

Use it or Lose it

**Protecting the Traditional Knowledge,
Genetic Resources and Customary Laws
of Marginal Farmers in Southwest China**



**Jingsong Li and Yiching Song,
Centre for Chinese Agricultural Policy (CCAP, China)**

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1 INTRODUCTION



Map 1. Project region in Southwest China.

1.1 Objectives and focus of the case study

This report provides the findings and lessons of the action research project “Protecting Community Rights over Traditional Knowledge: Implications of Customary Laws and Practices in Guangxi, Southwest China”. The project, which started in 2004, sought to: explore customary laws, values and practices relating to plant genetic resources (PGR) and traditional knowledge (TK) with local communities; develop innovative practices and local tools for PGR and TK protection; and inform national policy and legislation.

It builds on an ongoing participatory plant breeding (PPB) project in southwest China, which started in 2000 and worked on PGR conservation and improvement with breeding institutes and local farmers.

The work was conducted in areas of important biological diversity, involving different ethnic communities with significant agro-knowledge. Communities living in typical Karst remote mountain areas of SW China have rich plant genetic resources (PGRs) and traditional knowledge (TK), however, economically they are poor, because of their remote location, limited arable land, harsh natural condition and lack of public services. As with many small-scale and traditional farming communities around the world, they are facing hardship in nurturing and developing crop and animal biodiversity. Their experimentation and innovation practices are under stress. Our PPB work started working on maize since 2000, as it is their main staple food crop.

In view of farmers’ current inferior socio-economic status and increasing involvement in market competition, the protection of farmers’ right and interests for equal benefit sharing and sustainable livelihood is a key concern that requires greater attention from policy makers. Without compensating measures and appropriate protecting policies and laws, there will be exploitation of farmers’ rights and interests, and deterioration in their TK and the environment and natural resources (Zuo and Song 2002; UNDP 2003; Song and Zhang, 2004).

Our research in China’s Southwest mountainous areas confirms that farmers are key players in crop improvement and conservation, and that farmer-researcher collaboration through approaches such as PPB can produce added value that farmers or researchers alone could never realize. Besides that, we also support innovative marketing mechanisms such as local niche markets, which can provide incentives for those farmers who conserve and produce PGR and TK related products. One of our key assumptions is that farmers and local communities can get monetary benefit and non-monetary social recognition and can find more

motivations for continuous PGR and TK conservation through these policy and institutional experiments at the project level, and thus can influence the national ABS policy-making process.

The general objectives for this case study are:

- a) Exploring mechanisms for PGR & TK protection through institutional experiments at project level:
 - To respond to farmers' and community's needs, interests and rights and contribute to their livelihood security.
 - To protect biodiversity, and recognize that farmers' interests and roles are crucial for sustainable agricultural development in China.
 - To examine and understand the customary regulations and practices of indigenous and local communities relevant for controlling external use of maize landraces and traditional knowledge.
 - To explore diverse market instruments for adding value to PGR & TK at local and national levels.
- b) Integrating the project process and outcomes into PGR & TK related policy discussion and negotiation
 - To enhance agricultural innovation by providing policy and legal support for participatory plant breeding practices and processes at community and institutional levels.
 - To inform and contribute to the development of the relevant national policies, regulations and laws including the state's recognition of customary laws, the completion of IPR regulations, particularly focusing on the "Protection Regulation for New Plant Varieties" by the Ministry of Agriculture (MOA), and the formulation of related regulations and laws for access and benefit sharing (ABS) of genetic resources and traditional knowledge by the Ministry of Environmental Protection (MOEP).

1.2 Overall approach

This study used the concept of 'collective bio-cultural heritage (CBCH)' and an agricultural knowledge systems (AKS) perspective as its overall guiding approach.

1.2.1 Collective bio-cultural heritage approach

'Collective Bio-Cultural Heritage' means "knowledge, innovations and practices of indigenous peoples and local communities which are often held collectively and are inextricably linked to traditional resources and territories; including the diversity of genes, varieties, species and ecosystems; cultural and spiritual values; and customary laws shaped within the socio-ecological context of communities". These components of knowledge systems and their ongoing interaction are vital for the use, creation and transmission of traditional knowledge, and are often linked to knowledge of cosmic forces (as part of indigenous peoples 'cosmovision' or holistic worldview)' (report of the Cusco workshop, 2005). It reflects the holistic worldview of traditional communities where TK, biodiversity, land, cultural values and customary laws are closely inter-linked and interdependent; these are the key elements that sustain TK in practice. It gives a better understanding of the conditions and trends affecting TK and the responses needed to effectively address the loss of TK as well as the erosion of rights. The research focuses on both the protection of TK from loss and the protection of rights over TK.

The CBCH approach is consistent with an ancient Chinese philosophy which emphasizes balance and harmony between human and nature. Most existing traditional knowledge (particularly TK related to genetic resources) has been generated from interactions between humans and nature, and has been understood as an organic part of the ecological system and socio-cultural organization of traditional communities. Our research started from such traditional communities in SW China.

1.2.2 Agricultural knowledge system (AKS)

An agricultural knowledge systems approach has been defined as "a soft systems approach for looking at the interaction among the (institutional) actors operating in a 'theatre of agricultural innovation'. And the knowledge systems perspective looks at the institutional actors, within the arbitrary boundary of what can be considered as the theatre of innovation, as potentially forming a soft system" (Röling and Jiggins, 1998: 304). It can be used for agricultural knowledge management, with a focus on interactions among actors and their environments. This AKS approach can help researchers construct a platform for different actors working towards innovations on GR & TK conservation.

2 CONTEXT

2.1 Rural poverty and agrobiodiversity degradation in SW China

As the biggest developing country in the world, with diverse situations in culture, economy and ecology, China is experiencing a dramatic transition period in its economy, society and environment. China's entry into the WTO marks an important event in this period and is accelerating the transition process. The Chinese economy's opening up to foreign enterprises and integration with the global economy is undoubtedly having profound but different socio-economic impacts on different groups of people in different sectors and areas. The impact of these changes on vulnerable groups, like smallholder farmers and their communities and the implication for policy making and the reform of regulations and laws, have been drawing increasing attention from policy makers as well as researchers. The biggest issue is unbalanced development (between urban and rural, industry and agriculture, east coast areas and western remote areas etc.) which is leading to challenges such as extreme rural poverty and inequality, feminisation and aging of agriculture, and environment and biodiversity degradation as described below.

Challenge 1: Extreme Rural Poverty

The Chinese rural economy has experienced rapid growth since the adoption of a broad program of rural economic reforms beginning in 1978. China is widely recognized for its achievements in reducing extreme poverty since then. Nevertheless, there are about 30 million people who still live below the extreme poverty line (i.e. 0.5\$ per day, according to the 2007 report from the State Council Office of Poverty Alleviation), and they comprise the majority of the food insecure population. They are mainly farmers cultivating in resource-constrained remote upland areas, which are agro-ecologically diverse, resource poor and risk-prone regions in southwest and northwest China. They are small holder farmers with an average land size of less than 0.2 hectares. Although these poor have land use rights, in most cases the land itself is of such low quality (with many rocky areas) that it is not possible to achieve subsistence levels of crop production. Consequently, most poor people consume grain and other subsistence foods beyond their own production levels, and have been negatively affected by price increases for these products after the economic reforms. Ethnic minority peoples are known to represent a highly disproportionate share of the rural poor.

