Report of Collaboration on and Integrated Management of Mountain Ecosystems in Hongqiang, Chuxiong, Yunnan Province of China

Kunming Institute of Botany, Chinese Academy of Sciences (KIB-CAS), Heilongtan, Kunming 650204, China
Principal Investigator
Prof. Kang Yunhai, Deputy Division Head, Yunnan Academy of Social Sciences
Dr. Cai Kui, Resource Management Specialist, Yunnan Institute of Geography
Prof. Xue Jiarong, Forest Specialist, Southwest Forestry College, and
Prof. Long Chunlin, Country Coordinator of the Project, KIB-CAS

Background

Hongqiang is a Yi nationality community in the buffer zone of Zixishan Nature Reserve (ZNR) in Chuxiong, Yunnan (Figure 14). The ZNR, called Zixishan or Zixi Mountains, is located in central Yunnan and has an elevation of between 1,950m and 2,502m above sea level. It is dominated by evergreen, broad-leaf forests and pine forests. According to recent biological surveys, 1,300 species from 146 families of vascular plants have been found in the reserve. Among them, 120 species from 49 families are medicinal plants. It is rich in Theaceae, including nine species of camellia. Over 40 species from 9 families of mushrooms and about 100 species from 43 families of vertebrates including 61 bird species have also been recorded in the nature reserve. Some rare and endangered animals such as leopard, red panda, peacock, and golden pheasant are found in the nature reserve. Five of them are national protected species under grade one of the State Red Classification.

Zixishan has a historical position in religion in Yunnan. It is said that there were 66 forest lands, 77 nunneries, and 88 temples in the mountains about 400 hundred years ago. Traditional culture and indigenous knowledge have strongly affected biodiversity in the region. Local people have a tradition of managing, conserving and using biodiversity.

The Hongqiang Community Association for Biodiversity Conservation (HCABC) was founded in 1998. Since its establishment, HCABC has played an important role in biodiversity conservation and the extension of agricultural technology in the community.

Before this project, a pilot project was carried out at this case site (from 1995 to 1997, supported by the MacArthur Foundation and ICIMOD). The project team, aided by active participation from local government and the community made many multi-disciplinary achievements. Major activities and results include (1) a socioeconomic survey in Hongqiang; (2) biodiversity research, including indigenous knowledge and cultural contexts in biodiversity management; (3) the extension of 198 energy-saving stoves; (4) building of 1,100 water tanks for upland fields; (5) rehabilitation of the Yi Traditional Culture Centre; (6) establishment of a new school building with an area of 3,000m^2; and (7) publishing three papers and one booklet. The donors of the project were satisfied with these results. Therefore, the proposal for the current project was approved by the funding agencies.

The objectives of this project were as follow.

- To create greater awareness and knowledge about the sustainable ecosystem management of ZNR and its buffer zone

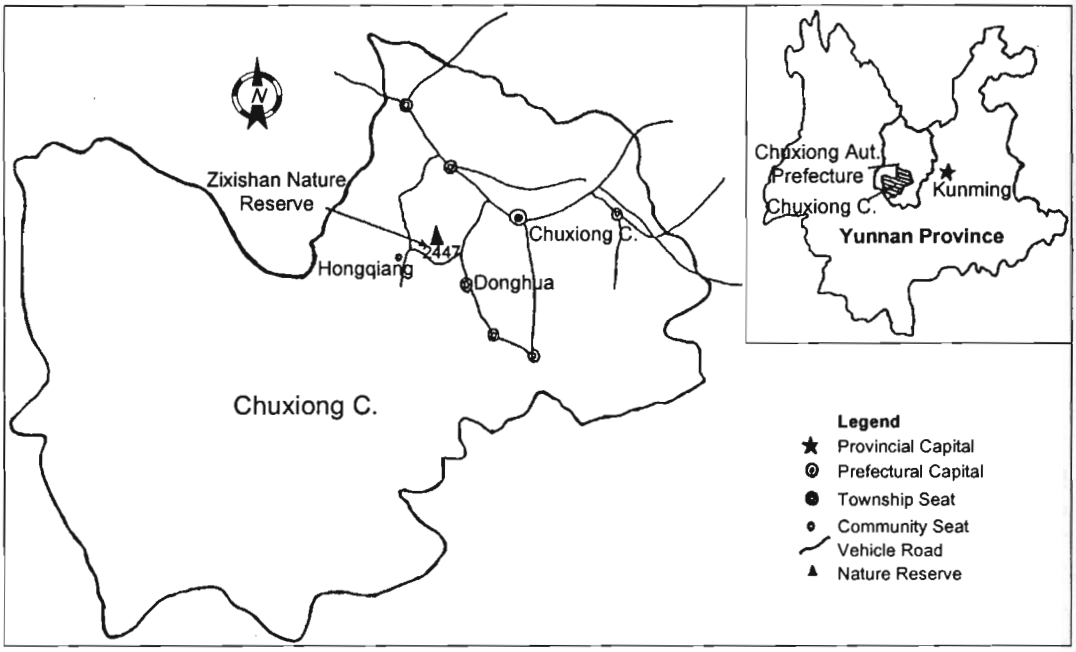


Figure 14: **The Location of Hongqiang Community, Chuxiong, Yunnan, China**

- To prepare a management plan for ZNR and its buffer zone
- To train local officials and villagers in biodiversity management
- To improve the quality of the forests
- To study traditional cultural beliefs and to promote them incorporating modern development requirements

After three years, we believe the project team reached these objectives.

The original tasks of this project were as follow.

- To organise training courses, for 20-30 officials of government organisations and staff of NGOs on integrated management of natural and man-made ecosystems in Chuxiong, including ZNR and its buffer zone
- To organise field trips for 30-40 officials in Chuxiong, who work in the field of natural resource management, to visit Hongqiang
- To lead farmer-to-farmer exchanges within and between communities in the ZNR buffer zone
- To train members of the newly established HCABC
- To compile training material in local languages and undertake education about the environment and biodiversity conservation in the primary school of Hongqiang
- To create a demonstration plot (2 ha) of mixed forest for pine forest improvement (and consequently increase seedling numbers of native alder (*Alnus nepalensis*) in Hongqiang)

The total grant was US $20,000: this comprised two components of US $10,000, one from the MacArthur Foundation and the other from UNEP.

Activities (1998-2000)

Training

First Beekeeping Training Workshop

The First Beekeeping Training Workshop was held in Hongqiang on 27-28 June 1998. Beekeeping is one of the traditional practices that use biodiversity in the Zixishan area. Local people can harvest honey twice a year for self-consumption. We realised, during our field trips in the area, that honeybees were extremely important not only for honey production but also for the whole agroecosystem. Many fruit trees (pear, peach, apple, and plum) and crops (rape seeds, pulses, and vegetables) can only harvest a good yield with pollination by bees.

Professor Kuang Bangyu and his colleagues were invited to the workshop. He is a professor at the Yunnan Agricultural University and has developed very successful management techniques for beekeeping in mountainous Yunnan, and is known respectfully as 'the King of Beekeeping in Yunnan'. If people in Hongqiang adopted his techniques, honey yield would increase by 5-8 times. Thus people would not only meet their own demands but also sell to tourists or at the local market. Twenty-nine local people participated in the workshop (see Appendixes 1). Professor Kuang and his colleagues trained the local people by means of lectures, videos, and practical demonstrations.

First Seminar on Environmental Education

The First Seminar on Environmental Education was held in Hongqiang Primary School on 10-15 September 1998. Based on the textbook (or training material) compiled by Zhang Fangyu, Yu Liliang, and Long Chun-lin (see later section on 'Training materials'), the seminar was given through lectures and field observation to all the students (197) at the school, by Zhang Fangyu and Yu Liliang. Both Mandarin and local languages were used in the seminar so that all the students could understand the content of the textbook.

Second Beekeeping Training Workshop

The Second Beekeeping Training Workshop was organised in Hongqiang on 20-24 September 1998. The major objectives of this workshop were to further progress beekeeping management techniques and to replace local traditional bee boxes with improved ones. Two lecturers from the Beekeeping Institute of Yunnan Agricultural University, Wang Jianming and Zhou Danyin, carried out the training, while 33 students from the university acted as volunteers to help (see Appendixes 2). About 65 farmers were trained (see Appendixes 3). Thirty-six groups of honeybees were transferred from old boxes to improved ones.

Seminar on Fruit Tree Management and Animal Husbandry

The Seminar on Fruit Tree Management and Animal Husbandry was held in Hongqiang on 26-28 September 1998. This seminar focused on agroforestry production in traditional orchards and on breeding of traditional black goats. Two agricultural experts from the Yunnan Agricultural University, Professor Yang Wenliang and Professor Peng Helu were invited to deliver the seminar. Twelve farmers from Hongqiang and three officials from local government attended the seminar (Appendixes 4).

