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Practice of conserving plant diversity through traditional beliefs: a case study in Xishuangbanna, southwest China

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Abstract. Developing various strategies for the global biodiversity conservation is important for today's critically degraded environment, and there is a growing recognition that the effective conservation of biodiversity will depend on the long-term participation and understanding of local communities. In order to establish the connection between traditional beliefs and the conservation of biodiversity, a case study was undertaken in Xishuangbanna, one of the richest areas in biodiversity in China. The Dai nationality, a dominant ethnic group in Xishuangbanna, has both Polytheistic and Buddhist beliefs, which have close relationships with plant diversity. This paper recommends the following approaches to conserve plant diversity by the application of traditional beliefs: (1) depending on the religious belief system, establishing an 'Association of Religious Plant Conservation' to organize local people to participate in the conservation by means of religious activities, to document the indigenous botanical knowledge and to train local people; (2) training local people to different levels to improve their capacity in conservation of plant diversity with science and religion working together; (3) demonstrating the conservation of plant diversity through the recovering of holy hill forests and plants in temple gardens.

Key words: Dai people, holy hill forest, plant diversity conservation, temple garden, traditional beliefs, Xishuangbanna

Introduction

Exponential human population growth in the last few centuries has affected the natural world to the extent that massive alteration of habitats and associated biological changes threaten the existence of millions of species and basic ecosystem processes. Developing various strategies for the global biodiversity conservation is important for today's critically degraded environment. Cultural diversity has a close relationship with biodiversity and its importance in biodiversity conservation has received increasing attention (Gadgil et al. 1993; Berkes 1995; Dasman 1995; McNeely 1995; Arizpe 1996; Furze et al. 1996; Liu 1996; Sinha 1996; Augustine 1999). For example, the Convention on Biological Diversity calls on parties to 'respect, preserve, and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for conservation and sustainable

use of biological diversity, and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices, and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices' (article 8j). Religious beliefs are the important components of culture. And all of the world's major religions are sensitive to the importance of biodiversity and nature environment (Hamilton 1993; Puspa 1996; David and Joy 1998; McNeely 2000). This paper reports the approach of conserving plant diversity through traditional beliefs in Xishuangbanna, southwest China based on the research of the relationship between the Dai people's traditional beliefs and plant diversity from 1993 to 1999.

Xishuangbanna is located in the south of Yunnan Province, in southwest China (24°10′–22°40′ N, 99°55′–101°50′ E). It borders Laos in the south and southeast and Burma in the southwest (Figure 1). The total area is 19220 km^2, of which approximately 94% is covered by mountains and hill terrain. The altitude varies greatly from 430 to 2300 m. The annual rainfall varies from 1200 to 1700 mm, 80% of which occurs during the rainy season from May to October. The average temperature is about 21.5 °C and the relative humidity is around 80%. Benefiting from the special location with diverse climates, the area is rich in plant diversity. There are about 5000 species of vascular plants (about 18% of China's flora), although the area covers only 0.2% of the total land of China. However, with the expansion of the population and the development of economic plants such as rubber, tea and tropical fruits, the coverage of the tropical forest has been reduced from 60% in the 1950s to around 30% in the 1990s, resulting in the loss of about 600 species of plant (Xu 1988). Great attention has been paid to the conservation of biodiversity in the area, such as the establishment