Challenge 2: Feminization and Aging of agriculture

Recent studies in China have revealed that there has been an overall increase in out-migration from rural to urban areas, especially from the poorer areas like west and southwest China. These studies also show that women's out-migration is far below that of men in terms of magnitude, time periods, and increase over time. This has resulted in an increasing feminization of agriculture in the last decade in rural China, especially in the poor western areas (Zuo and Song 2002; UNDP 2003; Song and Zhang 2004). It has shown that more and more women are left alone at home, and they have become more and more engaged in agriculture and natural resource management. Women compose around 70-80% of the existing labour force in most of the provinces, especially in the west and southwest poor areas in China (Song and Zhang, 2006). They are mainly middle-aged women with a limited education level.

Challenge 3: Environment and biodiversity degradation and erosion of related TK

The environment and natural resources in these regions are experiencing a rapid degradation as result of over-exploitation and inappropriate interventions. The small holder farmers and their farming communities are finding it more and more difficult to conserve and enhance agricultural biodiversity. Their traditional knowledge and local practices of experimentation and innovation are under stress. Biological diversity, especially landraces in farmers' field are disappearing at an accelerating speed. This is threatening the livelihood security of the poor and national agricultural sustainability and food security in the long run. In the last ten years, crop landraces in SW have decreased rapidly in farmers' field. For example, a recent survey carried out in Guangxi, Yunnan and Guizhou has revealed that there were about 90% respondent households cultivating maize landraces in 1998, reduced to 73% in 2003, and in 2008, there were only 56% households using maize landraces; more and more farmers are turning to hybrids accessed from markets (according to a survey¹ on maize landrace distribution in Guangxi, Yunnan and Guizhou in 2009).

¹ The survey was related to a PhD study funded by CCAP.

2.2 Cultural Diversity and Customary Laws in China

China is a united multi-ethnic country, so far, there are 56 nationalities formally recognized by the central government. The population size of each ethnic group varies greatly - Han is the biggest group and the other 55 ethnic groups are relatively small, customarily referred to as “minority” nationalities. According to the 5th national census in 2000, 55 ethnic minority groups totalled 104.49 million, accounting for 8.41% of the total population. The distribution pattern of these nationalities in China is, each small group living together in communities, with mixing of different ethnic groups. For example, other ethnic groups can live within Han Nationality dwelling areas, and vice versa. This distribution pattern is a result of long term historical change influenced by relationships and interactions among various ethnic groups. Even though the population of ethnic groups is limited, it can be widely distributed. According to statistics, the dwelling areas of ethnic groups cover 64% of the total land area of China.

Based on differences in history, natural condition, lifestyle and religion, each ethnic group has its distinguished customs. Historically, the ethnic groups living in southwest China - Yunnan, Guizhou, Sichuan, Guangxi, Chongqing - were mainly regulated by their customary laws, norms and traditional culture/values. Nowadays, part of these distinctive customs and habits has been eroded, but some are still in use as customary norms, traditional knowledge and traditional farming practices. The political-institutional system of the central government has reached every village in remote rural areas, since the commune system was established in the 1950s; thus the central governing system has been weakening local customary laws and traditional values.

Minority Customary Law is an important part of customary law. It is shaped by traditional authorities and social settings within local context, which are independent from National Law; its main task is to adjust the social relationships within its societies, with mandatory and customary rules of conduct combined. Each minority group has their own names for customary laws.

2.3 Development of the project as part of the PAR program

This research is under an umbrella of the Participatory Action Research (PAR) program, which was initiated by the Centre for Chinese Agricultural Policy (CCAP) in 2000 in Guangxi Autonomous Region. The program is co-funded by the International Development and Research Centre (IDRC) of Canada and related ministries of Chinese Government. Its research team consists of researchers from CCAP, partner institutes and universities, policy makers, agricultural technicians from county and township levels, and farmers from project communities. It is cross-disciplinary research and is operating at different administrative levels. We are learning by doing together for a harmonious rural society and a sustainable agricultural and rural development in China.

From 2000-2004, the program focused on Participatory Plant Breeding (PPB), Community-based Natural Resource Management (CBNRM) and biodiversity enhancement. Since 2004, the program started working on “Farmers’ Livelihood Security and Policy Changes.” It aims to link the field research results to the policy making process through participatory action research, policy piloting and policy advocacy. Two inter-related action research projects have been set up in Guangxi, Yunnan and Guizhou on genetic resources and traditional knowledge:

1. Participatory Plant Breeding (PPB) on maize and exploring PPB-related Access and Benefit-sharing (ABS) mechanisms

The aim of the PPB project is to bridge the two separate seed systems – the farmer seed system and formal seed system in southwest mountain areas. It started working on maize in Guangxi in 2000. The working principle is that, formal breeders and farmer breeders collaborate through germplasm provision, field varietal selection, seed testing and seed production, in order to make better use of local landraces and breed suitable varieties for the marginal mountain region. We are now in the third phase. The project has developed 5 varieties, including 4 OPVs (Open Pollinated Varieties) and 1 hybrid. In 2006, we realized that PPB varieties have to face a series of Intellectual Property Right (IPR) and Access and Benefit-sharing (ABS) issues, such as how to register PPB-varieties and how to distribute benefits generated from these varieties. By exploring appropriate mechanisms, the project team has reached some initial ABS agreements for small-scale community seed production and community-based genetic resource registration and conservation. From 2008, the PPB project has expanded to Yunnan and Guizhou and has started working on landrace registration, conservation and genetic analysis.

2. Protecting local genetic resources and associated traditional knowledge, and supporting organic farming and marketing

This project started from 2004 and was part of a project coordinated by IIED, and funded by International Development and Research Center (IDRC) of Canada. It aims to explore customary laws and institutions for protection of traditional genetic resources and associated traditional knowledge. Through adding value to and marketing local resources and knowledge, communities are encouraged and supported to conserve and utilize their genetic and cultural heritage, such as crop landraces, wild medicinal plants and local livestock varieties. At the end of 2008, in order to find more market opportunities for farmers, we started to work with a local NGO - Farmers' Friend, which works towards bridging food producers and consumers in a friendly and sustainable manner.

This report focuses mainly on the second project, but also includes lessons from the first. Besides these two projects, the PAR team have also conducted other projects, such as 'Social and Gender Analysis in Existing Action Research in Southwest China (2005 – 2009)', 'Supporting Farmer Organization and Rural Innovation in China (2008 – till now)' and 'Participatory Extension and National Extension System Reforming (2005 – 2009)'.

2.4 Study context - cultural, geographic & ecological

The project villages are located in southwest China; firstly the work started in Guangxi, and later in Yunnan and Guizhou. Southwest China has is rich in ethnic “minority” nationalities; after a long time of evolution and development, it has nurtured diverse cultures. The specific cultural make-up of the area includes coexistence of multi-cultures, combination of original and modern cultures, and embedding of foreign culture within local cultural systems. There are 25 ethnic minorities in Yunnan, 17 in Guizhou and 11 in Guangxi. Each ethnic group has their unique culture and cultural expressions , from festivals, clothing to art (e.g. dance, folk songs, etc.).

