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Applied Ethnobotany: Participatory Approach for Community Development and Conservation*

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Applied ethnobotany is a new subject in ethnobiological sciences referring to the transferring, reviving and cultivating ethnobotanical knowledge among different social groups within intra-and-inter-communities. Much research related to biodiversity in many countries is largely devoted to the gathering of more academic information, rather than to more incise studies focusing on finding answers to pressing challenges related to the use of plants by communities. China is a country possessing rich biodiversity and cultural diversity. The long history of Chinese traditional medicine, diversity of cultivated crops and utilization of wild plant species are great cultural traditions to the country. Today, many societies of the country are still intricately linked to the natural environment economically as well as societies and groups within China. However, China is facing major changes in modernization of the country's economy, and globalization to form part of the world exchange system. Increasingly high levels of consumptions of natural plants, as well as national and international trades on plant products have resulted, space in over-harvesting of wild resources and accelerated environmental degradation. Local social structures and cultural traditions have also changed in order to cope with policy changes. In this background, over the last decade, applied ethnobotany for rural community development and conservation has been employed in different field projects and ethnic minority communities in Yunnan province of China. The applied ethnobotany has focused on work at community level to achieve sustainable use of natural resources and conservation. This presentation discusses findings and lessons learned from the projects on alternatives and innovations to shifting cultivation in Xishuangbanna, southwestern China.

Key words: Applied ethnobotany, participatory approach, integrated development, Xishuangbanna.
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1 Introduction

Applied ethnobotany is a new subject in ethnobiological sciences for transferring, reviving and cultivating ethnobotanical knowledge among different social groups within intra-and-inter-communities[1]. Scientists have found a knowledge gap in natural resource management after the failure of technology during the Green Revolution, particularly in the tropical mountainous regions. Studies on ethnobotanical knowledge systems have great potential and serve as an alternative approach for biodiversity conservation and sustainable resource use in the most bio-cultural and diverse mountainous regions.

"The indigenous peoples of the world possess an immense knowledge of their environments, based on centuries of living close to nature. Living in and from the richness and variety of complex ecosystems, they have an understanding of the properties of plants and animals, the functioning of ecosystems and the techniques for using and managing them that are particular and often detailed. In rural communities in developing countries, locally occurring species are relied on for multiple uses, sometimes all-foods, medicines, fuel, building materials and other products. Equally, people's knowledge and perceptions of the environment, and their relationships with it, are often important elements of cultural identity." Director General of UNESCO said.

The maintenance of biological and cultural diversity is of global concern. Biodiversity and indigenous knowledge are interrelated and interacted. The loss of biodiversity in the tropics has consequently led to the erosion of ethnobotanical knowledge within human society. On the other hand, our scientific knowledge and its methodology for biodiversity conservation are

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still fragmented and deficient. **Ethnobotany** is an interdisciplinary science for documentation of indigenous knowledge and its interactions between people and plants. (However), classical ethnobotany is focused on six helpers, i. e., who, where, when, how, by whom, how many (much), and data is extractively collected with well designed methods. The new orientation for ethnobotanical study should be towards both participatory and integrated development, which emphasizes community based, and should be people centered and indigenous knowledge focused. It can be summarized as follows:

1st. To work with local people in way of participatory approaches, to document systematically local knowledge in use of plants and indigenous ecological knowledge concerning resource management in connection to local livelihood and strategies for conservation.

2nd. To not only collect specimen stored in the herbarium, genetic resource in the gene bank and ethnobotanical knowledge in the database, but also directly apply ethnobotanical knowledge for resource management and conservation.

3rd. To analyse and understand the diversity of interactions between people and organisms, people and people, and people and knowledge, as well as the community institutions relating to those interactions.

4th. To recognize that co-management systems a complex mixture of ecological, social, cultural and economic factors within a particular political framework, and the reality of rural community varies from case to case. This requires close work with local community and local people's participation.

5th. To encourage the participation of local people for collection, analysis, revival of indigenous knowledge, as well as improvement of their own livelihood and to transfer and replicate the indigenous knowledge and successful practices in other places for sustainable development.