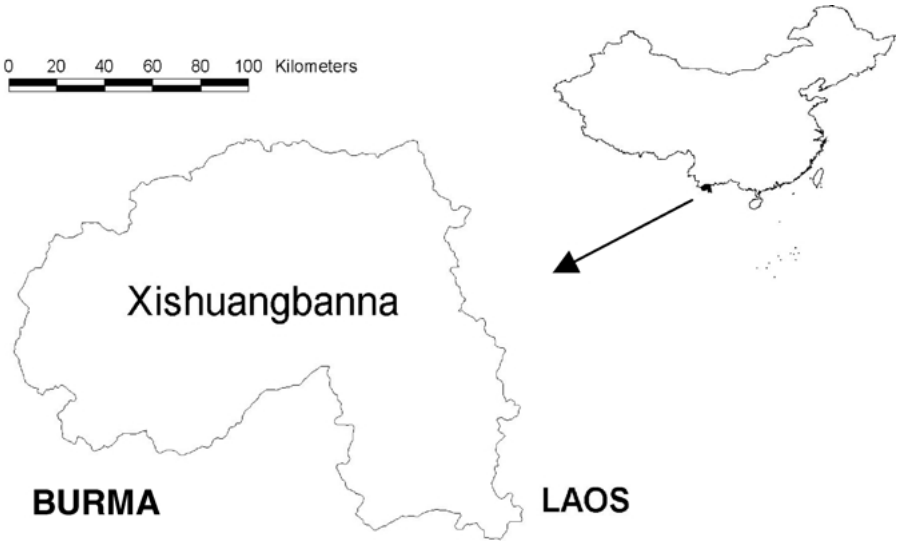

Figure 1. Location map of Xishuangbanna.

of a national nature reserve with an area of 240 km^2, occupying 12% of the total area (Xu and Jiang 1985).

Xishuangbanna is a Dai autonomous region although there are 13 nationalities inhabiting the area, including Dai, Hani, Jinuo, Yao and so on, and the population of the Dai people is 2.8×10^5, 1/3 of the total population of the area. The Dai nationality has the same origin and historical background as the other nationalities in nearby countries such as Thailand, Vietnam, Laos, and Burma (Gao 1992). The populations of the nationalities in these countries are over 2×10^6, 8.9×10^5, 1.8×10^6 and 2.5×10^6, respectively (Wang 1990).

The relationship between the Dai's religious beliefs and plant diversity

The Dai people in Xishuangbanna have both Polytheistic and Buddhist beliefs, which have blended and borrowed traditions from each other. Polytheistic religion was practiced by the ancestors of the Dai people before Buddhist religion was introduced to the area. Buddhism has been practiced by the Dai people in Xishuangbanna since the middle of the Tang dynasty (Dao 1992). It is the predominant belief in the Dai society and there is a Buddhism system in the area. Both have a close relationship with plant diversity and have played an important role in the conservation of plant diversity (Pei 1985; Liu et al. 1992, 1996; Xu and Liu 1995).

The role of holy hill forest in the conservation of plant diversity

Holy hill forest is the trace of the Dai's polytheistic beliefs. In the Dai people's thoughts, a holy hill is the place where gods live, and all plants and animals in the forest are considered to be protected by the gods. Any violence and disturbance for plants and animals in the forest will be punished by the gods. Therefore, hunting, gathering and cutting are strictly prohibited in the holy hill forest. Traditionally, each village had a holy hill forest. Currently, there are about 250 holy hills in Xishuangbanna, occupying about 1000–1500 ha. Twenty-eight holy hill forests were investigated. In each holy hill forest, all plant species were investigated and identified. And four samples (the area of each sample is 50×50 m) were established in four holy hill forests within which five quadrates of 10×10 m were selected at random. All individuals $\geq$ 5 cm DBH of tree species and shrub species were investigated in the sample and quadrates, respectively. The Shannon–Wiener index was used for comparisons of plant species diversity. The results show that most of the holy hills are distributed in the regions below 900 m above sea level, where the vegetation types are mainly dry evergreen seasonal rainforest and semi-evergreen seasonal rainforest. Now there are hardly any of these kinds of vegetation in other places even in the national nature reserves because of the expansion of economic plantations (Xu and Jiang 1985; Wu 1987). There are 268 plant species belonging to 92 families in the 28 investigated holy hill

Table 1. Comparison of plant diversity in holy hills and nature reserve.

	Index of species diversity	
	Before the project	After the project
Holy hill 1	3.78	4.16
Holy hill 2	4.12	4.29
Holy hill 3	3.56	4.12
Holy hill 4	4.01	4.22
Nature reserve	–	4.63

forests. Fifteen plant species are protected species listed in the 'Plant Red Data List of China' as *Magnolia henryi*, *Homalium laoticum*, *Antiaris toxicaria*, which is 30% of the total protected plant species. The indexes of plant species diversity in holy hills are very near that in the nature reserve (see Table 1). Therefore, the holy hills can be considered as some small nature reserves established by the Dai traditional beliefs.