The Southwest provinces connect the border of China, with a total area of 806,900 square kilometres, accounting for 8.4% of the total area. Forest coverage within this region is far higher than the national average (20.36%), e.g. 49.91% of Yunnan, 39.9% of Guizhou and 54.2% of Guangxi. It also belongs to sub-tropical climate zone. Such an eco-system has bred abundant biological resources and genetic resources within this region.

The project site increased since 2000. Table 1 shows the village numbers at different stages. Guangxi is the province we started working on PPB and TK protection and conservation from 2000 till now. We started carrying out similar work in Yunnan and Guizhou after 2007, as we increasingly realized the importance of conserving biological resources and traditional knowledge, especially in resource-rich regions like the southwest mountain areas. Most of these villages are located in the dwelling region of 'ethnic groups', where people conserve and share their ethnic culture and knowledge.

Table 1. The number of villages covered by project sites

Village nr.	Stage 1 (2000 - 2003)	Stage 2 (2004 - 2007)	Stage 3 (2008 - 2011)
Guangxi	6	6	13
Yunnan	0	0	1
Guizhou	0	0	3
Total	6	6	17

3 METHODOLOGY

3.1 Conceptual Framework

Here are the main concepts and definitions related with this research.

3.1.1 Customary law & Collective Biocultural Heritage

Customary laws can be defined as: “locally recognised principles and more specific rules which are orally held and transmitted and are applied by community institutions to internally govern or guide all aspects of life”. They include customary worldviews, principles or values (eg. reciprocity), rules and codes of conduct (eg. for sustainable use, and healers); and established practices (eg. for conflict resolution). They are enforced by community institutions, and can have sanctions attached. They are derived from natural resource use – some practices and beliefs acquire the force of law. They are locally recognised, orally held, adaptable and evolving. (Report of the Burnham Beeches Workshop, 2009)

Collective Bio-Cultural Heritage (CBCH) means “knowledge, innovations and practices of indigenous peoples and local communities which are often held collectively and inextricably linked to traditional resources and territories; including the diversity of genes, varieties, species and ecosystems; cultural and spiritual values; and customary laws shaped within the socio-ecological context of communities’. These components of knowledge systems and their ongoing interaction are vital for the use, creation and transmission of traditional knowledge, and are often linked to knowledge of cosmic forces (as part of indigenous peoples ‘cosmovision’ or holistic worldview)’ (Report of the Cusco workshop, 2005).

3.1.2 Participatory Action Research

Participatory Action Research (PAR) – a participatory, democratic process concerned with developing practical know-how in the pursuit of worthwhile human purposes. It is grounded in a participatory worldview and brings together action and reflection, theory and practice, in participation with others in the pursuit of practical issues of concern to people, and more generally the flourishing of individual persons and communities (Reason and Bradbury, 2006: 1). PAR strives to embody ‘a democratic commitment to break the monopoly on who holds knowledge and for whom social research should be undertaken (Fine, 2008)’ by explicitly collaborating with marginalized or ‘vulnerable’ others (Rahman, 1985; Kindon et al, 2007). The methodology of our research follows the principles and methods of participatory action research. It is an action-oriented approach, in which we combine desk research, baseline survey and follow-up supportive activities together. During conducting the activities, community-based adaptive management around PGR and TK conservation has been enhanced, and the small holder farmers and their communities have been empowered. The project process is a social learning cycle, and participants and partners have generated experience and knowledge together.

3.1.3 Participatory Plant Breeding (PPB)

Participatory Plant Breeding (PPB) is a strategy with a set of methodologies for plant breeding (including setting breeding objectives, making crosses, developing finished varieties and their release) with the involvement of its stakeholders, such as producers/farmers, traders, industries and consumers (Ashby, 2009). The goals for PPB are improving crop varieties, enhancing agro-biodiversity, empowering local farmers and communities, and influencing varietal release regulations and policies. In our case, farmers’ participation in the PPB cycle is the entry point for both on farm PGR and TK conservation, and capacity building and knowledge sharing with and amongst local communities.

3.2 Methods and tools for data collection

3.2.1 Methods

This case study adopted the following research methods and objectives to generate data and information at different levels:

- At community level – to examine and further understand the customary regulations and practices of indigenous and local communities relevant for controlling external use of maize landraces and traditional knowledge; and to support community-based PGR & TK registration and conservation.

- At project level – to further enhance research-farmer’s collaboration for crop improvement and capacity building; to link PGR & TK products of communities with local niche market; to generate sufficient experience and knowledge through learning by doing amongst the cross-disciplinary team, i.e. combining natural science and breeding techniques with social science and policy research.
- At provincial level – to influence agricultural research institutes through scaling out PPB method in southwest provinces; to build up a network among PPB institutions for experience and knowledge sharing; and to facilitate and strengthen the linkage between research institutes and local communities.
- At national level –to inform national authorities of the research findings and suggestions and contribute to the development of the relevant national policy, regulations and laws including the state’s recognition of customary laws, the completion of IPR regulations, particularly the improvement of the “Protection Regulation for New Plant Varieties” by MOA, and the formulation of related regulations and laws for access and benefit sharing by MOEP.

3.2.2 Tools for data collection

The following are the tools used for data collection in this study

- Desk research on literature and background information relating to plant genetic resources, traditional knowledge and customary laws in SW villages.
- Baseline survey: Explorative research on existing PGR and TK and customary laws and practices, and the threats they face, in the southwest region. The survey was done by researchers, with help from farmer facilitators. The survey covers customary law and bio-cultural heritage in project villages, including TK, biological resources, genetic resources, land, culture and local customary values.
- Participatory/action oriented research, involving farmers and breeding institutes and community-based PGR & TK registration and conservation. The process and outcome have been documented for further research.

3.3 Assumptions made

The study has based its assumptions on the following issues:

- Genetic resources and related traditional knowledge have been threatened by modernization and globalization. The resources in the ‘common pool’ need to be strengthened by the whole of society.
- In southwest China, it is urgent to improve the livelihood of resource-poor farmers who live in this diversity-rich region (both genetically and culturally), since they are the real keepers and users of GRs and TK.
- The priority is to find the balance between economic growth and bio-cultural diversity conservation, and find a sustainable relationship between eco-systems and human society.

4 FINDINGS / RESULTS

4.1 Status & trends of TK, GRs, cultural values & customary laws

4.1.1 Interlinked Bio-cultural systems

In Guangxi province the total maize germplasm collection has around 2,700 entries of which more than 1,700 are landraces from the region, and there is a similar situation in Yunnan and Guizhou. These are the results of local people's selection, domestication, cultivation and diffusion through their TK systems for thousands of years. There are close connections among the cultures of more than 20 groups of 'minority' people dwelling in this region, their TK and local rich GRs. They conserve their GRs with special use, which is instructed by their customs and TK systems. For instance, with the rapid adoption of hybrid varieties, some people (particularly women and older people) still like waxy maize, which is used as quality food or for making maize wine for festivals and weddings. However, cultural and spiritual values for maintaining TK and biodiversity are becoming weak and vulnerable. More and more young villagers are 'modernized', and migrating out for off-farm job opportunities. TK, together with GRs have been disappearing in local communities over the last few decades.

The following findings are based on an explorative research carried out during 2005-2006 in project villages of Guangxi province. They show a holistic picture of PGR and TK distribution and conservation in Guangxi. We explain local bio-cultural systems as two interlinked systems, i.e. socio-cultural and ecological systems. The socio-cultural system includes people, culture, religion, language and market gatherings; the ecological system includes land, crops, variety change and its dynamics, and medicinal plants.