"the objective of this workshop was to train policy-makers, government officials and staff from management agencies of the nature reserve, and environmentalists in NGOs in biodiversity conservation and sustainable uses of natural resources"

First Workshop on Natural Resource Management and Community Development

The First Workshop on Natural Resource Management and Community Development for officials and staff from government and non-government organisations was held in Zixishan, Chuxiong, on 24-28 November 1998. The objective of this workshop was to train policy-makers, government officials and staff from management agencies of the nature reserve, and environmentalists in NGOs in biodiversity conservation and sustainable uses of natural resources. Twenty-seven participants attended the workshop (see Appendixes 5), which was delivered by Lu Xing from the Yunnan Institute of Geography and Yang Qing from the Yunnan Academy of Forestry.

Second Seminar on Environmental Education

The Second Seminar on Environmental Education for students was held in Hongqiang Primary School on 10-15 March 1999. Zhang Fangyu, our project consultant, and Yu Liliang, from the Folk Cultural Association of Chuxiong, gave the seminar as two courses every afternoon. About 120 students attended the seminar.

Major topics included natural forests in Hongqiang, biodiversity and its significance, the relationship between forests and water, bio-totems in traditional Yi culture, and national and regional laws of environmental protection. Examples from local society were used so that the students could understand them very easily. The training material ('Textbook of Biodiversity Conservation') compiled by the project and HCABC was used during the seminar.

Third Beekeeping Training Workshop

"the objective of the workshop was to train local beekeepers so that they could harvest more honey after the bee boxes had been improved"

The Third Beekeeping Training Workshop was held in Hongqiang on 26-28 March 1999. The objective of the workshop was to train local beekeepers so that they could harvest more honey after the bee boxes had been improved. Zhang Xuan, a lecturer from the Beekeeping Institute at Yunnan Agricultural University, taught local beekeepers the harvest techniques through courses and demonstration in Hongqiang. Sixteen local beekeepers participated in the workshop (see Appendixes 6).

Three honey-harvesting machines were brought to the community to help the local people collect honey. Local farmers were very surprised that there was so much honey in their improved bee boxes. For example, Wang Jianhai's family could harvest only 2 kg of honey from each bee box in a year when they used the old bee boxes. However, they collected 5.5 kg honey from each box only two months after they adopted the improved boxes. The yield has been increased by 15-20 times. This is a big achievement and increases the enthusiasm of local people for bee keeping.

Second Workshop on Natural Resource Management and Community Development

The Second Workshop on Natural Resource Management and Community Development was held in Chuxiong on 22-24 May 1999. It was delivered

by Lu Bin (Senior Fellow, Yunnan Academy of Forestry) and Du Yong (Forester and Division Head, Yunnan Provincial Department of Forestry). Eighteen trainees including policy-makers, nature reserve staff, and members of HCABC participated in the workshop (Appendixes 7).

Lectures covered the functions of nature reserves and the concepts and examples of ecotourism and agrobiodiversity. The policy-makers and nature reserve staff are very interested in ecotourism because Zixishan Nature Reserve (ZNR) has been opened to the public but it is resulting in pollution of the reserve. Members of HCABC are interested in agrobiodiversity. They like to have forests, various crops, fruit trees, animals, bees, and many others species in their agroecosystem.

Training Workshop on Bamboo Cultivation and Management

A workshop on bamboo cultivation and management was organised in Hongqiang on 12-13 August 2000. Bamboo experts, Professor Xue Jiarong and Professor Du Fan from Southwest Forestry College, were invited to deliver the training. Twenty-five participants from HCABC and villages attended (Appendixes 8).

The lectures comprised six parts: (1) general introduction to bamboo; (2) propagation techniques and seedling preparation; (3) land preparation and transplantation; (4) fertilisation, selective logging, and management; (5) disease and pest control; and (6) harvesting and marketing. After the lectures, a field demonstration was conducted in a private bamboo garden of Hongqiang Village.

Dissemination

Publications

The project team has completed six papers and one piece of training material since the beginning of the project. Some articles have also been published.

In addition to publications, some of the project results are being disseminated through conferences. These include the 'Second International Symposium on Plant Resources', the 'Anniversary Congress of the Chinese Society of Botany', and the 'Symposium on Sustainable Development in Mountain Areas in Yunnan'. All three symposia invited Professor Long Chun-lin to a give keynote presentation on the project activities and achievements from Hongqinag, Chuxiong, Yunnan.

The publications are

Liu Aizhong; Long Chun-lin (1999) 'Advances in Ethnobotany'. In *Advances in Plant Sciences*, Vol. 2, pp 166-173. Beijing: China Higher Education and Heidelberg: Springer-Verlag

Liu Ai-zhong; Pei Shengji; Chen Sanyang (1999) 'Plant Worship of the Yi People in Chuxiong of Yunnan, China'. In *Ethnobotany*, 11: 1-8

Liu Ai-zhong; Pei Shengji; Chen Sanyang (2000) 'An Investigation and Study on the Plant Worship by the Yi People in Chuxiong, Yunnan'. In *Chinese Biodiversity*, 8(1): 130-136

Liu Ai-zhong; Pei Shengji; Chen Sanyang (2000) 'Investigation and Studies on Sacred Groves of the Yi People in Chuxiong, Yunnan'. In *Ethnobotany and Sustainable Utilisation of Plant Resources*, pp 271-280. Kunming: Yunnan Science and Technology Press

Long Chun-lin (1999) 'Participatory Conservation and Community Development— Practice in the Buffer Zone of Zixishan Nature Reserve in Yunnan, China'. In Yunbin, Ai (ed.)

Proceedings of the Symposium on Sustainable Development in Mountain Areas in Yunnan, pp 209-213. Kunming: Yunnan Science and Technology Press

Long Chun-lin; Zhang Fang-yu; Pei Shengji; Chen Sanyang (1999) 'Impact of Traditional Yi Culture upon Biodiversity in Zixishan of Yunnan'. In *Chinese Biodiversity*, 7(3): 197-204

Training Materials

The environmental training material, entitled 'Textbook of Biodiversity Conservation' was compiled by Zhang Fangyu, Yu Liliang, and Long Chun-lin, illustrated by Liu Yi and Liu Yitao, and issued by the HCABC and the project in August 1998. It is the first training material for local government officials, farmers and primary school students to address the protection of biodiversity in China. The textbook consists of the following sections: (1) love nature; (2) powerful forests; (3) the broad-leaf forest is a treasure house; (4) protect birds while conserving forest; (5) forest is equal to a purification factory; (6) big trees contain water; (7) foster seedlings; (8) everybody will praise my home town; (9) colourful flowers; (10) no forest, no mushrooms; and (11) significance of reforestation. A beautiful illustration is attached to each section.

"the first training material for local government officials, farmers and primary school students to address the protection of biodiversity in China"

The HCABC have issued 1500 copies of the textbook. Most of them are used for teaching in Hongqiang Primary School and some of them are used by farmers, local government officials, and members of the HCABC. Many people in the field of biodiversity conservation in China (including Taiwan and Hong Kong) have paid great interest to this textbook and, as a result, about 30 copies have been sent to different people from different organisations in China. This is very useful for the dissemination of research results and working experiences, and for raising public awareness about environmental protection.

Dissemination/Exchange of Biodiversity Conservation and Community Development Experiences in Mountain Ecosystems

The experiences from Hongqiang, including the methodologies and results, might be useful for other places in southwest China, where the biophysical and cultural environments are very similar. Such experiences can be disseminated through meetings. With this consideration, a seminar on Experience Dissemination/Exchange of Biodiversity Conservation and Community Development in Mountain Ecosystems was held in Chuxiong, Yunnan, China on 18-21 November 1999.

The main objectives of the seminar were to disseminate the project findings and to increase awareness of biodiversity conservation and integrated management of natural resources. Six participants from Sichuan, two from Guizhou, one from Chongqing, one from Hunan, seven from Yunnan, and two from international organisations were invited to attend the seminar (Appendix 9). They represented a broad background from government organisations from provincial, through county to township level, research institutions, and universities. Participants were

required to share and exchange their experiences encountered in biodiversity conservation and rural development in mountainous southwest China.

Zhang Fangyu, Consultant to the ICIMOD-UNEP/MacArthur project in Chuxiong, was the first speaker in the seminar. He gave a presentation entitled "Strategies for Biodiversity Conservation and Sustainable Rural Development in Hongqiang, A Yi Community in the Buffer Zone of Zixishan Nature Reserve". He summarised the project activities and achievements in the past few years and he emphasised the role and significance of the HCABC in the conservation of biological and cultural diversity and sustainable rural development in the community. It is remarkable that traditional culture, religious beliefs, and indigenous knowledge have been playing an important role in biodiversity conservation according to the case study from Hongqiang.