Buddhism and conservation of plant diversity

Buddhism was introduced into Xishuangbanna in the Tang Dynasty. A temple is a place for practicing religious activities. The canons of Buddhism specify that the following four requirements must be met before a temple can be established – they are: a portrait of Sakyamuni, a pagoda, over five monks and some plants related to Buddhism. A village must have a temple, and currently, there are 558 temples in Xishuangbanna. Plant species in 51 temple gardens in Xishuangbanna were surveyed by means of participating rapid assessment (PRA) in cooperation with the local people including religionists, older farmers, and the use of these plants in religion were investigated too. Meanwhile, some religious documents have been collected for checking the use of plants in religion. The results show that over 100 plant species were cultivated in temple gardens, which can be divided into three groups (Pei 1985, Xu and Liu 1995): ritual plants including the Buddha trees and other plants related to Buddhism, such as *Alstonia scholaris*, *Ficus racemosa*, *F. religiosa* and so on are Buddha trees, the leaves of the *Corypha umbraculifera* were used for carving Buddhist Sutras, and there are over 50000 volumes of such Buddhist Sutras that are protected in Xishuangbanna. The woods of the *Tectona grandis*, *Artocarpus heterophylla* and *Gmelina arborea* were used for making the statues. The oil extracted from the seeds of *Mesua ferrea* and *Aleurites moluccana* were used for lighting the temple. Offering plants including flowering plants such as *Nympaea lotus*, *Hedychium chrysoleucum*, *Crinum asiaticum* and tropical fruits such as *Anona reticulata*, *Citrus grandis*, *Mangiera indica* etc. are normally used as offerings at Buddhist ceremonies and are also served as daily food for

monks at the temple. Ornamental plants such as *Butea monosperma*, *Cassia fistula*, *Michelia alba* play a role in beautifying the temple and the village. All plants mentioned above are protected by religious regulations. Similar to the botanical garden, temple gardens have played a significant role in the *ex situ* conservation of plant species. Moreover, many species planted in the villages were obtained from the temple gardens (Yu 1985). Therefore, temple gardens could be called 'Temple–Botanical Gardens'.

Approaches to conserve plant diversity through traditional beliefs

Establishing the association of religious plant conservation

As discussed above, the Dai people both in Polytheism and their traditional beliefs have a very close relationship with plant diversity. Religious beliefs are powerful, and the religious system is strongly developed in the area. However, there is no organization to integrate the traditional knowledge with plant diversity management. In order to enhance the role of traditional beliefs in conservation of plant diversity, the association of religious plant conservation was established, which is a non-government organization and is attached to the Religious Association of Xishuangbanna. The task of the association is: to document the traditional botanical knowledge, to train and educate people, especially the young generation, to understand the importance of traditional knowledge, and to encourage local people to use their traditional knowledge in the conservation of biodiversity and environment. All people who respect the traditional beliefs and like to conserve plant diversity and environment can be members of the association. The association has a headquarters including a documentation section, education section and three branches, which are located in the general temple of Xishuangbanna and regional temples, respectively. The association has played an important role in training and organizing local people to participate in the conservation of plant diversity.

Training local people in multi-levels through religious system

The temple is not only the place where people practice religious activities, but also the school for learning traditional knowledge. Traditionally, young men of the Dai nationality must stay in the temple for some years to learn the traditional knowledge. Now there are 558 temples in Xishuangbanna and about 5500 young men are studying there. In cooperation with the botanists, 32 training courses have been run since the establishment of the association in 1998. They can be divided into three levels: the first level courses were held in the Xishuangbanna general temple to train the students of the Buddhism College and the heads of regional religionists and farmers, the second level courses were held in regional temples to train the heads of village

Table 2. Ritual plants in temple gardens.