Socio-cultural system –

- People: in our project villages, most of the people are minority nationalities, such as Zhuang Nationality and Yao Nationality. There are also people of Han Nationality, which is the majority nationality in China. The people of minority nationalities have their own language systems; they can transfer their language and culture to the future generations within their families and communities. Nowadays, young people can learn mandarin when they go to school. But old people in the minority nationality communities can only speak their own language.
- Language system: For different nationalities, the language system is quite different. People who have the same nationality prefer to live together, and gradually shape natural villages with single nationality. The language, together with the culture (such as food, dressing and dwelling customs) will be delivered and transferred within the families and communities by local people. Nowadays, there is a school in Long'an County, where the language of Zhuang Nationality is taught.
- Religion: there are temples for the 'god of earth' in the villages. Some villages have their own temples; others share temples with neighbouring villages. Most of the local people have the belief in the god of earth, and burn joss sticks in the temple twice a month.
- Food culture: most of the food local people eat is grown on their land, such as maize, beans, cassava, broomcorn and some vegetables; they also eat poultry and livestock, especially when there are festivals in their village. People in the villages are used to drinking maize wine made by the farmers themselves. The native chicken is very famous for its taste in Guangxi province, and the feeding process of the chicken in villages is now becoming more and more commercialized. The native chicken is mainly supplied to the restaurants, labelled with the county's name (e.g. Mashan Native Chicken). There are contracts between individual farmers and restaurants (or the third parties such as an NGO): farmers feed chickens at their home and the restaurants (or the third party) come to collect chickens on schedule.
- Local market gatherings: in each village, there is a local market gathering every three days. The vendors on the fair are those local farmers who are now working off farm. Usually farmers go to the market only for 'buying', and not for 'sale'. The farmer traders sell seasonal food, seeds and farming equipment regularly. Exchange of goods will not happen during the market gathering; however it might happen among the neighbours or relatives. For seed exchanging, in our project site there is a so-called Farmers' Seed Fair once a year, since 2004. It was launched by the project in 2004, aiming at encouraging local people to share their seeds and experience with planting. Significantly, the farmers' seed fair has an important function in helping people collect genetic resources and in enhancing the biodiversity for indigenous communities. The farmers have continued this activity of their own accord.

Ecological system² –

- Land: it is the Karst area, most of the land is mountain land. Land shortage is one of the main problems for farmers and local communities, as well as one of the driving forces for farmer migration. Our survey in Guangxi in 2006 found that there are about 2 mu per person in Wentan village, 0.6 mu per person in Xinfeng village, 0.6 mu per person in Guzhai village and 0.8 mu per person in Shuangjia village (15 mu = 1 hectare). Local people cultivate crops intensively and usually intercrop maize with other crops, such as soybean, sweet potato, vegetables and beans.
- Changes in crop varieties: Before the mid 1980s, the maize varieties were based on the local genetic varieties; from the mid 1980s to 1990s, more and more hybrids were imported, but the local varieties were still the majority; and from 2000 until now, the planting area for hybrid maize varieties has been enlarged at great speed, with the consequence that the local varieties have decreased rapidly. In the long term, the basic change in local communities is that maize has taken the place of rice in the past 50 years, because of the gradually decreased water resource. The loss of water resources is partly due to climate change, another reason might come from local deforestation. Other crops, such as sweet potatoes and soybeans are all planted with local varieties. Since the land for maize planting is always limited, it is difficult for local people to maintain the maize diversity on their land and the most important thing for them is to increase productivity, and when they find some variety with higher productivity, they will probably plant it on all land they have; on the other hand, they cannot only depend on the land to secure their livelihood, people (especially young people) usually join the team for migration or find some jobs off-farm.
- Maize varieties: As maize plays a central role in the local livelihood system, people prefer to plant those varieties with high productivity. Normally the local genetic maize varieties cannot produce as much as the imported hybrid varieties. This can be seen as the main reason why more and more hybrid varieties take the place of the local genetic varieties; even though the seed of hybrids is not cheap for farmers. In terms of TK protection, there are still opportunities for protection of local varieties. For example, people, especially old people like the taste of local maize much better than imported varieties, so some of them still plant those local varieties as they used to (eg. in their home gardens). This shows that cultural preference is helping to sustain genetic diversity. Participatory Plant Breeding (PPB) can be another positive tool for genetic resource protection. Farmer breeders and formal breeders work together on the improvement of local genetic maize varieties.
- Wild medicinal plants: There are plenty of medicinal plants growing wildly in the mountain area. In villages, only a few old farmers can recognize and know how to use them (such as for curing colds and fever). Most of the farmers are reluctant to and fear to use the locally-growing medicinal plants, which are unknown to them. They prefer to go to the village clinic when they are sick. There are some local collectors who collect wild growing medicinal plants and sell them to the vendors in the village, who then sell the plants to the Wholesale Market of Medicinal Materials outside the village. In this process, both the collectors and the vendors do not know what the plants collected would be used for. People told us that the wild plants have decreased rapidly in recent years. And as more and more young people go outside the village for work, traditional knowledge about medicinal plants will be lost gradually in the near future. In a village clinic, we found about 40 varieties of Chinese medicinal plants; people working in this clinic told us, most of these medicinal plants could be found in the village. Unfortunately, few people know their exact uses.

4.1.2 TK Transmission and Ownership

There are different types of TK, such as 1) *Communal knowledge and resources* (eg. seeds and much medicinal TK) are freely shared for community welfare, within and between villages. 2) *Specialised knowledge (usually medicinal)* is restricted to family lineage, clan or kin. 3) *Sacred knowledge* is kept secret amongst specialised healers or elders, and used in spiritual healing, ceremonies, worship etc (Swiderska, 2006).

When doing the baseline research in the communities, we also found it necessary to define TK as common TK and specific TK, the former is similar to communal knowledge and the latter is close to specialised knowledge. Common TK can be shared with the whole community, and it is easy for community members to obtain and transfer it to the younger generation. For example, in Wuming and Mashan counties, we met some older farmers, who know how to find and use the local medicinal plants and are always willing to share their knowledge with others in the villages, and outsiders like us. Specific TK means that it is clan/family-owned and can only be transferred through generations within the clan/family system, and cannot be shared with others.

People follow this customary law since a long time ago, because of the traditional values transferred among generations within the clan or family. In one of our project counties Long'an, there is a local family which

² Information on the local ecological system comes from the baseline survey of the project in 2006.

knows the indigenous medicinal plants and their uses, but the knowledge can only be transferred to the smartest son in the young generation, other children are not allowed to know.

It seems logical that the common TK should be owned by the whole community. Right now, the recognition of ownership is quite vague for the farmers. For example, Qinghao, a kind of wild medicinal plant, was collected from the farmers at the price of 6 yuan/kg, but when sold at the medicine shop in Nanning city, the price labelled is 30 yuan/kg, 4 times increased. It is difficult for farmers to access the benefits, when they do not have recognition of their rights over GRs and TK. For specific TK, as it is owned by the clan/family system, other community members can be excluded from benefit sharing. Such customary ownership is strongly recognized and respected by the indigenous communities. Nowadays, there are still clans or families that hold such specialised medicinal knowledge in the village. Farmers from those clans or families provide traditional medical services for their neighbours and relatives. But usually the traditional medical knowledge can only be shared within their clans or families.