Professor Kuang Bang-yu, Director of the Beekeeping Institute of Yunnan Agricultural University, emphasised the important role of bees in agroecosystems in his presentation entitled 'Discussion on the Relationship between Honeybee and Agrobiodiversity'. Beekeeping in mountain ecosystems not only provides local people with honey and other bee products (including beeswax, royal jelly, and pollens) it can also promote local agroecosystems and improve agricultural yields through pollination by honeybees. Hongqiang, as one of the demonstration cases of beekeeping in Yunnan Province, under the supervision of Professor Kuang, has benefited from the improved techniques of beekeeping developed by Professor Kuang's institute.

Wang Jianhai, Head of Hongqiang Community, told the participants that biodiversity conservation and rural development can exist together, based on experiences of the last few years. He explained that the ongoing project has greatly improved awareness of the ecological environment. Local people understand that the nature reserve is their source of water and non-timber forest products. In addition to paying more attention to the conservation of the nature reserve, they have agreed to establish water source-protected areas (total area of 1000 ha) in the community. Through education and training, particularly in agricultural techniques like fruit-tree management and agroforestry techniques, local people have received more products from their farm land.

The main contents of the seminar were disseminated through papers dispersed at the workshop, and through Chuxiong Television Station on the evening of 19 November 1999. This seminar and the ICIMOD-UNEP/MacArthur project were also reported through other media, such as Yi's Prefecture News and Chuxiong Radio.

The two-day seminar achieved its objectives. The participants stated that they had learned a lot from the project site and also from each other.

Farmer-to-Farmer Exchanges

Two Farmer-to-Farmer Exchanges had been organised at the time of writing.

Six farmers from Laoshaohe Community visited Hongqiang on 12-13 July 1999. This community is located in the buffer zone of the ZNR. Farmers from Laoshaohe mainly observed the water tanks, the energy-saving stoves, and the HCABC. They had very productive talks with the people in Hongqiang about agricultural production and biodiversity management. Zhang Fangyu and Wang Jianhai coordinated this activity.

Chen Liming, the local facilitator of the project, took a group of 10 farmers from Hongqiang to Shuzuo Township, Chuxiong from 3-5 September 1999. Shuzuo is known in Chuxiong for its

good agroforestry management and rural economy. Farmers from both communities shared a lot of experiences of agricultural production and forest management. In particular, farmers from Hongqiang paid much attention to the fact that the people of Shuzuo grow green manure in their orchards in autumn and winter after they have harvested fruits and summer crops like corn and soybean. Several farmers of Hongqiang indicated that they would grow green manure on their lands in the winter. Participants of the Farmer-to-Farmer Exchanges are listed in Appendix 10.

Hand-in-Hand Project

The first activity of the Hand-in-Hand Project was proposed by the project team in August 1998. It involves a household from the Kunming Institute of Botany (KIB) supporting a family from Hongqiang who are too poor to afford for a child to finish primary school education. The project was initiated in early September at the KIB. At the end of September, the organisers of the project accepted 4,220 yuan, 717 books and 788 pieces of clothing from 112 staff and graduate students of KIB. On 1-2 October, representatives from KIB came to Hongqiang and met the students at Hongqiang Primary School. The staff and graduate students from KIB have established a partnership with 23 local students (Appendix 11) who are very poor. These students will be supported financially by their partners at KIB until they finish their primary school education. It was poignant that the meeting was organised on the National Day of China (October 1).

"farmers from both communities shared a lot of experiences of agricultural production and forest management"

The project team organised the second activity of the project on 1-2 July 1999. Thirty-one students from Hongqiang Primary School were brought to Kunming and met their partners. They visited Kunming Botanical Gardens, Kunming Children's Centre, and the Exhibition of the Animal Kingdom. Students reported that the visit to the city was an eye-opener for them in terms of social, economic, and scientific development, and that they received excellent environmental education.

Alder Seed preparation

In October-November 1998, the project team members had gathered three kg of alder seeds. They came from two species, *Alnus nepalensis* and *A. cremastogyne*• (both are native to central Yunnan), that are suitable for growing in Chuxiong. Alder trees are highly appreciated by the local people in the Zixishan area for their beneficial characteristics that include fast growth, nitrogen-fixing properties, and their suitability for timber production and fodder supply and as a green manure. The seeds were treated in March 1999 and the subsequent seedlings were to be used to create a demonstration plot (2 ha) of mixed forest for pine forest improvement so as to increase the number of native alder seedlings in Hongqiang.

The alder seeds were put into hot water first and then sown in a well-prepared nursery. Unfortunately, not enough seedlings grew to cover an area of two hectares, because mice ate most of the seeds after sowing. Thus the project team moved their attention to a demonstration plot of bamboo. Again the area would be two hectares.

Demonstration of Bamboo Cultivation

Introduction

Currently, more than 1,000 bamboo species of 70-80 genera have been recorded around the world. Some 40 genera and 400 species of bamboo are present in China and Yunnan is the province with the richest bamboo biodiversity in China. In the whole province of Yunnan there are 210 woody bamboo species within 28 genera distributed naturally and the total area of bamboo forests in Yunnan is estimated to be 331,000 ha. Scientists have predicted that new species and genera of bamboo will be discovered in Yunnan in the future. Therefore, Yunnan is commonly accepted as the original and modern distribution centre of bamboo in the world.

People in China, especially those in south and southwest China, traditionally collect, cultivate, manage, and use bamboo. In all indigenous communities of Yunnan, bamboo is widely used in daily life, for construction, for making furniture and paper, for weaving, for handicrafts, for aesthetic purposes, and as food (bamboo shoots). Because of its significance, bamboo can be seen in every community in south and southwest China.

The Chinese people love bamboo so much that China has been called a country with a bamboo civilisation. Traditionally, bamboo was praised as one of the three intimate friends of human beings, along with pine and red plum, for its ability to withstand severe cold. In the classical gardens of China, bamboo is grown as an indispensable element among ornamental plants. Su Dongpo (1036-1101), one of the most famous writers in Chinese history had a very famous saying about bamboo, which every Chinese person knows: "I can manage life without meat; I could not, however, tolerate living in an environment without bamboo".

There are 25 ethnic groups living in Yunnan and most of them are polytheists. Some groups consider bamboo as their totems and worship them. For example, the Yi people in Chengjiang of central Yunnan believe that the golden bamboo (*Phyllostachys nigra* [black bamboo]) is their ancestral god and Yi families in Chuxiong, Yunnan, worship the rhizome of a species of *Fargesia* (grass). Bamboo is endowed with the meanings of birth, regeneration, and long-life in Taoism.

Based on its functions in economy, culture, and religion, it is easy to understand why the indigenous people in Yunnan have managed, conserved, used, and cultivated bamboo for many generations. Major bamboo species found in local communities in central Yunnan include *Fargesia yunnanensis* (grass family), *Dendrocalamus bambusoides*, *D. farinosus*, *Phyllostachys nigra*, *Neosinocalamus affinis*, *Chimonobambusa yunnanensis*, *Yushania polytricha* (grass plant), and *Bambusa intermedia*, some of which have been introduced for cultivation in Yunnan.

In the place of the alder cultivation, the establishment of a bamboo demonstration plot will help to gather many useful bamboo species and to demonstrate their economic, cultural, and religious value to the people. The supply of bamboo resources from such a demonstration plot could hold much potential for future development. Most attention will be paid to conservation of the most useful bamboo species that provide food in the form of edible shoots in central Yunnan.

Objectives

- To establish a bamboo demonstration plot of species useful to central Yunnan.
- To demonstrate the significance of native bamboo in economy, culture, and religion.
- To demonstrate bamboo propagation methods to the indigenous communities.
- To increase public awareness of biodiversity conservation through the HCABC.

Main Activities and Results

Traditionally, local people in Hongqiang manage, conserve, and use biodiversity, including that of bamboo, and their active participation in the project activities has made the bamboo demonstration plot very successful. The main activities are outlined below.

- First, a survey of the project site and its surrounding areas was conducted. Bamboo species occurring in central Yunnan were investigated and identified, particularly the useful species.
- A list of bamboo species introduced into the demonstration plot was prepared. They include *Bambusa ventricosa*, *B. lapidea*, *B. intermedia*, *B. glaucescens*, *Chimonobambusa yunnanensis*, *Dendrocalamus bambusoides*, *D. farinosus*, *D. latiflorus*, *Fargesia yunnanensis*, *Indocalamus longiauritus*, *Neosinocalamus affinis*, *N. farinosus*, *Phyllostachys aurea* (fish-pole bamboo), *P. nigra*, *Qiongzhuea tumidinoda*, and *Yushania polytricha*. Among them, *Fargesia yunnanensis*, *Chimonobambusa yunnanensis*, *Dendrocalamus bambusoides*, and *Phyllostachys nigra* are very important to the local people, economically and culturally, and most attention has been paid to these species (Appendix 12).
- The bamboo demonstration plot was established on an area of two hectares in a valley near the Hongqiang Community site in July 2000 (Figure 1[4]).
- The propagation techniques for very important bamboo species were demonstrated through training courses.