However, the simplified application of indigenous knowledge systems does not help community livelihoods in most cases. Poverty and environmental degradation dominate the eco-cultural landscape in the mountainous region. It is necessary to know how and why it works or not. This paper discusses two case studies through applied ethnobotany for community livelihood development and conservation of biological diversity in Yunnan(Fig. 1).

Fig. 1 Location of project site, Xishuangbanna, Yunnan Province, southwestern China

Yunnan is a mountainous region characterized by great biological and cultural diversity. Situated at the roof of inland China and Montane Mainland Southeast Asia (MMSEA), it has six major watershed systems (including the upstream of Yangtze, Mekong, Salween, Red River, and Pearl River), bordering with Vietnam, Laos and Myanmar. The topography has shaped diverse and complex microclimates leading to a diverse range of farming practices. It is managed via a mosaic of microenvironments or micro-sites even within watersheds and villages. Many ethnic minorities have been practicing a combinated farming system, from hunting and gathering, swidden cultivation, terracing, to home gardens and nomadic grazing, based on their technical knowledge about climate, soils, water, relief, plants and animals, which is encoded in the culture and language of the people. Many ethnic minorities respect the land as their mother, and treasure what it provides as a source of livelihood and cultural materials. The cultures have evolved to provide a means of managing the land and the natural resources in a sustainable manner, and customary laws have regulated access to and exploitation of resources for many centuries. The cultural beliefs and religions, including indigenous shamanism, adaptive Buddhism, or even catholic practices, are embedded in their daily life for harmonious existence between nature and society.

2 Participatory approach for community development and conservation

2.1 Globalization and its impacts on mountain indigenous communities

Globalization is a process of economic change initiated by market-oriented policies and state economic development programs, in this process, the market, instead of traditional norms and rules, plays the key role in driving the economic transactions at different levels. The potential impacts of globalization on mountain indigenous are as follows:

2.1.1 Livelihood security Mountain people have to face the uncertainty of livelihood since they have to produce or explore the natural resources driven by market demands instead of self-sufficient and traditional limited exchange between lowland and upland;

2.1.2 Knowledge uncertainty Indigenous farmers have faced newly introduced crops, technology, and market mechanism which are alien to them. Development interventions, in most cases designed indiscriminately by outsiders, usually aim at replacing the indigenous systems, which are described as "primitive" and"backward", with a "scientific" system. Activities have focused on the development of infrastructure in order to improve access to markets and to facilitate the transition to market economy. Development interventions are often sector-based, technical oriented, without socio-cultural consideration.

2.1.3 Economic marginalization Most indigenous people practise a highly autonomous subsistence system, and have stayed at the periphery of decision-making in the context of overall development, meaning they have been further economically marginalized during transition to market system. Marginality is also evident under influence from non-local factors in the use of mountain resources. Today, international markets determine how local resources are used and are best often controled by outsiders. Inadequate development interventions have further deteriorated the degraded environment in mountain areas.

2.1.4 Institutional Gaps The external development efforts that have taken place in indigenous areas have often had little impacts on local livelihoods and have led to deteriorated environments in many cases due to incompatible institutions. Mobilize local community organizations, customary institutions and cultural values and beliefs still shape indigenous decision-making and management practices.

2.2 Overall trend in Xishuangbanna

With the introduction of "Households Responsibility System" and economic development in Xishuangbanna, in the late 1970s, the forest cover dramatically decreased. Agricultural land was increasing converted for cash crop plantations such as rubber in the 1980s, sugarcane in 1990s, and recently passionfruit and fruit trees. During the early 1950s, there were only 100,000 people living in the uplands, those

people engaging in swidden agriculture, and cultivating 13400 ha annually in the region. Most dense forests were maintained as "holy hills" and "holy forests", which were well protected for religious purposes, particularly the Dai. However, large areas of forest were cut during the 1950s, 1960s and 1970s, due to the centrally directed "Great Leap Forward" used to fuel for steel furnaces; turbulence during cultural revolution, and "To Acquire Grain from Uplands" for increasing food production. The cultivated swidden areas were expanded to 26700 ha. The movement for expansion of cultivated areas, "Exploitation of Marginal Lands" led by the provincial government office in 1978, again led to forest destruction in the uplands. The total cultivated swidden fields peaked at 53,400 ha in Xishuangbanna during that time[2].