The conservation and transmission of PGR and TK in southwest China has been challenged during the transition period in China. Traditionally, they were transmitted generation by generation through customary practices and laws that ensured transmission; now they are transmitted and renewed mainly through PGR & TK utilization and innovation, combined with knowledge generated from innovative practices, such like PPB.

4.1.3 Customary law principles and worldviews

Holistic worldviews and spiritual beliefs are customary values relating to TK/biodiversity shared by many local communities. According to their holistic worldview, human beings and their living eco-systems are part of nature; tangible biological and genetic resources and intangible knowledge, practices and innovations are interlinked and interdependent with each other. Because of such integration, natural resources in local communities usually have certain spiritual meanings respected and feared by farmers. Human actions on exploitation of natural resources can thus be limited in a sustainable manner. One of the core ideas of traditional Chinese eco-cultural system is that the supreme state for human being is highly in harmony with nature. During the survey, we found that such traditional culture and spiritual values are still there especially in remote and ethnic group dwelling areas.

Specific customary laws vary widely between cultures and communities; but certain principles are commonly shared and could form the basic understanding for national and international policy making processes (Swiderska 2006). There are three key principles:

- Reciprocity: equal exchange in society and with nature;
- Duality: everything has a complementary opposite; traditional & western systems can be used;
- Equilibrium: balance/harmony in society and in nature.

These principles have a deep influence in local communities in southwest China. Although under the trend of modernization in rural China, farmers living in southwest China are still keeping part of their lifestyle in a traditional way, especially in the more remote villages. Because there is less influence from globalization and modernization, this leaves space for traditional and customary values.

4.2 Key threats to TK and Bio-cultural systems

4.2.1 Situation and trends in China

The genetic base for maize breeding in China has been dramatically reduced during the last 30 years. A new assessment has revealed that biodiversity loss is one of the big challenges for China to ensure future food security and sustainable agricultural development (Huang, 2003). In the national legal system, TK protection and enhancement are not included. In the study area, landraces and related TK in farmers' field are disappearing as a result of the spread of modern varieties with high yield.

China is one of the biodiversity rich countries of the world, and has played an important role in conserving biodiversity and related TK, at eco-system, species and genetic levels. For conservation of crop genetic resources, the Chinese government has put a lot of effort towards setting up interconnected and complementary systems at the national level, through for example integrating in situ and ex situ conservation, combining long-term and medium-term conservation, and linking national and provincial gene banks. By 2007, China had established 62 protected areas for in situ conservation of wild crop genetic resources, 12 national gene banks, and a national crop germplasm network which has been served by nearly 400 members from public research institutes and universities (Yang, 2007; Xue 2009).

4.2.2 Key threats to Genetic Resources and TK

The main threats to genetic diversity and TK are:

- globalization related modernization and urbanization;
- limited indigenous communities with reduced cultivated land, unstable and unclear land rights (a new national policy has commercialized land and legalized farmers' land transfer),
- institutional interventions on TK systems and customary laws (such as modern breeding technologies which have changed farmers' seed systems),
- farmers' migration for off-farm job, and
- increasing commercialization and globalization of GRs & TK products (which bring IPR tensions and ABS issues to be considered).

With farmers migrating out, transferring GRs & TK to new generations becomes difficult. More and more farmers have shown reduced interest in farming activities, and at the same time, the income structure has changed significantly. On average, the proportion of non-farming income has increased from about 15% in 1995 to about 45% in 2007, while, the traditional staple crop income have decreased from about 35% in 1995 to only 15% in 2007.

Crop genetic resources have experienced 15% annual rate of decline at national level (Zhang et al. 2010). In the case of maize, its landraces have decreased rapidly in the last decade. In Yunnan, many farmers changed most of their landraces to hybrids in 2005, because the landraces they used to plant cannot resist 'grey leaf spot disease'. Since then, more and more farmers rely on hybrids. In Guangxi, before 2002-2004, farmers living in mountain areas had a relatively independent seed system, defined in a CIMMYT impact study as 'farmer seed systems'; however after 2004, one of the hybrids, called 'Zheng Da 619', released from a Thai seed company, had taken place of local landraces gradually, with its high yield and lodging resistance. For most of the farmers, saving seeds after harvesting for next growing season is not necessary and not possible with hybrid varieties. Instead, they are always wandering around the seed market before planting to decide which variety they can choose for this season.

No doubt some customs have been changed by the change in seeds in the past 10 years. The loss of related TK and culture happened at the same time in SW villages, when farmers stop conserving their local varieties passed down from older generations. Hybrids bring high yield to farmers, but also bring risks for farmers' livelihood and local agro-biodiversity, because they are less genetically diverse and hence are less resilient under changing climate conditions. The most recent example in SW China is the well known big spring drought in 2010, which killed almost all the hybrid maize varieties, yet most of the landraces survived (Chen, 2010).

4.2.3 Analysis of Policy & Legislation

At international level, China ratified CBD in 1992, and as a member country, China has worked on PGR & TK conservation and ABS legislation and made lots of progress. At the same time, pushed by economic interests and trade pressures, China also joined UPOV in 1999 and became a WTO member country in 2001. This means that, under these competing international regimes, the domestic legislation framework has to balance the interests of diverse sectors and groups, in order to support sustainable development and social equity.

At national level, there is no special law on TK. However, discussions and reflections around PGR & TK protection and ABS mechanisms have gradually generated certain achievements. As discussed above, there are two competing trends on PGR & TK legislation – ABS supporters and IPR supporters; on the one hand, ABS supporters prefer to protect farmers' and communities' right over PGR & TK utilization through mechanisms such as Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT); on the other hand, IPR supporters work for an industrialised and individualised IP regime, which puts commonly shared PGR&TK under the threat of being patented and individualised. However, there is no clear-cut distinction between ABS supporters and IPR supporters, as in some cases, the latter can also work for farmers' right and benefit, such as proposed 'soft' IPRs (e.g. collective trademarks, copyright and Geographical Indications).

Our research has made some progress in new crop variety breeding and landrace conservation and collection, but challenges have emerged. For instance, the first participatory plant breeding variety, named "New Mexico 1" (produced in 2002), is a collective achievement of farmers, breeders and extensionists in terms of effort, knowledge, breeding materials and other inputs. Despite the collective nature of the innovation process, the variety can only be registered under a breeder or a formal breeding institute's name according to the existing new variety registration system known as the "Protection Regulation for New Plant Varieties" (PVP law in China, regulated by the Ministry of Agriculture since 1999). As such, it discourages farmer involvement

in the innovation process. Therefore, this needs to be addressed to enable equitable benefit-sharing and protection of farmers' rights at policy level.

The following is a list of China's PGR & TK related legislation and regulation.

- *Regulation on Plant New Variety Protection (RPNVP)*, enacted on Oct 1, 1997, by Ministry of Agriculture.

The Regulation brings Chinese PVP law into line with UPOV 78. This regulation can be seen as the preparation for joining UPOV. It defines an exclusive PBR but has left space for breeders' exemptions for research-oriented breeding, and farmers' privilege for storing and using farm-saved seeds or propagating materials. But farmers' varieties can hardly be registered due to their lack of uniformity and distinctness. Some part of the regulation is already compatible with UPOV 91, such as the requirement on novelty, distinctness, uniformity and stability (NDUS). The regulation focuses on the protection of new (modern) varieties, while limiting market space of local landraces.

