



Case Study:

Agroforestry in Northwest Yunnan: Converting Productive Agricultural Lands to Productive Forest Cover

Organization: ICRAF

Country: China

Cite As:

Buck, L.E. 2009. Agroforestry in NW Yunnan. Conservation Bridge Case Study No. 03. Cornell University, Ithaca, NY. 13 p., with documentary video. Available at

URL:

<http://www.conservationbridge.org/casestudy/agroforestry-in-northwest-yunnan/>

This case study was funded by the USDA CSREES
Higher Education Challenge Grants Program





Introduction

Xu and Zhou felt relaxed and hopeful in one another's company as they pulled their Isuzu pickup to the side of the road. They alit from the vehicle to absorb an expansive view into a familiar catchment of the 42 sq km watershed in Yangliu Township of Baoshan Prefecture in Yunnan Province where they had worked together during the past six years.

The landscape pattern pleased them, comprised of diverse species of trees in a variety of configurations interspersed throughout the patchwork of different crop fields on the terraced slopes above and below. From their well appointed perch three of the five local villages that comprise the predominant administrative village of the area were visible, and they could make out villagers and some of their livestock moving along the well worn pathways and small irrigation canals to and from their fields of wheat, rice, tobacco, corn, potatoes and beans. And thanks, now, to their joint efforts, small orchards of walnut and pear trees intercropped with native medicinal plants were beginning to comprise part of the pattern. As they tilted back their heads to take in the higher elevations, the natural vegetation of pine and alder species became visible, as well as the eucalyptus trees that had been promoted and planted through the National Forest Protection Program (NFPP) and the Sloping Land Conversion Program (SLCP).





The two plant experts took a moment to express words of appreciation for the collegial and productive partnership they had forged in their efforts to join the expertise and the mandates of ICRAF-China and the Baoshan Forestry Bureau. They had to grin at the irony that they were becoming respected, now, as holders of expertise in participatory community development. Zhou admitted to Hu that it would have been impossible to imagine, just a few years ago, that working knowledge about rural livelihoods would be instrumental to his effectiveness as a forester. Nor could either of them consider a future for the project, now, that was not founded on continuing to better understand relationships between how people satisfy their livelihood requirements, and the integrity of the ecosystem that their livelihoods depend upon. It was easy to confirm that this they had learned.

As the men returned to the truck and began making their way down the steep incline to the village below, where they knew that the village leader would be waiting to greet them, they quickly reviewed how they would explain the purpose of their visit. They had come from their offices in the city to the watershed, today, to begin laying the groundwork for an external evaluation of ICRAF-China's project on *medicinal plants to support Sloping Lands Conversion Program (SLCP)* implementation in Baoshan that was anticipated to commence within in the coming year. They sought informally to review progress in the project to help them in recommending evaluators and preparing terms of reference that would ensure as productive and useful an evaluation as possible. After all, it was going to cost the project a considerable sum of money, and villagers would need to invest an appreciable amount of time showing the evaluation team about and answering their questions. So it had best be designed with deliberation, to help the project advance its long term goals. The pair was not concerned about securing the cooperation of village leadership; confidence in the mutuality of their objectives had long since been established. Their aim, rather, was to secure the insights of people in the project area in designing an evaluation process that would continue to advance the learning and the productive outcomes that the project had set in motion.

Before they reached the village leader's home, the botanist and forester had re-confirmed their interest in spending the afternoon reviewing how the project had affected people in the watershed in the past six years, and noting any vulnerabilities that the project should address. And as always, they would keep before them the all-important and vexing question of whether and how what had been accomplished so far could be sustained, and how it might be scaled it up beyond the pilot watershed, to have impact, ultimately, at Provincial level and beyond.



Context and Setting: Sloping Lands in Yunnan Province



Commonly referred to as the “Roof of Southeast Asia,” Yunnan Province of China is known for its mountainous terrain rich in ecological and cultural diversity. Yunnan is home to over 45 million rural people who comprise 25 different indigenous ethnic minority groups, each exhibiting its unique culture and agriculture. Much of the Province lies some 3000 meters above sea level. It contains the headwaters of six major rivers.

While a comparatively rural and ‘outlying’ Province, Yunnan has become an area of prime interest to the central Chinese government owing to the legendary hydrological instability of the Yangtze and Yellow Rivers, and the massive soil erosion, siltation and flooding that they generate. These processes impair the livelihoods of citizens on a visible and dramatic scale, thus considerable government effort is warranted to manage and control them.

The Chinese government created the Sloping Lands Conversion Program (SLCP), also known as the ‘Grains for Greens’ program, as the largest scale afforestation program ever to be implemented in China. The SLCP provides farmers grain and cash subsidies



to reforest farmland; targeting marginal lands, particularly those with slopes greater than 25 degrees. Although the program was created to address the hydrological instability of the Yangtze and Yellow Rivers, it has spread far beyond this area to encompass more than 750,000 hectares of cropland. The farm to forest conversion process is anticipated to cause extreme negative effects on the livelihoods of over 10 million inhabitants in China, and to disrupt the heart of indigenous farmland in Yunnan (ref needed). The program has been criticized for employing a top-down approach to conservation with little input from the local communities which it will affect, and little room for decentralization of administrative procedures.