"traditionally, local people in Hongqiang manage, conserve, and use biodiversity, including that of bamboo, and their active participation in the project activities has made the bamboo demonstration plot very successful"

Impact of the project

Awareness Strengthening of Biodiversity and Forest Conservation

School Students

After two environmental education activities and the distribution of the 'Textbook of Biodiversity Conservation', all students in Hongqiang Primary School have a good understanding of the significance of biodiversity and the relationships between people and forests, trees, wildlife, and mushrooms. Educated from childhood, they will be able to pass on their knowledge about biodiversity conservation to their parents and neighbours. In the future, they will be better equipped to manage their biological resources than the older generation.

Local Farmers

When the project team first went to the villages in Hongqiang nobody knew what biodiversity meant. Through various training schemes and activities of the HCABC, local farmers started to gain more knowledge about biodiversity, its conservation, and its utilisation. The understanding of relationships between water and forests, mushrooms and trees, birds and insects, snakes and rats, and herbal medicine and the natural environment, has increased local people's awareness of biodiversity conservation and its sustainable uses.

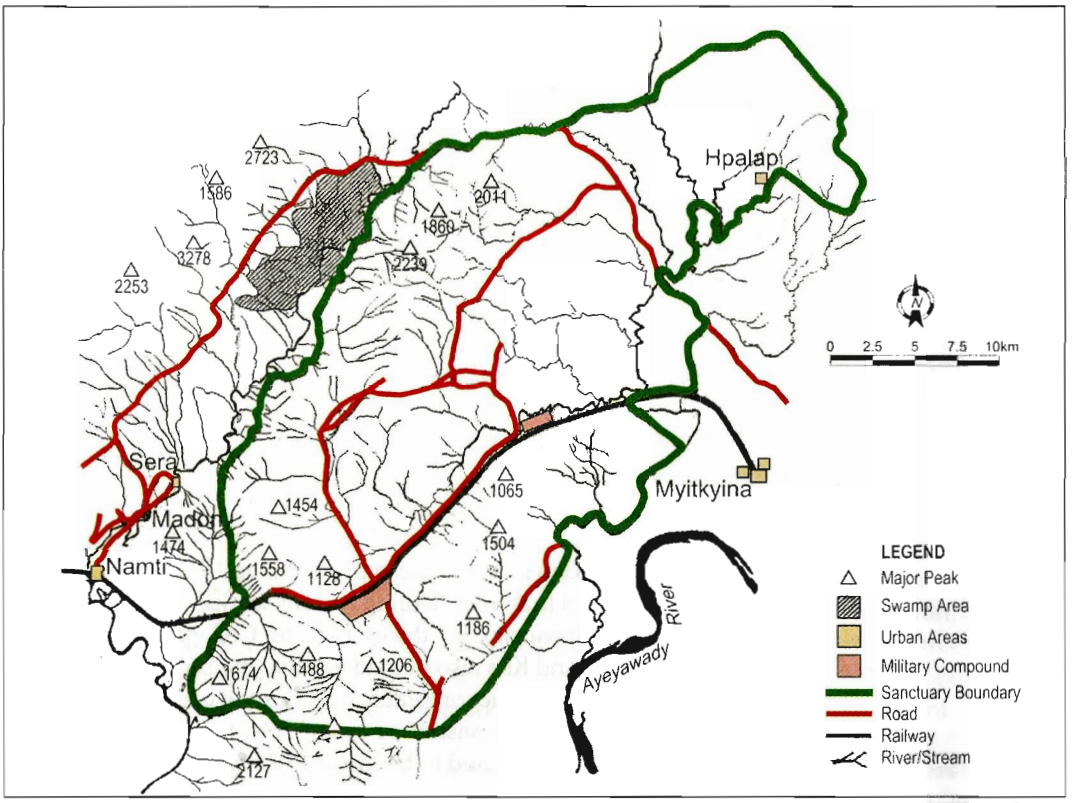


Figure 15: **Skeleton Map of Pidaung Wildlife Sanctuary** (See page 193)

Establishment of the Hongqiang Community Association for Biodiversity Conservation

Understanding the significance of biodiversity, people in Hongqiang realised that biodiversity occurring in the ZNR and its surrounding areas urgently needed to be protected by them. In consultation with the project team members and other experts on biodiversity and the environment, they applied for an association to be formed which would help conserve biodiversity while allowing agricultural techniques to be extended, learned about, and exchanged within the association. Thus HCABC was established on 8 February 1998, the date of the traditional Rhododendron Festival, according to the Chinese lunar calendar.

The regulations of HCABC were issued when the association was founded. It was emphasised that the association is a farmers' NGO for the conservation of biodiversity and the environment in the Zixishan region.

Promotion of Agricultural Techniques through Training

Training on agricultural techniques such as beekeeping, bamboo cultivation, fruit tree management, and animal husbandry has enriched local farmers' knowledge about developing and managing their crops, trees, and animals. Traditional beekeeping could only provide a family with 2 kg of honey per box per year. After the techniques from Yunnan Agricultural University were adopted, the honey yield reached 12-16 kg per box per year. In addition, bee populations have increased in the past three years, helping to increase the insect pollination of crops and fruit trees, and thus productivity from the fields.

"traditional beekeeping could only provide a family with 2 kg of honey per box per year. After the techniques from Yunnan Agricultural University were adopted, the honey yield reached 12-16 kg per box per year"

Some families have grown bamboo in their domestic gardens for many years. Yields of bamboo shoots and culms, however, have been very low compared with those in other bamboo gardens. Cultivation and management techniques of bamboo from Southwest Forestry College have helped local people in Hongqiang to develop their bamboo shoots and culms in both quantity and quality. *Fargesia yunnanensis*, for example, used to provide about 85 kg of bamboo shoots per year in an area of one mu (1/15 ha) in Hongqiang Village. With the adoption of management techniques from the training workshop held in August 2000, the yield of bamboo shoots per year from an area of the same size in 2001 was estimated to be 200 kg; this was because the young culms in the same plot are now larger than the old ones.

Direct Benefits from the Project

The Increase in Crop Yields

The training workshops on fruit tree management and other agricultural techniques have provided local people with agricultural knowledge to manage their crops and fruit trees. During various workshops, experts from Yunnan Agricultural University, Southwest Forestry College, Yunnan Academy of Forestry, and KIB also helped to solve the problems that occurred in agricultural production practices. Thus the yield of crops and fruit trees has increased in the past three years. The cherry trees in Longba Village, for example, did not used to be pruned or trained well. After the training workshop, people in the village trained and pruned their cherry trees in the winter of 1999. As a result, the yield of cherries increased from 180 kg to 330 kg per mu in 2000. Some families harvested twice the amount of cherries than in 1999.

"after the training workshop, people in the village trained and pruned their cherry trees in the winter of 1999"

The building and extension of water tanks has also ensured an increase in crop yield. At the time of writing, over 1500 water tanks had been built. Each tank can supply water for one mu of upland to grow winter maize. Thus the yield of corn can be sustained by regular irrigation in the dry season from October to May. Before this project, only 150-200 kg of winter corn could be harvested from 1 mu of upland. In 1999, people harvested 250-300 kg of corn, using water tanks for irrigation in the winter.

Improved Agroecosystems

With recommendations from the project team, the Hongqiang Community and the HCABC jointly declared 1000 ha of forests to be community protected areas, after an integrated ecological survey. These forests are distributed in different villages and have traditionally provided the villagers with water. Trees here are mostly evergreen, broad-leaf species of Fagaceae, Theaceae, Lauraceae, Ericaceae, and Rosaceae. The declaration of forest protection has not only helped biodiversity conservation in the region, but has also provided a better agroecosystem environment for the local people and for flora and fauna. Local people benefit from a water supply and non-timber forest products such as mushrooms and wild vegetables that can be collected from the protected forests.

"the yield of cherries increased from 180 kg to 330 kg per mu in 2000"

The beekeeping training workshops and the introduction of new techniques for beekeeping over the past three years have stimulated and encouraged local people to raise more bees than before. As important pollinators of flowering plants, bees not only help to increase crop and fruit yield in the community, by pollination, but also make a contribution towards sustaining local agroecosystems.