- *Seed Law*, enacted in December 2000 by the National People's Congress of China

The Seed Law protects breeders' benefits and opens up a seed market for private entities. It states that any company compliant with the law can apply for a seed-breeding license and seed business license and can conduct seed production and management within the permitted region.

- Article 2 mentions 'conservation and use of germplasm resources'. Article 10 stipulates that the State has national sovereignty over plant genetic resources; therefore any institution and/or individual cannot provide germplasm resources to foreign institutions and/or individuals before obtaining approval from national authorities responsible for agriculture and forestry.
- Article 8 of the Seed Law requires that any institution and/or individual shall not possess or destroy germplasm resources, and the collection or farming of natural germplasm resources will not be allowed. Exemptions for scientific research or other special needs need approval from national or provincial authorities responsible for agriculture and forestry.

The Law leaves an unclear space for smallholder farmers' interest and farmers' right over their landraces. Other rules relating to seeds, germplasm and livestock are included in the box 1 below. These rules are largely designed for formal seed and livestock sectors and tend not to specifically address the needs of smallholder farmers.

Box 1. Rules on seed production, germplasm and livestock GR

- *Rules of Seeds-production and operation license systems*, enacted on Feb 26, 2001, by Ministry of Agriculture

Institutions or individuals that conduct multiplication on main crop seeds (such as rice, wheat, maize, cotton, rape, peanut and soybean) need a seed-production license. Entities applying for a seed-production license should be well qualified. Institutions or individuals applying for a license on main crops, must prepare 5 million Yuan as registration capital. Article 15 stipulates that: registration capital of applicants who combine selection with production and operation must be more than 30 million Yuan.

- *Rules for Multiplication of Main Food Crops*, enacted on Feb 26, 2001, by Ministry of Agriculture

Entities applying for a seed-production license should possess the following qualifications: selection or artificial improvement; distinction from existing varieties; genetic characteristics are relatively stable; morphological and biological characteristics are uniform; and appropriate denomination.

- *Rules for Management of Germplasm Resources of Agricultural Crops*, enacted on July 8, 2003, by Ministry of Agriculture

Works for strengthening protection, exchange and utilization of crop germplasm resources. It has standardized working mechanisms on identification, registration and conservation of agricultural germplasm resources; it has also regulated the process of importing germplasm resources.

- *Regulation Concerning Approval of Import and Export of Livestock Genetic Resources and International Collaborative Research Using Livestock Genetic Resources*, enacted in 2008, by the State Council

Article 7: Any institution or organization that intends to export livestock genetic resources included in the protection list shall submit an application together with the following documents: (a) contracts or grant agreements that may be signed for such export; and (b) documents that contain detailed benefit-sharing arrangements provided by the importer.

- *Outline of National Biological Species Resources Conservation and Utilization Plan* enacted in October 2007, by the State Council

Priority action 6: establish a legal system for the acquisition and benefit sharing of biological genetic resources and related TK.

- Priority project 1: Study the definition of TK, formulate a protection list for important TK with protection from its loss or misappropriation, and establish the protection system for biological resources and TK.
- Priority project 2: Study and establish a system for requiring the disclosure of origin of genetic resources in patent application.
- Priority project 3: Establish organizations for processing biological genetic resources and associated TK, and a mechanism of information exchange.
- Priority project 4: Study the construction of a protection database of biological genetic resources and TK, and formulate a protection list of genetic resources and relevant TK, through which communities/farmers' contribution on maintenance of those resources and knowledge can be formally recognized.

- *Outline of the National IP Strategy*, enacted on June 5, 2008, by the State Council

Aims to improve the protection, exploration and utilization of genetic resources, preventing the loss and misappropriation of genetic resources. Coordinate the relationship between protection, exploration and utilization of Genetic Resources, and establish a reasonable mechanism for Access to Genetic Resources and Benefit Sharing. Guarantee the rights of awareness and consent of the providers of Genetic Resources, including local communities and farmers.

- *National bio-diversity protection strategy and action plan*, enacted in 2009, by State Council

Aims to strengthen studies on the genetic resource administration system at national level, and establish relevant policies that are in conformity with national conditions. Besides the requirement of origin disclosure in patent application, there is also the requirement to follow the principle of prior informed consent (PIC), so that the benefits can be shared according to commonly determined articles (on principles), and guaranteed to resource providers, and the interests of vulnerable groups like local communities and minorities can be protected. At the same time, we should examine the establishment of special laws on biological resources; and introduce the system of certificate of origin of biological resources. We should strengthen the enforcement and custom inspections, combat illegal activities like smuggling of species, biological plagiarism and private export. Investigation, registration, documentation of TK and associated biological resources is needed, along with establishment of *sui generis* systems for TK protection.

- *The revised Patent Law*, enacted on October 1, 2009, by the National People's Congress of China

Article 5 stipulates that inventions or innovations using genetic resources in a way violating laws or regulations related to access to and use of genetic resources shall not be granted patents. Article 26 requires patent applicants to disclose the origin of genetic resources used in inventions or innovations. Patent law in China can only be used for protecting innovations or inventions at micro-organism and gene levels; not for protecting new plant and animal varieties. The latter can be protected by RPNVP, enacted in 1997. However, for varieties developed by farmers/communities, the protection system is not yet in place.

4.3 Responses based on customary laws & practices

4.3.1 Customary laws, decision-making and PIC

In southwest China, people in the communities with different nationality have different lifestyles, language and customary laws. In general, genetic resources and TK considered as common or public property are transferred between and within communities through village trade fairs, festivals, gatherings etc. Villagers are always willing to share these common TK with others, even outsiders. Yet, some specific TK that is clan/family-owned, can only be transferred through generations within clan/family system, e.g. special indigenous medicinal plants and their uses. Such customary "ownership" is very strongly respected by the indigenous people.

This implies that third parties should seek the collective consent of neighbouring communities for access to common TK and GRs, and for specific TK, they should seek the consent of the clan/family that holds the TK. The community decision-making process is dominated by the village committee, which is under the government political institutional system. Although this system is becoming more democratic, it still cannot fully represent the interests of farmers and local communities.

In the last few years, the PPB project has facilitated some ABS discussions involving public breeding institutes and PPB communities (some are natural village-based and some are farmer organizations). This can be seen as PIC and MAT exploration and experimentation at the project level. Finally in June 2010, two agreements have been signed formally between 3 formal institutes (2 breeding and 1 policy institution) and 10 farmer communities on rice and maize landrace conservation and utilization. This is a first step experiment and a breakthrough for PIC at local level in China. Since the agreements were signed, there have been more and more discussions and efforts at various levels to explore legal and practical PIC mechanisms for local level ABS for GRs and TK.

4.3.2 Development of Innovative local tools for protecting TK

At the project level, Participatory Plant Breeding (PPB) activities and NGO-supported niche market development have brought numerous changes for community and farmer PGR & TK management, practices and innovation. The following are actions and responses at community and project level, which can be seen as a platform for further utilizing and sharing benefits from PGR & TK.