2.3 Case studies in Xishuangbanna

2.3.1 The Hani (Akha) and their history The Hani people are believed to have practiced irrigated agriculture more than a thousand years in central Yunnan. Following wars, earthquakes and landslides, some Hani split off from the Akha and migrated toward what is now Xishaungbanna. Finding the river valleys of the warm, humid, sub-tropical regions were already occupied by other groups, the Hani learned to practice shifting cultivation in the still vacant uplands. The majority of Hani moved southeast towards the Red River Basin and practised terraced agriculture. Today, there are approximately 1.2 million people of Hani ethnicity living in the uplands of Yunnan (1990 census). The Hani practise a composite shifting cultivation system that includes traditional tea gardens (jungle tea garden), intensively terraced rice paddies in the river plains, homegardens, livestock, and shifting cultivation on the hillsides.

The Hani are a patrilineal clan. The position of the village chief (zoema) is normally hereditary but the chief may be selected instead by a group of knowledgeable and respected village men. The role of the village chief was traditionally imbued with legal authority and religious functions, but never with the authority of an absolute ruler. The chief makes decisions through discussions among the male clan members and household heads. Customary institutions play important roles in regulating land and natural resources. The Hani are basically animistic in their beliefs and place a strong emphasis on worshiping their ancestors as evidenced in their strictly protected cemetery forests[3].

2.3.2 The Jinuo and their maybe in hold The Jinuo are an ethnic minority who traditionally lived only in the Jinuo mountain of Xishuangbanna with a population of slightly more than ten thousand. The Jinuo practise a combined shifting cultivation system, which includes shifting cultivation fields, jungle tea gardens (historically one of six major tea producing regions in Xishuangbanna), homegardens, hunting and gathering[5].

Before the 1960's, the Jinuo consisted of several clans before the 1960s. The village committee was responsible for maintaining and enforcing indigenous institutions, coordinating with other communities, managing land and shifting cultivation. The committee is consisted of representatives from each clan and usually the most senior man was responsible for committee meetings and decision-making. The land belonged to the community, clan and private, respectively. Clans owned most of the land, particularly shifting cultivation fields.

3 Findings and lessons learned

3.1 Interdisciplinary research and participatory planning

Both the Hani (Ahka) and Jinuo ethnic minority groups are still largely dependent on swidden cultivation for subsistence needs and even cash income in Xishuangbanna. For centuries they have accumulated and passed down a variety of indigenous (technical) knowledge on agroforestry and forestry conservation in their swidden systems. For example, the Hani have practised rattan cultivation in the swidden-fallow fields for about one hundred years[3]. In fact, the swidden agro-ecosystem is one of the most dynamic ecosystems in the tropics in terms of biological diversity, particularly crop diversity, and flexibility of the indigenous knowledge for its management. With the

rapidly changing market-oriented economy in China, however, both the biodiversity of agro-ecosystems and the related ethnobotanical knowledge have been eroded by patterns of mono-cultural agriculture and extractive resource exploitation. These practices inevitably result in environmental degradation and social poverty because of the lack of options for ecological and economic security due to reliance on a single species. Although initial steps have been taken by indigenous people to innovate in face of rapid change, assistance from the outside is essential to enable local farmers to promote sustainable resource management with both ecologically and economically improved fallow management in swidden agro-ecosystems.

The Project Alternatives to Swidden-fallow Agroforestry in Xishuangbanna, supported by the Ford Foundation, aims to work with local shifting cultivators together to develop appropriate alternatives to swidden cultivation, increase local capacity for their management, and preserve ethnobotanical knowledge among different social groups (particularly, with respect to age and gender) of Hani and Jinuo communities. An interdisciplinary ethnobotanical team comprising of local community members together with experts in upland resource management, ethnobotany, agroforestry, and social forestry has conducted comprehensive inventory survey on biodiversity in swidden agroecosystems and indigenous knowledge, practices and community institutions for shifting cultivation.