Improved Livelihood

Through environmental education and agricultural technology training organised by the project team, local people in Hongqiang understand that their livelihood could be improved by conserving and using biodiversity and by using modern agricultural techniques. In 1995, local people in Hongqiang Community had only 217 kg of grains and 960 yuan income per capita per year. By the end of 2000, however, the numbers had increased to 461 kg and 1584 yuan.

With support from the project and many other people, poor children in Hongqiang could go to school to get a primary education. Donors also provide them with clothes, books, and money. These activities helped to reduce poverty and improve livelihood both now and in the future.

In general, local people have benefited from biodiversity conservation and understand the significance of biodiversity to the local ecological environment, agricultural production, and future sustainable development. In addition, local people have traditions to protect trees, including rhododendrons and *Ilex*, and sacred forests in the region. This will help to conserve local biodiversity and improve sustainable socioeconomic and ecological development.

Activities organised by the Hongqiang Community Association for Biodiversity Conservation

The Environmental Protection Regulations of Hongqiang

The HCABC issued the Environmental Protection Regulations of Hongqiang in May 1998. The regulations were produced as a result of a meeting of HCABC members in April. After negotiations by HCABC representatives with the community and natural-village leaders, it was agreed that the regulations could be issued to the community. The major contents of the regulations are given below.

- It is suggested that all people in the community be familiar with the relevant laws issued by central and provincial governments. Such laws include the Forestry Law, the Environment Protection Law, and Regulations for Wild Animals and Plants Protection. Members of HCABC should become the enthusiasts and promoters of these laws.
- The traditional sacred forests and water-source forests of natural villages are the heritage of local folk societies. Villagers should carefully protect these forests.
- It is forbidden to seize or kill animals in the forests, including peacocks, white pheasants, golden pheasants, eagles, monkeys, snakes, deer, musk deer, frogs, and others. Everyone should adhere to this regulation.
- It is forbidden to cut or damage all protected plants, namely camelias, rhododendrons, *Trachycarpus nana* (palm plant), *Manglietia insignis*, *Rosa odorata* (Rose), *Cephalotaxus fortunei*, orchids, and others. It is proposed that some native plants, including black alder, winter *Prunus*, *Quercus*, *Cinnamomum*, *Sorbus*, magnolias, and 20 other species, are protected by the villagers.
- Sacred and water-source forests of natural villages, which harbour many species of plants and animals, should be carefully protected by the people in the community. The total area is

"sacred and water-source forests of natural villages, which harbour many species of plants and animals, should be carefully protected by the people in the community"

1,000 ha. Any activity that affects the forests negatively is punishable by the association or the community.

Environmental Education Activities

The HCABC organises activities at least twice per year. Within these activities, environmental education is one of the most important concerns. In addition to the association providing environmental education directly, members also train other people in the villages who have environmental knowledge.

As mentioned above, the HCABC and project team jointly composed the 'Textbook of Biodiversity Conservation' for villagers and school students. Every member has a copy of this book. Using the descriptions and illustrations in the textbook, members have educated local villagers about biodiversity conservation.

When members know or see somebody making a negative impact on the protected areas, they will stop such activities. If this is difficult to do at the site, they will report it to the association or the community. This has happened in two natural villages and the community and association have punished those responsible for the damage. This has helped to protect biodiversity and forests in Hongqiang.

Training in Agricultural Techniques

With the project team or the community, the HCABC have jointly organised nine training workshops, five of which are on agricultural techniques. Members of the HCABC have priority to receive training. Their knowledge gained from the training is used within their own families and sometimes they also transfer it to other families. It is a kind of farmer-teaching-farmer method.

Members of the HCABC are the pioneers for testing new techniques. When the training workshop on bamboo cultivation and management was carried out, few people in Hongqiang had a good knowledge about bamboo. Those who grew bamboo did not selectively cut bamboo and the density of culms in the fields was high. After training, HCABC members who had bamboo plantations followed the experts' advice and removed some bamboo culms according to the experts' experiences. In 2000 they observed that their bamboo grew bigger and taller than that of other villagers. Their success will encourage other villagers to adopt new agricultural techniques.

"those who grew bamboo did not selectively cut bamboo and the density of culms in the fields was high"

Follow-up activities for participatory biodiversity conservation

The follow-up activities for participatory biodiversity conservation in the buffer zone of ZNR will focus on agrobiodiversity.

As a scientific term, agrobiodiversity has been widely accepted by both scientists and the public for several years. It refers to human-managed or modified biological diversity. It can be divided into four levels: variety

diversity or genetic diversity, agricultural species diversity, agroecosystem diversity, and management type diversity. Agrobiodiversity is regarded as a subset of biodiversity that includes the diversity and variability of animals, plants, reptiles, birds, insects, and micro-organisms, and the in situ and ex situ conservation of genetic resources linked with agriculture. Scientists believe that more biodiversity exists in human-managed ecosystems. Because of land-use system changes, deforestation, population pressure, urbanisation, degradation of land races, and over-harvesting of non-timber forest products, agrobiodiversity is now reducing very rapidly at ecosystem, species, variety, and management system level. The importance of agrobiodiversity, therefore, should be emphasised by the academic, economic, and political sectors.

Fortunately, the significance of agrobiodiversity has captured the interest of scientists and various agencies. Current work emphasises its conservation both in situ and ex situ, through traditional and scientific approaches, and sustainable uses of agrobiodiversity.

A very important document on agrobiodiversity was issued by the Global Environmental Facility (GEF) in 1998: the 'Framework for GEF Activities Concerning Conservation and Sustainable Use of Biological Diversity Important to Agriculture'. There are only two objectives for GEF in supporting agrobiodiversity activities, the conservation objective and the sustainable-use objective. Because it is not possible to conserve all species in a region by using conservation areas alone, the operating programmes support biodiversity conservation and sustainable use outside the designated conservation or protected areas and their integration into the management of natural and modified surrounding areas.

Agrobiodiversity in the buffer zone of ZNR is very high. However, many local varieties of crops and medicinal plants, for example, are being lost because of the introduction of improved varieties or over-harvesting. It is necessary to investigate, conserve, study, and demonstrate local agrobiodiversity for sustainable development in the mountain ecosystems.

The objectives of the proposed activities are given below.

- To document agrobiodiversity in the buffer zone of ZNR.
- To study indigenous knowledge related to agrobiodiversity.
- To develop a conservation strategy for agrobiodiversity.
- To undertake research on sustainable uses of agrobiodiversity.
- To set up a demonstration plot for sustainable uses for technology extension in the Hindu Kush-Himalayas region.

The follow-up activities that correspond to these objectives are discussed below.

Investigation and Inventory of Agrobiodiversity

Agrobiodiversity at agroecosystem, species, variety, and management system level will be investigated and documented in the buffer zone of ZNR. Cultivated plants will be the major targets. Other flora and fauna including honeybees and animals raised by local people will be components in the inventory.

During the investigation, participatory approaches will be adopted. Some important and endemic species/varieties will be selected and screened for further studies. Information on indigenous knowledge related to agrobiodiversity will also be collected and studied.

Agrobiodiversity Conservation and Improvement

Agrobiodiversity can be conserved in traditional ecosystems (in situ conservation) and in newly established collections (ex situ conservation). Traditional agroforestry practices in the buffer zone of ZNR provide an effective model for conservation of agrobiodiversity in local agroecosystems which can be shown as 'fruit trees + *Musella lasiocarpa** + food crops + bees'. Within this system, all the components are native species or long-term cultivated or domesticated species and local varieties. Importantly, *Musella lasiocarpa* is the only species in the genus *Musella* (Musaceae [banana family]), which is endemic to northwest Yunnan and southwest Sichuan. Wild populations are now very difficult to find in the fields. The Yi people in these areas, however, conserve this species in their traditional agroecosystems as a forage plant for pigs.

"some important and endemic species/ varieties will be selected and screened for further studies"

The traditional agroforestry systems in the target area will be selected and screened for agrobiodiversity conservation and improvement. Every component in the system, including trees, crops, bees, and *Musella*, will be checked very carefully in terms of native species and local varieties and only native species or local varieties will be encouraged to be in the systems. The spaces between seedlings and spatial arrangement will be designed according to indigenous knowledge and recent scientific developments.

Demonstration of Sustainable Uses of Agrobiodiversity

Because the protected areas cannot incorporate the complete range of biological diversity of the region, people can conserve biodiversity by growing and raising and using appropriate plants and animals.

Agrobiodiversity in the buffer zone of ZNR can also be well protected through its sustainable use. *Musella lasiocarpa* provides a good example. In the following two sections, two plots designed to demonstrate the sustainable use of agrobiodiversity in mountain ecosystems are discussed. Lessons learned from these plots can be applied to other places in the Hindu Kush-Himalayas where the biophysical environment and cultural background are similar to Zixishan region.