Scientific name	Use in Buddhism
Alstonia scholaris	Buddha tree
Termienalia brlliriica	Buddha tree
Dolichandrone caudafelia	Buddha tree
Securinega virosa	Buddha tree
Ficus racemosa	Buddha tree
F. altissima	Buddha tree
F. religiosa	Buddha tree
Mallotus barbatus	Buddha tree
Oroxylum indicum	Buddha tree
Cinamomum sp.	Buddha tree
Bambusa ainospinosa	Buddha tree
Tectona grandis	Buddha tree
Michelia champaca	Buddha tree
Gmelina arborea	Buddha tree
Celtis cinnimomum	Buddha tree
Dialium ovoides	Buddha tree
Dolichandrone caudafelina	Buddha tree
Musella lasiocarpa	Buddha tree
Macaranga denticulate	Buddha tree
Mesua ferrea	Buddha tree and the seed oil used for lighting the temple
Gossampinus malarica	Buddha tree
Saraca dives	Memorial tree for Sykamuni's birth
Shorea assamica	Memorial tree for Sykamuni's death
Corypha umbraclifera	The leave used for carving Buddha Sutra
Chukrassia tabularis	Wood used for construction of temple
Paramichelia bailonii	Wood used for construction of temple
Artocarpus heterophylla	Wood used for carving Buddha statuary
Aleurites moluccana	Seed oil used for lighting the temple
Cinnamomum comphora	Cooked water with the wood used for washing Buddha statuary
C. ponectum	Cooked water with the wood used for washing Buddha statuary
C. glanduliferum	Cooked water with the wood used for washing Buddha statuary
Syzygium jambos	Cooked water with the parts of the plant used for washing monks when he is promoted
Acacia pennata	Cooked water with the parts of the plant used for washing monks when he is promoted
Bixa orellana	Used for dying the offering foods
Morinda angustifolia	Used for dying monks' clothes
Gardenia jasminoides	Used for dying monks' clothes
Nymphaea tetragona	Offering flower
Cirnum asiaticum	Offering flower
Hedychium coronerrium	Offering flower
Plumeria rubra	Offering flower

religionists and farmers, and the third level courses were held in the village temple to train local religionists and farmers. There are 1320 people including

religionists, farmers and local officers who have been trained. The training contents include: relationship between traditional beliefs and plant diversity, and the technique of identifying and managing plants related to traditional beliefs.

Recovering plant diversity in holy hills and temple gardens

Traditionally, holy hill forests and plants in temple gardens were protected well. However, in the 1960s and 1970s, many holy hill forests and temples were destroyed. Even the maintained holy hills and temple gardens were partly occupied by economic plants. From the 1980s, many temples and holy hills have been rebuilt, but the plants there have not been recovered. Based on the training and education, four holy hills and six temple gardens distributed in different regions were chosen as the demonstration sites for recovering plant diversity. Organized by the association of religious plant conservation, more than 500 people have participated in the demonstration activities and plant diversity in the holy hills and temple gardens have recovered well (Table 1).

The number of plant species in six temple gardens has been increased to 91 species and most ritual plants have been recovered (Table 2).

The recovery of plant diversity not only helps the conservation of traditional culture but also beautifies the environment, which is helpful in the development of ethnic ecotourism. Besides the demonstration sites, many other villagers have learned the technique of recovering the plant diversity in their holy hills and temple gardens.

Conclusion

Human cultural diversity has a close relationship with biodiversity and environment. Traditional societies have often protected parts of the natural landscape they occupy, or left untouched some of its elements. Most such societies, for instance, have considered certain sites as sacred, where most or all human activities are prohibited. As there is rich biodiversity in Xishuangbanna, southwest China, the local communities have developed their own traditional culture which is based on the rich biodiversity, and the traditional culture has also played an important role in the conservation of biodiversity. The holy hill forest and religious plants are good examples. However, establishing a connection between specific cultural practices and conservation or enhancement of biodiversity is by no means a simple matter. This paper reported the approaches of conserving plant diversity through traditional beliefs in Xishuangbanna, southwest China, and the results show that the approach of conserving biodiversity based on cultural and religious values are often much more sustainable than those based only on legislation or regulation. Indigenous people are often very knowledgeable about biodiversity (Redford and Padoch 1992), but the indigenous knowledge was created

in the conditions with a smaller population, large forest coverage and richer biodiversity. When confronted with market pressures, higher densities, new technologies and increased opportunities, there is a long way to go for promoting the wide use of indigenous knowledge in the conservation of biodiversity.

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