- **Community based PGR & TK registration** and collection were started in project villages since 2005. Such activities have provided more opportunities for farmers to access diverse resources. For example, at the beginning, farmers collected wild medicinal plants and related TK only for documentation, after several seasons, they have planted those medicinal plants in their home gardens, for self-supply and farmer-to-farmer exchange. As a local response to the decreasing PGR & TK, this has strengthened genetic diversity and knowledge systems. Farmers can monitor their PGR & TK changes and react to these changes. The community-based GR & TK register is a computer database maintained by communities. Every August, farmers in the villages register and renew the GR & TK information after collection. The photos of GRs are saved in the database. The database is managed by farmer facilitators in the villages. Such databases also help communities educate their younger generations.
- **PPB activities** have been conducted for more than 10 years in Guangxi and about 3 years in Yunnan and Guizhou. The aim of PPB is to link the farmer seed system and formal seed systems in marginal southwest region. The PPB project has fostered germplasm exchange among public institutes, project villages and farmers' households. So far, more than 80 varieties have been used in PPB trials on station and in the field of the PPB villages. Based on eight years of experimentation, four farmer-preferred PPB varieties have been selected and released in the research villages. (We know from observations and anecdotal evidence that they also have spread beyond these villages.) In addition, five varieties from CIMMYT that were showing increasingly poor results have been adapted locally. Another five landraces from the trial villages have been improved thanks to the joint efforts of farmers and formal breeders. Agronomic traits, yields, taste, and palatability of all these varieties are satisfactory. They are also showing better adaptation to the local environment (CCAP, 2004; Song, Zhang Shihuan et al., 2006). At same time, more than 120 maize landraces have been collected from Yunnan, Guizhou and Guangxi by the public institutes for further biodiversity research and adaptation improvement. Poor farmers have also benefited from PPB varieties because they got seeds of each season for free. PPB has enhanced both the farmer seed system and formal seed system. For the farmer seed system, it has broadened seed access and exchange networks. For the formal seed system, the genetically diverse landraces can promote future breeding. PPB also builds up an interlinked team for ABS negotiation - as the varieties are developed jointly, both professional breeders and farmer breeders have rights to benefit sharing.
- In 2008, the project team started to **collaborate with a local NGO *Farmers' Friend (FF)*** for value adding to GRs and TK. The NGO, FF, follows Community Supporting Agriculture (CSA) approach and has supported a series of activities like organic restaurants, farmer markets, etc for urban and rural interaction and linkage. As a niche market, the restaurants brings confidence in PGR & TK back to farmers and consumers. Farmers' varieties, traditional processing skills and traditional farming knowledge have been encouraged through a supportive pricing mechanism. PGR & TK are thus transmitted among communities and consumers. In collaboration with the NGO we also encourage farmer associations working on organic food production. To differentiate with the certified organic food, the organic restaurant uses farmer-produced traditional organic food. Mutual trust is the basis for certification. To date, farmers from 5 PPB villages have sold their food products to the restaurants, such as rice (they accept landraces only), maize, vegetables, eggs, chickens etc., and the restaurant can only accept food without any chemical fertilizer and pesticide. Farmers have shown great interest in working with the restaurants, and this can help farmers integrate a traditional and organic farming strategy into their PPB/PVS (Plant Variety Selection) activities, and not only focus on variety selection, but also on daily on-farm management.

The communities' main concerns are value addition and recognition by the formal system. Farmers' awareness of ABS and IPR issues in the PPB process is still weak. They consider genetic resources and TK in seed

selection as common property and even feel proud to share with others, especially formal breeders. However, the local farmers are gradually realizing that their sharing principle is not practiced by all, especially not by profit oriented stakeholders. They are starting to realize the need for equal ABS, like farmers' free access to PPB varieties and other varieties, made with local germplasm and TK, for community seed production, landrace registration and documentation.

Farmers' own organization and community based management are essential for the enhancement of farmers' collective right and customary laws at local level and for their recognition by the state. Clear and systematic ABS agreements should be made between local communities and outsiders before and during collaboration such as PPB. Such agreements should respect customary laws and respond to the unique needs of indigenous and local communities. National laws for protection of new plant varieties and genetic resources should give full recognition to the rights of farmers rather than only formal plant breeders, as farmers are also breeders and important contributors of genetic resources/ TK.

Participatory Plant Breeding and Community Based Natural Resource Management offer opportunities for local genetic resource protection. These collaborative approaches through which the formal system stakeholders work with farmers are crucial for GR/TK protection and can bridge agro-biodiversity conservation and rural development by focusing not on crops and crop diversity per se, but on the farmers, their TK, skills and (adaptive) management practices which maintain and depend on agricultural biodiversity on-farm and off-farm. However, ABS issues need to be carefully addressed in this collaborative process. In addition, farmers' seed fairs offer ways through which farmers' seeds and TK could be further valued and exchanged amongst different communities; while local registers and community seed banks offer ways to record and collect genetic resources by local communities for improved local use and conservation.

To conclude briefly on the innovative tools developed at the project level, we will list those tools in three interlinked groups, i.e. protecting wild medicinal plants, adding value to traditional organic products, and conducting participatory plant breeding (PPB).

Around wild medicinal plants:

- PGR & TK registration and collection – local registers and community seed bank, documenting, recording and collecting genetic resources by local communities
- Farmers' seed fair through which farmers' seeds and TK can be further valued and exchanged with different communities.
- Farmer adopted medicinal plants in their home garden can also provide a platform for knowledge sharing and transmission at community level.

Around traditional organic products:

- Niche market development together with a local NGO and/or public institute – through which value can be added to PGR & TK with specific recognition of their biological and cultural values.
- Interaction with urban consumers – through which the value of PGR & TK can be introduced to consumers and integrated into diverse food systems. The linkages between traditional and organic farming have been defined by consumers and intermediaries, motivated by concerns over national food safety. This will provide more opportunities for PGR & TK products.
- Farmers' organization and network building can support mutual learning among farmers and communities. Farmers can thus get back their varieties and knowledge as well as their confidence through learning from each other.

Around PPB:

- Community-based seed registration and conservation – through which farmers get to know more information about varieties, including landraces, farmers' traditional varieties and modern hybrids. Based on such information and its annual renewal, farmers can plan for both landrace conservation and quality hybrid adoption.
- On-farm experiments and varietal selection – through which farmers and local communities recognize the values of their genetic resources and their TK and share them, in an appropriate way, with other communities and scientists through PPB and PVS – Participatory Variety Selection. This helps farmers to find and breed better adapted varieties.

- Community-based seed production – through which farmers can get monetary benefit from their seeds; and the farmer seed system can be enhanced, since it has been challenged by the industrialized and profit-driven hybrid seed systems for a long time.
- ABS discussion and contracting with public breeding institutes – which can be seen as the implementation of PIC and MAT at the project level. Both farmers and institutes have reached an ABS agreement at the project level, which regulates benefit sharing principles and working mechanisms in written form. These should be signed before accessing the crop germplasm of farmers.



5 CONCLUSIONS & RECOMMENDATIONS

It is clear from this study that genetic resources and traditional knowledge play a substantial role in the livelihoods of poor marginal farmers in SW China, but have declined rapidly over the last decade due to the adoption of hybrid varieties. Wild medicinal plants have also decreased rapidly in recent years. Hybrids bring high yield to farmers, but also bring risks for farmers' livelihoods and local agro-biodiversity, because they are less genetically diverse and hence less resilient under changing climate conditions. The study also shows the close inter-linkages between genetic resources, TK and cultural values, since related TK and culture was lost at the same time as farmers stopped conserving their local varieties; while older people and women are still conserving some traditional varieties for cultural reasons. The concept of collective bio-cultural heritage, which reflects these inter-linkages was useful for understanding complex TK systems and the different threats they face.