Demonstration of Paris polyphylla Cultivation

Paris is a genus of the Tilliaceae family. The rhizomes of most species in the genus are used as a traditional herbal medicine. Among them, the rhizome of *Paris polyphylla* var. *yunnanensis* is a traditional Yi ethnopharmaceutical medicine. It is naturally distributed in the ZNR and its buffer zone. The wild population, however, is becoming very rare because of over-harvesting. This plant has great marketing potential both now and for the future. It can be inter-cropped with fruit trees. Therefore, the demonstration plot of *Paris polyphylla* will not only show that local people's income can be increased but also that this native species can be conserved within its traditional agroecosystems. Major activities will include

- investigating methods of breeding from seeds and rhizomes and propagation from tissue culture,
- development of planting techniques,
- *Paris*-based agroforestry model selection, focusing on local species and varieties,
- the establishment of a two-hectare demonstration plot, and
- technical extension and farmer-to-farmer exchange.

Demonstration of Medicinal Yam Cultivation

Medicinal yams (*Dioscorea zingiberensis*, *D. deltoidea*, *D. panthaiaca*, and *D. collettii*) are the important raw material for the production of diosgenins which are used for making many hormone-based medicines. Tubers of these plants are products from farm land; they can be harvested three years after planting. The yearly income from medicinal yam cultivation can be three times that from maize or potato cultivation in the target area. These plants can be grown in the traditional agroforestry systems in the buffer zone of ZNR. Major activities for the demonstration of medicinal yam cultivation will be

- investigating methods of breeding from tubers and propagation from tissue culture,
- development of planting techniques,
- yam-based agroforestry model selection, focusing on local species and varieties,
- the establishment of 2 ha of demonstration plot, and
- technical extension and farmer-to-farmer exchange.

Appendix 1: **List of Participants in the First Beekeeping Training Workshop**
(June 27-28, 1998; Hongqiang, Chuxiong)
(Resource Persons: Prof. Kuang Bangyu et al.)

Name	Village Name	Sex	Nationality
Wang Jianbing	Zhongcun	M	Yi
Wang Jianlin	Zhongcun	M	Yi
Wang Jianhong	Zhongcun	M	Yi
Zhao Lixin	Zhongcun	M	Han
Zhao Lichun	Zhongcun	F	Han
Chen Yourong	Zhongcun	M	Yi
Chen Youlin	Zhongcun	M	Yi
Shi Youliang	Longba	M	Yi
Liu Xianwei	Hewei	M	Yi
Luo Chaowang	Hewei	M	Yi
Wang Jianwen	Hewei	M	Yi
Luo Chunliang	Hewei	M	Yi
Li Chihong	Hewei	M	Yi
Li Chijiang	Hongqiang	M	Yi
Li Guifa	Hongqiang	M	Han
Li Zhiping	Hongqiang	M	Han
Li Guihai	Hongqiang	M	Yi
Li Zhiyang	Hongqiang	M	Yi
Li Cunfu	Hongqiang	M	Yi
Li Shixiang	Dalongtan	M	Yi
Li Shijin	Dalongtan	M	Yi
Li Zhiwen	Guojiacun	M	Yi
Li Facai	Guihua	M	Yi
Li Zhengfa	Maocaoping	M	Yi
Luo Cunli	Maocaoping	F	Yi
Zhou Fangfen	Dapingdi	F	Han
Wang Jiachong	Hongqiang	M	Yi
Luo Cunfu	Hewei	M	Yi
Li Xianwang	Hewei	M	Yi

Appendix 2: **List of Volunteer Students from the Second Beekeeping Training Workshop**
(September 20~24, 1998; Hongqiang, Chuxiong)

Name	Sex	Organization
Luo CM	M	Eastern Bee Research Institute, YAU
Tao WH	M	Eastern Bee Research Institute, YAU
Li YH	M	Eastern Bee Research Institute, YAU
Wang WS	M	Eastern Bee Research Institute, YAU
Liu JQ	F	Eastern Bee Research Institute, YAU
Feng L	F	Eastern Bee Research Institute, YAU
Wang ZD	M	Eastern Bee Research Institute, YAU
Yang CX	M	Eastern Bee Research Institute, YAU
Li J	M	Eastern Bee Research Institute, YAU
Li ZH	M	Eastern Bee Research Institute, YAU
Pu LM	F	Eastern Bee Research Institute, YAU
Wang XC	M	Eastern Bee Research Institute, YAU
Zhang CF	M	Eastern Bee Research Institute, YAU
Zou J	F	Eastern Bee Research Institute, YAU
Bai BH	F	Eastern Bee Research Institute, YAU
Deng LJ	M	Eastern Bee Research Institute, YAU
He YX	M	Eastern Bee Research Institute, YAU
Shao WQ	M	Eastern Bee Research Institute, YAU
Wang S	M	Eastern Bee Research Institute, YAU
Xiong TL	M	Eastern Bee Research Institute, YAU
Song G	M	Eastern Bee Research Institute, YAU
Li T	M	Eastern Bee Research Institute, YAU
Ou CH	M	Eastern Bee Research Institute, YAU
Ning X	M	Eastern Bee Research Institute, YAU
Bao FH	M	Eastern Bee Research Institute, YAU
Li XK	F	Eastern Bee Research Institute, YAU
Yuan P	F	Eastern Bee Research Institute, YAU
Yang ZY	F	Eastern Bee Research Institute, YAU
Hong JH	F	Eastern Bee Research Institute, YAU
Xiong LX	F	Eastern Bee Research Institute, YAU
Yang SX	F	Eastern Bee Research Institute, YAU
Yang M	F	Eastern Bee Research Institute, YAU
Zhang FQ	F	Eastern Bee Research Institute, YAU

YAU = Yunnan Agricultural University

Appendix 3: **List of Participants in the Second Bee-Keeping Training Workshop**
(September 20~24, 1998; Hongqiang, Chuxiong)
(Resource Persons: Wang Jianming, Zhou Danyin)

Zhongcun village: Li ZZ, Wang JB, Wang JL, Wang JH, Zhao LX, Zhao LC, Chen YR, Chen YL (8 participants)

Longba village: Shi YL, Chen YC, Hu HG, Zhang QL (3 participants)

Hewei village: Liu XW, Luo CW, Wang JW, Luo CL, Li CH (5 participants)

Changchongwa village: Pu CF, Pu CF, Pu WF, He CB, Zhou WC (5 participants)

Wulayi village: Li JD, Hu YL, Chen CW, Li GS (3 participants)

Hongqiang village: Li TH, Li CJ, Li GF, Li ZP, Li GH, Li ZY, Li CF (7 participants)

Laoshaohe village: Li FM, Li FX, Li GH, Luo KW (4 participants)

Gaoshanmu village: Li ZC, Li ZW, Li ZX, Li FJ, Li FY (5 participants)

Dalongtan village: Li SX, Li SJ, Li XB, Wang TW (4 participants)

Xiaolongqing village: Zhang XC, Zhang XF, Wang ZF, Wang ZH (4 participants)

Guojiacun village: Li ZW, Li ZX, Zhou WX (3 participants)

Bainichong village: Zhou WH, Wang WZ (2 participants)

Guihua village: Li FC (1 participant)

Maocaoping village: Li ZF, Luo CL (2 participants)

Dapingdi village: Zhou FF (1 participant)

Jiangxiqing village: Li TY, Li FZ, Li TC, Wang YC, Wang TH (5 participants)

Ganheba village: Zhu CS (1 participant)

Total: 63 participants from 17 villages in Hongqiang.

Appendix 4: **List of Participants in the Seminar on Fruit Tree Management and Animal Husbandry**

(September 26~28, 1998; Hongqiang, Chuxiong)

(Resource Persons: Prof. Yang Wenliang, Prof. Peng Helu)

Wang Yanhua, Leader, Donghua Township, Chuxiong;

Li Guoming, Division Head, Chuxiong Bureau of Agriculture, Chuxiong;

Yang Congyi, Officer, Zixishan Forest Plantation, Chuxiong;

Wang Zongzhi, Zhongcun village, Hongqiang;

Zhang Xianlin, Zhongcun village, Hongqiang;

Hu Yingcai, Zhongcun village, Hongqiang;

Luo Chongjin, Hewei village, Hongqiang;

Luo Zhiwen, Hewei village, Hongqiang;

Li Zongming, Gaoshanmu village, Hongqiang;

Li Fuying, Gaoshanmu village, Hongqiang;

Li Fafan, Hongqiang village, Hongqiang;

Li Guifang, Hongqiang village, Hongqiang;

Li Zhifa, Hongqiang village, Hongqiang;

Wang Yuecheng, Jiangxiqing village, Hongqiang;

Li Chongning, Jiangxiqing village, Hongqiang.

Total: 15 participants, out of which 12 are villagers, 3 are local officials.

