestry Product Processing were constituted in 2002 and 2003; these plans will be carried out by the Forestry Bureau annually.

2. Natural forest resources protection program (the County Forestry Bureau, townships government, state-run farms):
From 2003 to 2010, the eco-forest construction plan will be carried out, the commonweal forests will be protected through implementation of the *Responsibility System* and *Contract Managing System*.

3. Implementation of the Grain to Green Programme (the County Forestry Bureau, township governments, State-run farms): By 2005 all farmland on slopes of more than 25° degrees should be turned into forest; by 2010, farmland along rivers, surrounding the reservoir and irrigation ditches and farmland along roads should also be turned into forest

4. Increase tree planting (the County Forestry Bureau, township governments, state-run farms):
To achieve 65, 333 ha of planted trees by 2010, of which 20,000 ha should be crop plantations eg rubber. Planting is managed under the *Responsibility System*.

5. Promoting eco-county construction objectives (the County Office, Government Office and Ecological Administration Office):
Review the plan annually to ensure the responsible actions of relevant departments.

6. Implement the leadership evaluation system combining the ecological county construction objectives (the county personnel department):
Include the eco-country development and ecological protection in the evaluation of leadership, in 2002 the system was settled and has been implemented since 2003.

7. Eco-village development (township governments and state-run farms):
Every township will set up 5-10 eco-villages and every farm shall set up 5-10 ecological working teams.

8. Forestry development in the county and township (land, environment and resource administration bureau, the County Forestry Bureau and state-run farms):

9. Establishment of nature reserve (the Country Forestry Bureau, the Land, Environment and Resources Administration): A master plan for the establishment of Nankai Provincial Nature Reserve was formally set out in 2002, for Nangaoling Provincial Nature Reserve in 2003. The master plan for establishment of Yinggeling National Nature Reserve should be formally set out before 2010.

10. Bamboo and rattan plantation (the County Forestry Bureau and township governments):
To achieve the planting of 5, 333 ha of bamboo and 10,000 ha of rattan by 2007.

11. Demonstration project for eco-environment control and renovation (the County Forestry Bureau):

The second phase of the project finished in 2002, the third phase finished in 2003.

12. Protect natural forest and instigate reforestation (the County Forestry Bureau):
In 2002~2004, fostered and managed forest with an area of 5053 ha

13. Investigate and combat illegal trade in protected wildlife destruction of the rainforest (the County Forestry Bureau):

14. Establish tree nurseries (the County Forestry Bureau):
Establish three nursery bases in Bangxi, Baisha and Fulong, project started in 2002 and to be finished by 2010.

15. Compile list of forest industry projects (developing and planning bureau, the County Forestry Bureau, the Land, Environment and resources Bureau):
A list of projects was compiled in 2002, including planting, forestry product processing and forest tourism.

16. Establishing of the Bangxi Nature Reserve (the County Forestry Bureau):
Finish infrastructure construction in 2005; in 2006~2010, establish and improve facilities for tourism and make it the first eco-tourism park in western Hainan.

17. Develop forestry product processing (the County Forestry Bureau, township governments):
In 2002 a factory was established in Qifang producing bamboo and rattan crafts; in 2005 a factory producing turpentine, was set up, as was a timber processing plant.

18. Construct Forest park (the County Forestry Bureau):
Establish Baisha Forestry Park in 2010 with an area of 13, 333 ha

19. Establish forestry service system (the County Forestry Bureau):
Between 2002 and 2005 establish Baisha Forestry Association and Baisha Forestry Technology Training Center. In 2010 establish a Forestry Research Institute.

20. Develop tropical plant business (the County Forestry Bureau):
Establishes a rare plants base in Bangxi Township.

21. Implement Ecological Poverty Alleviation Program and Forestry Integrated Development Program (the County Forestry Bureau):
Programs first implemented in 2002: development of economic crops and livestock; in 2005 select some demonstration projects and promote the scheme throughout the county in 2010.

References:

Department of Wildlife Conservation. State Forestry Bureau. 2004. *Guide to Community Co-management in Nature Reserve*. Beijing: China Forestry Press

Department of Wildlife Conservation. State Forestry Bureau. 2002. *Community Co-management in Nature Reserve*. Beijing: China Forestry Press

Proceedings of International Workshop Addressing Cooperative Management in China Nature Reserve. 2004. Beijing.

Li Xiaoyun. 2001. *Introduction to Participatory Development: Concept, Methodology, Facility*. Beijing. China Agricultural University Press.

Master Plan for Hainan Bawangling National Nature Reserve. 2004.

Kadoorie Farm and Botanic Garden, 2001. *Report of Rapid Biodiversity Assessments at Bawangling National Nature Reserve and Wangxia Limestone Forest, Western Hainan, 3 to 8 April 1998. South China Forest Biodiversity Series: No. 2. KFBG, Hong Kong SAR, ii + 33 pp.*

IUCN 2004. *2004 IUCN Red List of Threatened Species.* <www.redlist.org>. Downloaded on 10 August 2005.