While customary values and laws have been eroded under the trend of modernization in rural China, principles of reciprocity, duality and equilibrium (ie. harmony with nature and equity in society), still have a deep influence in local communities in southwest China. Holistic worldviews and spiritual values relating to natural resources are still there especially in more remote, ethnic areas. Traditional knowledge and genetic resources are widely shared and viewed as common resources, except for 'special' TK which is held by families and clans and is not widely shared. Such customary custodianship should be reflected in mechanisms to protect TK (eg. through an emphasis on collective PIC and benefit-sharing). The formal village decision-making mechanism alone may not be sufficient to represent the interests of smallholder farmers in the PIC process.

The case study has revealed that the main constraints and threats for local livelihood and GRs & TK are limited cultivated land, unstable and unclear land right, continuous institutional interventions on the traditional knowledge system and customary laws, and increasing commercialization and globalization. Hence it's crucial to enhance the TK system and customary laws for protecting farmers and their communities' rights over local genetic resource and traditional knowledge. Our case study illustrated that farmers' own organisation and community based management provide the essential basis for the enhancement of farmers' collective right and customary laws at local level and for their recognition by the state subsequently. Although customary laws have been weakened, local norms for collective resource management are re-emerging with the creation and strengthening of farmers organisations (Report of project workshop in Burnham Beeches, 2009)

The study also shows that protection of farmers' rights and equitable benefit-sharing for the use of their genetic resources and TK are important to improve livelihoods, and generate incentives for conservation. PPB allows improved varieties to be developed whilst enhancing local genetic resources and TK rather than undermining them. It can provide improved varieties, free seeds and social recognition for farmers, as well as monetary benefits. PPB is also a vehicle for linking the previously separate formal and farmer seed systems so that the needs of poor farmers are better address and both systems can be strengthened. It has provided the entry point for raising farmer awareness of the value of their GRs and TK, and developing related activities such as community registers and farmer seed fairs, which have also the increased utilisation of threatened GRs & TK. At the same time, the organic restaurant provides a market and supportive pricing mechanism for GR & TK-based products. Furthermore, the Participatory Action Research approach has enhanced community based management of PGR & TK conservation and empowered smallholder farmers and their communities.

Based on our PPB experience our case study suggests that clear and systematic ABS agreements/contracts should be made between local communities and outsiders before collaboration. Such agreements should respect customary laws and respond to the unique needs of farmers and local communities. Meanwhile, national regulations and laws for the protection of new plant varieties and the conservation and utilization of genetic resources should give full recognition to the rights and interests of farmers, rather than only formal plant breeders, for an equal ABS. As farmers are also breeders, in the case of PPB, they are important contributors in terms of genetic resource and TK provision. There is continuous exchange between TK and scientific knowledge, and between local genetic resource and exotic materials in the domestication and cultivation process.

Much remains to be done in China to create a more conducive enabling environment for collaborative efforts that promote the sustainable use of biodiversity. Farmers have a key role to play in crop improvement and conservation (including of medicinal plants), and farmer-researcher collaboration can produce added value that farmers or researchers alone could never realize. Acknowledging and institutionalizing these two elements is important. In addition, there are other institutional issues to deal with. Farmers should be officially recognized as "co-authors" of new varieties. These informal plant breeders should be recognized and rewarded not only for the release of new varieties, but also for their contribution to the process leading to the final products (eg. improvement and conservation of genetic resources over generations).

6 WAYS FORWARD

After more than 10 years' work in SW China, we realize that, in the remote mountain areas, it is necessary to combine PGR & TK conservation with its innovative utilization, poverty alleviation, capacity building and niche market development. Both national and local governments need to support the sharing of benefits generated from PGR & TK with farmers. Our suggestions focus on the following aspects:

Enhancing farmer capacity for PGR & TK conservation

Genetic resources and traditional knowledge play a substantial role in small holder farmers' livelihoods; on the other hand, they also play important roles for national food security and sustainable development. The most effective way to conserve GR and TK is to better utilize them and improve them through utilization. PPB can be seen as one of these options. Other feasible options include: carrying out community-based registration, recognition and exhibition; encouraging knowledge sharing among farmers, farmer groups and communities; organising annual seed fairs for local seed exchange; supporting community-based agriculture planning towards progressive landrace conservation and new variety experimentation and adoption.

Strengthening farmers' knowledge and seed systems

Innovative practices based on traditions should be encouraged. Such knowledge and techniques delivered through farmer to farmer systems can help build up a decentralized knowledge exchange system, which sustains GR and TK, and their holders. Feasible options can be: monitoring and documenting local climate change and its influence on farming; helping farmers access their traditional varieties (from both in situ and gene banks); encouraging farmer improved varieties and community-based seed production; and facilitating public breeding institutes to work with farmers on both traditional varieties and new varieties.

Providing incentives for activities for conserving PGR & TK,

The most effective way of protecting PGR and related TK is to add more market value to these resources and knowledge, i.e. conserving through use. However, small farmers lack the ability to compete with industrialized partners, thus, it is necessary for third parties (such as NGO and public institutes) to support small farmers (and their groups) and their PGR & TK products to reach local niche markets and consumers. Feasible options can be: setting up contracts or agreements among PPB participants in community seed production; adding value to local specialised products /resources, funding traditional organic farming and niche organic markets; and formally recognizing farmers and formal breeders' contribution to conserving and improving landraces in situ and ex situ.

Collaboration with public R&D institutes towards PGR & TK conservation, in terms of public value recovery and enhancement

In order to better utilize GR & TK and to empower farmers and their communities, it is urgent to improve public agricultural R&D, especially towards remote small-holder farmers. The formal R&D sector cannot continue to be separate from farmers' needs and interests. Such a utilization process should involve farmers' participation and feedback. Feasible options can be: inviting public researchers and public institutes to join in the work, defining common interests of stakeholders, facilitating stakeholders' access to PGR & TK and ensuring equitable and transparent benefit sharing during the processes; and improving evaluation criteria of public researchers and institutes (through which public service and research delivered by researchers and institutes can be formally measured and evaluated).

Influencing PGR & TK related policies and legislation:

In particular, revising current PVP law in China and leaving space for small holder farmers and their varieties and PPB practices; and fostering TK and ABS legislation which can represent the cultural value of PGR products and can help guide ABS negotiations and processes. During use of GR and TK, we need to recognize the contributions from smallholder farmers and their communities. Such recognition should be reflected in policy-making and legislative processes. It is important to develop ABS related policy and legislation towards appropriate recognition of GRs and related TK, and their holders as well.

Further Exploration and legalizing PIC practices for a fair ABS

The Chinese government has recognized the need for two-tier PIC - national and local level. For the local part, more efforts are needed to explore appropriate PIC principles and protocols for different targets in different contexts in China. The two agreements reached between formal institutes and PPB communities could serve as the basis and starting point for further exploration and experimentation.

Supporting the development of farmer groups / organizations:

This can be done through capacity building and on-farm experiments, to bring livelihood and conservation benefits for farmers, while also helping to promote positive changes in policy.

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