Appendix 5: **List of Participants in the First Workshop on Natural Resource and Community Development**
(November 24~28, 1998; Zixishan, Chuxiong)
(Resource Persons: Mr. Lu Xing, Mr. Yang Qing)

Li Tinghua, Division Head, Chuxiong Bureau of Forestry;

Pu Zhengxi, Acting Director, Chuxiong Bureau of Forestry;

Yang Shengyi, Division Head, Chuxiong Bureau of Agriculture;

Li Yuanhua, Acting Director, Chuxiong Committee for Environmental Protection;

Li Yinggui, Manager General Assistant, Chuxiong Company for Tourism;

Liu Zhaojin, Governor, Donghua Township, Chuxiong;

Peng Yaoliang, Vice Governor, Donghua Township, Chuxiong;

Pu Tianguang, Acting Director, Chuxiong Government Office;

Chen Liming, Director, Chuxiong Office for Foreign Affairs;

Lu Zhanmao, Deputy Director, Chuxiong Office for Urban Management;

Hu Meilan, Member, HCABC

Li Zhaomin, Member, HCABC

Li Guihong, Member, HCABC

Hu Zhaofa, Member, HCABC

Hu Meixiang, Member, HCABC

Li Zhaoqing, Member, HCABC

Luo Fengying, Member, HCABC

Liu Xiezhong, Member, HCABC

Li Chengying, Member, HCABC

Luo Fengxian, Member, HCABC

Li Shixian, Member, HCABC

Zhang Yongxian, Member, HCABC

Li Zhengfu, Member, HCABC

Li Guangfu, Member, HCABC

Li Fengyou, Member, HCABC

Li Kaiming, Member, HCABC

Zhang Fangyu, Consultant, HCABC

Total: 27 participants, out of which 10 are officials from different government agencies, 9 are women, 1 is an environmentalist and project & HCABC consultant, and the others are members of HCABC.

Appendix 6: **List of Participants in the Third Bee-Keeping Training Workshop**
(March 26-28, 1999. Hongqiang, Chuxiong)
(Resource Person: Zhang Xuan)

Wang Jianbin, Zhongcun Village

Wang Jianlin, Zhongcun Village

Wang Jianhua, Zhongcun Village

Zhao Liancai, Zhongcun Village

Chen Yongren, Zhongcun Village

Shi Yongliang, Longba Village

Liu Xuewu, Hewei Village

Luo Cunwu, Hewei Village

Luo Cunlu, Hewei Village

Luo Cunfu, Hewei Village

Li Cunjin, Hongqiang Village

Li Huangfa, Hongqiang Village

Li Guanghai, Hongqiang Village

Li Shixian, Dalongtan Village

Li Zhengwen, Guojiacun Village

Li Fucai, Guihua Village

Appendix 7: **List of Participants in the Second Workshop on Natural Resource Management and Community Development**
(May 22-24, 1999. Chuxiong, Yunnan)

Zou Hengfang, Division Head, Yunnan Provincial Department of Forestry

Yang Weimin, Division Head, Yunnan Provincial Bureau of Environmental Protection

Yang Zonghuan, Division Head, Yunnan Provincial Committee of Plans

Wang Bin, Secret General, Yunnan Provincial Department of Agriculture

Su Zhe, Deputy Division Head, Yunnan Provincial Committee of Sci. & Tech.

Chen Liming, Division Head, Chuxiong Municipal Government

Yang Guanghai, Division Head, Chuxiong Municipal Government

Li Zhengfa, Deputy Director, Chuxiong Bureau of Forestry

Yang Yongxiu, Deputy Director, Chuxiong Bureau of Environmental Protection

Li Lianyun, Deputy Director, Chuxiong Bureau of Agriculture

Ding Zhinxiang, Director, Management Commission of Zixishan Nature Reserve

Deng Yi, Staff, Management Commission of Zixishan Nature Reserve

Li Zhijian, Staff, Management Commission of Zixishan Nature Reserve

Zhong Guiping, Staff, Management Commission of Zixishan Nature Reserve

Yang Yongkang, Staff, Management Commission of Zixishan Nature Reserve

Li Guiyou, Member, HCABC

Wang Jianhai, Member, HCABC

Hu Meilan, Member, HCABC

Resource persons

Lu Bin, Senior Fellow, Yunnan Academy of Forestry

Du Yong, Forester & Division Head, Yunnan Provincial Department of Forestry

Appendix 8: **List of Participants of the Training Workshop on Bamboo Cultivation and Management**

(August 12-13, 2000; Hongqiang, Chuxiong)

(Resource Persons: Xuejiarong, Du Fan, professors of Southwest Forestry College)

Bainichong village: Zhou Hongwei, Wang Wenzeng (2 participants);

Changchongwa village: Pu Changfeng (1 participant);

Dalongtan village: Li Shihua, Li Jianhua (2 participants);

Gaoshanmu village: Li Zhengcheng, Li Zhengfang, Li Fangyu (3 participants);

Guojiacun village: Zhou Wenxiang (1 participant);

Hewei village: Liu Xinwen, Luo Cunwen, Wang Jianwu (3 participants)

Hongqiang village: Li Tianhong, Li Cunjia, Li Guifa (3 participants);

Jiangxiqing village: Wang Yingchang (1 participant);

Laoshaohe village: Li Faming (1 participants);

Longba village: Chen Yaochang, Hu Huaguo (2 participants);

Wulayi village: Li Jinhua, Hu Yonglian (2 participants);

Xiaolongqing village: Zhang Xingcan (1 participant);

Zhongcun village: Li Zongzheng, Wang Jianbin, Chen Yonglan (3 participants);

Total: 23 participants from 13 villages in Hongqiang.

Appendix 9: **List of Participants of the Seminar on Experience Dissemination/Exchange of Biodiversity Conservation and Community Development in Mountain Ecosystems**

Zhang Jinhua, Programme Officer, UNEP

Tang Ya, Project Coordinator and Specialist, ICIMOD

Tang Ming, Division Head, Sichuan Bureau of Land Resource Management

Tu Shengbin, Vice-Governor, Maoxian County Government, Sichuan Province

Zhang Jian, Division Head, Liangshan Prefectural Bureau of Land Resource Management, Sichuan Province

Fu Guangchun, Senior Staff, Forest Department, Sichuan Province

Zhou Jin, Associate Professor, Chengdu Institute of Biology, Chinese Academy of Sciences, Chengdu

Zhang Jianhua, Associate Professor, Institute of Soil and Fertilizer, Sichuan Academy of Agricultural Sciences, Chengdu

Jin Kerong, Senior Staff, Forest Department, Chongqing

Gu Zhongcun, Director and Associate Professor, Institute of Ecology, Jishou University, (western) Hunan Province

Lei Huaguo, Vice-Governor, Jiangkou County, Guizhou Province

Zhou Wei, Program Officer, Guizhou Bureau for Environmental Protection, Guiyang

Pu Chunxi, Vice Mayor, Chuxiong Municipal Government, Yunnan Province

Chen Limin, Division Head, Chuxiong Municipal Government, Yunnan Province

Zhang Fangyu, Consultant, Chuxiong Bureau for Environmental Protection

Wang Jianhai, Head, Hongqiang Community, Chuxiong, Yunnan Province

Kuang Bangyu, Director and Professor, Institute of Eastern Bee, Yunnan Agricultural University, Kunming

Wang Jianming, Lecturer, Institute of Eastern Bee, Yunnan Agricultural University, Kunming

Liu Yiqiu, Lecturer, Institute of Eastern Bee, Yunnan Agricultural University, Kunming

Wang Li, Lecturer, Institute of Ornamental Plants, Yunnan Agricultural University, Kunming

Long Chun-lin, Professor and Project Coordinator, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming

Liu Yitao, Fellow, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming

Li Rong, Graduate Student, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming

Guo Xiaorong, Graduate Student, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming

Appendix 10: **List of Participants of the "Farmer to Farmer Exchange" Activities**

Name	Sex	Age	Village / Community	Date
Wang Tingsheng	M	37	Bacun, Laoshaohe	12-13/7
Li Qionghua	F	26	Lengshi, Laoshaohe	12-13/7
Li Jinhui	F	41	Yilicun, Laoshaohe	12-13/7
Luo Shijin	M	32	Jiulichong, Laoshaohe	12-13/7
Wang Jianhua	M	35	Jiulichong, Laoshaohe	12-13/7
Zhou Jiarong	M	40	Baihuacun, Laoshaohe	12-13/7
Li Zhaofu	M	46	Maocaoping, Hongqiang	3-5/9
Li Shihua	F	24	Dapingdi, Hongqiang	3-5/9
Liu Wenxue	M	29	Hewei, Hongqiang	3-5/9
Liu Ailin	F	25	Hewei, Hongqiang	3-5/9
Li Zhengwen	M	33	Guojiacun, Hongqiang	3-5/9
Li Shijin	M	43	Dalongtan, Hongqiang	3-5/9
Shi Yongjiu	M	30	Longba, Hongqiang	3-5/9
Chen Yongcheng	F	48	Zhongcun, Hongqiang	3-5/9
Li Jinfa	M	32	Hongqiang, Hongqiang	3-5/9
Li Jinqiong	F	34	Hongqiang, Hongqiang	3-5/9