The interdisciplinary team has also applied participatory approaches for community planning and implementation. The Hani people in Mengsong Village and Jinuo people in Longpa Village have implemented the project and supported organizations based at the township, county, prefecture and provincial levels of administration. The Center for Biodiversity and Indigenous Knowledge (CBIK) and the Kunming Institute of Botany (KIB), Chinese Academy of Sciences (CAS), will conduct project coordination, management and monitoring.

3.2 Field activities for livelihood development

3.2.1 Ecologically improved fallow Ecologically improved fallow aspires to maintain soil fertility in the cultivated field and replenish soil fertility in the fallow field by using nitrogen-fixing legumes or other green manure in order to prolong the cultivation period and shorten the fallow period and therefore meet the local increasing demand for food[4]. The ecologically improved fallow focuses mainly on the introduction of multi-purpose legume plants (*Acacia mangium* Wild, *Tephrosia candita* DC., and *Leucaena leucocephala* (Lam.) Der Wit) in the swidden fields both for erosion control and soil fertility improvement. Ideally, the swidden field should be maintained on a permanent basis for food production. Legumes planted along the contour serve as bio-hedgerow for soil erosion control, and later produce adequate biomass as green manure for annual food crops, well known as Sloping Agricultural Land Technology (SALT). Several hectares of legumes have been planted either in cultivated fields in Mengsong Hani community and fallow fields in Jinuo community. It turns out that legumes are well accepted by the Hani women in Mengsong, but resisted by the Jinuo farmers in Longpa.

3.2.2 Economically improved fallow Economically improved fallow refers to introducing valuable species (timber, non-timber forest products, cash crops, etc.) to manipulate plant communities instead of natural succession, and therefore to harvest marketable plants before the next swidden-fallow cycle starts. The economically improved fallow allows local shifting cultivators to plant more market-oriented cash crops[4].

A fast growing tree (*Trewia nudiflora*) with the potential for bio-pesticides had been recommended by researchers from KIB and produced a total of 8000 seedlings for planting both in the swidden fields and along roadsides. Coffee is another cash crop requested in Longpa Jinuo village. The swidden fallow has been converted into more permanent upland gardens with multi-cropping tree vegetables (Orchid tree, *Bahaunia variegata* var. *candita*, snake acasia, *Acacia pennata*, tree tomato, *Cyphomandra betacea*), bamboo (both sweet and bitter varieties), and fruit trees (peach, plum and jackfruit). Pine trees are highly valued by Hani people in Mengsong and are planted in the village scenic forest, called Puchang by Hani.

More pine seedlings will be transplanted during the coming wet season.

3.2.3 Non-timber forest products A total number of ten thousand rattan seedlings were transplanted in the jungle tea garden and swidden fallow fields by Jinuo villagers in Longpa in June, the beginning of the wet season. A total of several thousand rattan seedlings were planted in the community protected rattan forest (*Sangpabawa*) in Mengsong Hani community. The customary laws governing access to wild rattan resources in *Sangpabawa* are reinforced through public meeting and renewal of detailed regulations within local Hani communities. The farmer's nurseries have been established for producing rattan seedlings and planting in the swidden-fallow fields.

3.3 Innovation initiatives

3.3.1 Rattan extension After implementation of rattan nurseries and seedling distribution, there was a requirement from local government and other shifting cultivators to provide technical support to foresters and other farmers for developing rattan nursery and planting rattan in nature reserves, forestland and swidden-fallow fields. Four rattan nurseries have been established, together with local farmers and foresters from local government forestry agencies.

3.3.2 On-farm trials of cash crops High quality varieties of lemon, avocado, and jackfruit have been introduced in the swidden fields by transplanted seedlings and grafting on local varieties in Longpa Jinuo Village. A total of 269 local citrus trees have been grafted. The Jinuo farmers required more fruit trees in the swidden fields than they could finance. A total of 20ha of orchards has been developed with persimmon, peach and cherry trees. The orchards, located close to the village, are collectively owned and well fenced with bamboo.