Coordinators/Facilitators: Zhang Fangyu, Wang Jianhai, Chen Liming

Appendix 11: **List of Partnerships in the Hand-in-Hand Project**

Student name	Birth time	Grade	Sex	Nationality		Village Partner in Kunming Institute of Botany (KIB) in 1998
Zhu Guixiu	Sept. 1987	4	F	Yi	Xiaoche	Liu Guifang
Li Zhengfu	Nov. 1988	4	M	Yi	Maocaoping	Li Shunlin
Li Jianghong	May 1988	4	M	Yi	Maocaoping	Liu Yitao
Li Qiongxian	Dec. 1987	4	F	Yi	Wulayi	Li Xiaoming
Li Huayan	Oct. 1988	3	F	Yi	Hongqiang	Li Haiyan
Li Fahui	May 1989	3	F	Yi	Zhongcun	Wu Yu
Li Mingzhen	Oct. 1986	5	F	Yi	Laoshaohe	Gao Juan
Li Tinghui	Apr. 1990	2	F	Yi	Jiangxiqing	Yang Shixiong
Luo Fagao	May 1989	3	M	Yi	Maocaoping	Hao Xiaojiang
Li Falu	Sept. 1990	2	M	Yi	Dapingdi	Zhu Huajie
Liu Jianzhen	Oct. 1986	5	F	Yi	Hewei	Guo Zhenhua
Zhou Wanqiang	Feb. 1985	6	M	Yi	Hongqiang	Yu Hongyuan
Luo Tingli	Sept. 1989	3	F	Yi	Laoshaohe	Gan Fanyuan
Luo Jinshou	Sept. 1983	6	M	Yi	Changchongwa	Ai Xihui
Luo Jinwang	June 1985	6	M	Yi	Changchongwa	Li Lu
Wang Tingsheng	Dec. 1988	4	M	Han	Xiaolongqing	Li Zhengan
Zhou Xiaoyan	Apr. 1989	4	F	Yi	Guojiacun	He Shuzhen
Luo Jinbao	July 1990	2	M	Yi	Zhangjia	Wu Shuguang
Li Shihua	Feb. 1987	4	F	Yi	Jiangxiqing	Yang Jin
Li Xingzhi	Nov. 1987	4	F	Yi	Wulayi	Yang Lixin
Liu Jianguo	Sept. 1988	3	M	Yi	Wulayi	Dong Haijun
Zhou Wancui	July 1986	5	F	Yi	Zhoujia	Long Chunlin
Zhou Wanxian	Oct. 1984	7	F	Yi	Zhoujia	Long Chunlin

Appendix 12: **List of Bamboo Species Cultivated on the Demonstration Plot**

1. *Bambusa multiplex* (Lour.) Raeuschel
2. *Bambusa multiplex* (Lour.) Raeuschel. cv. *alphonse* R. A. Young
3. *Bambusa multiplex* (Lour.) Raeuschel. cv. *fernleaf* R. A. Young
4. *Bambusa texitilis* McClure
5. *Bambusa vulgaris* Schreber ex Wendland. cv. *wamin* McClure
6. *Bashania fargesii* (E. G. Camus) Keng f. et Yi
7. *Chimonobambusa pachystachys* Hsueh et Yi
8. *Dendrocalamus latiflorus* Munro
9. *Fargesia lufengensis* Q. R. Xue, sp. nov. (ined.)
10. *Fargesia fractiflexa* Yi
11. *Fargesia fungosa* Yi
12. *Fargesia yuanjiangensis* (grass family) Hsueh et Yi
13. *Fargesia yunnanensis* Hsueh et Yi
14. *Indosasa hispida* McClure
15. *Phyllostachys heteroclata* Oliver
16. *Phyllostachys nigra* (Lodd) Munro
17. *Phyllostachys pubescens* (grass family) Mazel
18. *Pleioblastus oleosus* Wen
19. *Pleioblastus argentiostriatus* f. *albostriatus*
20. *Qiongzhuea tumidinosa* Hsueh et Yi

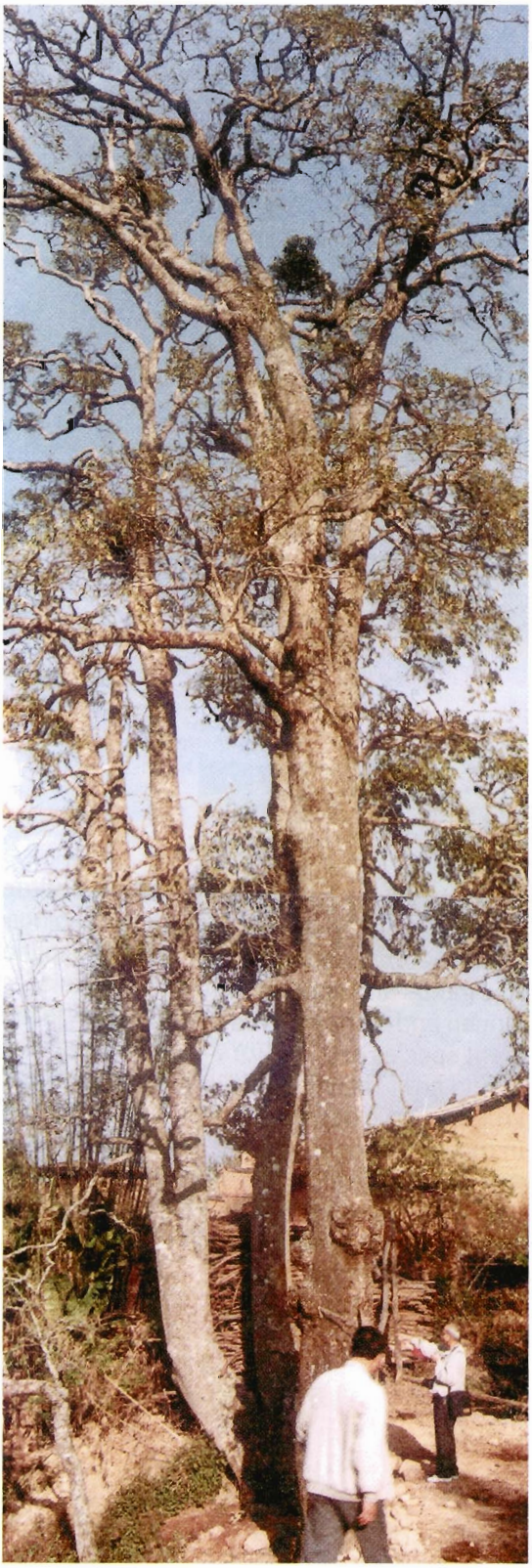
Water harvesting on sloping rainfed farmland in Hongqiang Community — *Long Chunlin*

Beekeeping training for local farmers — *Long Chunlin*

Agroforestry is the traditional farming system in the Zixishan region. People grow crops between fruit trees so that they can harvest both types of crop. Most of the crops in agroforestry systems are native species and local landraces. Plants in the picture are cherry, maize, potato and pumpkin
— *Long Chunlin*

Bamboo cultivation and technical training. The Hongqiang Community Association for Biodiversity Conservation (HCABC) was established in 1998, with encouragement and support from the project. In addition to implementing biodiversity conservation activities, HCABC also organises various training workshops for local farmers
— *Long Chunlin*

Musella lasiocarpa is an endemic genus and species of the junction region between Yunnan and Sichuan. Wild populations of this beautiful plant species are threatened and very difficult to find now. The Yi people in Zixishan and its neighbouring regions have domesticated this species and protected it in their traditional farming systems. People use it as a vegetable, pig fodder, medicine, ornamental plant, a soil erosion control plant, weaving material, and wine-making. It is very easy to see a type of *Musella-based* agroforestry in Zixishan region "Fruit trees + *Musella* + Crops + Bees" — *Long Chunlin*



Holy trees are protected by indigenous communities in the Zixishan region. Over 20 species of trees are worshipped by the local people — *Long Chunlin*

Rhododendron delavoyi is a plant totem of the Yi people in Zixishan region. The Yi people worship and protect this beautiful plant. They even have a specific traditional festival for *Rhododendron*, the Yi's Mayinghua Festival, in which mayinghua means *Rhododendron delavoyi* — *Long Chunlin*