3.4 Capacity building

3.4.1 Training on grafting fruit trees Training is crucial project activities for capacity building. Trainers are not only from research and extension agencies but also from indigenous experts within local communities. A hundred of farmers were trained for improved nursery technology, grafting and pruning, pests and diseases control, biomass and soil fertility management. The grafting tools such as knives and scissors were also delivered to trained farmers.

3.4.2 Farmer's networking After the failure of several micro-projects in the first year, local farmers realized that more management should be taken in order to implement all activities efficiently. The Hani farmers established their own network for managing field activities and sharing experiences.

4 Discussion and Conclusions

4.1 Change of land tenure and its impacts

During the collective period (People's Commune) with the central planning system between late 1950s and late 1970s, land-use practices were controlled by the state. The customary arrangement of land and its tenure were changed. The large expansion of shifting cultivation had always been a response to changes of state policies. Both Hani and Jinuo people witnessed the destruction of forest resources. Since the introduction of the Household Responsibility System, local farmers in both villages have re-gained control of their resources. And the total area of shifting cultivation has been stabilized during the last decade.

4.2 Technology development

Both Hani and Jinuo have a good sense for technology development in order to compete with lowland Dai people and Han Chinese. The farming practices in swidden agro-ecosystems have significantly changed due to easy access to market and development interventions. Fewer varieties of rice landrace and use of chemicals such as herbicides for weed control in the terraced rainfed upland, particularly in Jinuo villages. Demarcation of forestland and swidden fields in 1982 resulted in the stabilization of swidden fields, shortening of swidden-fallow cycle and intensification of farming. Buffalo ploughing and a more than 3-year period of cultivation in the swidden-fallow cycle are commonly practiced by Jinuo people in order to control weeds, which makes secondary succession difficult. The ethnototanists can play significant role in technology development with shifting cultivators in the upland farming system in a participatory approach

by bridging scientific knowledge and indigenous knowledge.

4.3 Role of customary institutions and its change

Both Hani and Jinuo were vassal groups governed by the Dai people before 1950. In the past customary institutions played crucial roles in the past for governing access to natural resources within the local community. Those local governance systems were weakened during the collective period. The decentralization process, with the introduction of the Household Responsibility System and Economic Reform in 1978, restructured the decision-making process and even restrengthened some community institutions. Both Hani and Jinuo could decide whether they would like to maintain swidden fields for the whole village or households. Swidden fields in Mengsong were allocated to household levels, which is indicated by the more diversified small landscape mosaics in Mengsong, and large swidden mosaics in Jinuo village. This study clearly demonstrates the adverse effect, which the government agencies can have done on forest cover when they fail to see the benefits as well as the costs of swidden cultivation. In Mengsong, there is a direct correlation between government policies on producing food from hilly lands and the destruction of forest cover. Once farmers were allowed to make decisions regarding the management of their own swidden/fallow/forest systems, they decreased the amount of land farmed and intensified their farming methods. The government's decision to allow farmers to manage their own land, and its related recognition of customary institutions for managing land resources, enabled farmers in Mengsong to stabilize the amount of land under swidden cultivation while meeting the subsistence needs of a growing population.

4.4 Market-orientation

Shifting cultivators are increasingly dependent on the external market for material supplies and cash income generation. In the past, the main source of cash income for Jinuo, in the past was tea, and is now cardamom and passionfruit. Unreliable market prices and marketing systems have resulted in big losses of income for the Jinuo. In contrast, the Hani have less income than Jinuo but are more diversified and have more reliable markets for traditional non-timber forest products, such as tea, rattan, bamboo, and wild vegetables. Capacity building for farmers in market analysis should be considered for community development.

4.5 Diversification

With assistance of the project, the Hani people in Mengsong have developed the upland jungle garden for permaculture as an alternative to shifting cultivation. Diversity of marketable species, such as timber species, rattan, bamboo, tree tomatoes, have been selected by local villages and planted in the fallow fields on a large scale. Tourism development in Xishuangbanna has provided a great opportunity for diversification of local products.

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