The SLCP demands the planting of just a handful of species, which often are difficult to incorporate into the ecologically complex and culturally diverse provinces of China, where foresters and farmers have different species preferences. Furthermore, the SLCP does not allow for intercropping of annual crops while the trees are still young and fruits and nuts are not yet mature enough to harvest and sell. Many farmers are eager for the opportunity to gain cash compensation and free or subsidized seedlings; however, the monetary reward lasts for no more than five years beyond implementation. Farmers then must search for alternative means of livelihood as their farmland gives way to plantation forest.

The Innovation – An agroforestry alternative to afforestation

In 2002, ICRAF-China initiated a partnership with Baoshan Forestry Bureau to overcome shortcomings of the SLCP approach to reforestation through the use of agroforestry (see Box 1). The two organizations aimed to develop agroforestry practices with high value trees and medicinal plants as an alternative means of implementing SLCP in Baoshan. The agroforestry alternative would enable farmers to generate income from forest lands while their trees are growing. Although intercropping with annual crops is not permitted in the SLCP, perennial medicinal plants could be inter-planted while farmers waited for pear and walnut trees to bear fruit. In addition to its potential benefits within the SLCP, the project aimed to contribute to the sustainable use and income generation potential of wild medicinal plants through their domestication.

ICRAF-China enjoined the Forestry Bureau to employ both a participatory and a scientific approach to developing viable agroforestry systems in the pilot area. While forestry officials initially met ICRAF with skepticism, within a short time they were 'won over' not only by the agroforestry approach to land use in the area, but also by the method used to design and develop agroforestry systems. The effectiveness of the systematic, scientific process of engaging farmers in the selection of species and development of management methods was self-evident.

ICRAF-China employed a Participatory Technology Development (PTD) approach to incorporating non-timber forest products into forest restoration in Yunnan. Xu and Zhou and their collaborators found PTD to be a useful approach to researching appropriate



agroforestry management in Yunnan, and a successful means of farmer empowerment. It was applied to increase the likelihood that technologies developed for resource poor households would be adopted, by maximizing the use of indigenous technical knowledge (ITK) through local participation. The experiment in collaboration that took place between foresters, farmers, and ICRAF was conducted in a rural village of Yunnan with an ultimate aim to create a “balanced, multifunctional, mountain landscapes that can provide local people with satisfactory livelihoods and environmental services downstream.”

Box 1. Agroforestry

Agroforestry is a system of farming that combines trees and shrubs with crops and/or livestock (World Agroforestry Center)
(http://www.worldagroforestry.org/eca/downloads/ECA_Strategic_Plan.pdf).

The intentional integration of trees, animals and crops can conserve, protect and rehabilitate soil, water and vegetation resources. Documented benefits from agroforestry practices include increased production, improved water and soil quality, biodiversity conservation, land use efficiency, improved habitat for both humans and wildlife, and diversified sources of income (Buck et al., 2000; Attra, (<http://attra.ncat.org/atrapub/agroforestry.html>)). Agroforestry also can reduce poverty and hunger. (http://www.worldagroforestry.org/eca/downloads/ECA_Strategic_Plan.pdf).

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http://www.worldagroforestry.org/eca/downloads/ECA_Strategic_Plan.pdf

<http://www.unl.edu/nac/afnotes/ff-1/>

(http://www.worldagroforestry.org/eca/downloads/ECA_Strategic_Plan.pdf)

(<http://attra.ncat.org/attra-pub/agroforestry.html> - "Agroforestry Overview")

<http://www.centerforagroforestry.org/practices/rb.asp>

ICRAF-China implemented the PTD process through the following six steps:

1. **Getting started:** Engaging all stakeholders in understanding the current situation and the consequences of SLCP implementation, and agreeing on steps for PTD.
2. **Looking for things to try:** Inventorying indigenous knowledge, developing lists of useful plants, collecting and identifying plant specimens, scoring, ranking and selecting promising medicinal plants for cultivation.



3. Designing experiments: Drawing up participatory research plan by voluntary farmer innovators, local foresters and scientific team from ICRAF.

4. Trying things out: Farmer innovators carry out on-farm experiments in SLCP areas, monitoring and documenting species performance under different treatments.

5. Sharing results: Farmers 'field school' supported by forest extension workers becomes important focal point in watershed for exchanging experiences and results, and generating new ideas to try.

6. Keeping up the process: Project team negotiates with local government officials of the SLCP to allow intercropping with medicinal plants on experimental basis, and in process SLCP become supportive of bottom up approach to integrated conservation and development in mountain regions.

The PTD approach is further elaborated in Jun He et al., 2009.





Box 2. Indigenous Technical Knowledge (ITK)

ITK is the practical knowledge that people in a given locality, community, and culture have developed and improved over time, often over many generations, and continue to develop (Kumar, date). ITK is dynamic and changes in response to circumstances, both internal and external, as well as social and biophysical (Mwhale, date). It is based on experience as well as experiment, often tested over a long period of time and implementation, and adopted to local culture, tradition and environment. The goals and environment of a given community help create and determine its ITK. For any community to survive and endure it must adapt to changes in its environment, and procure, develop and improve its methods and strategies of extracting and using what it needs from the available natural resources. In so doing, it develops its unique body of ITK (Argawal).

Sources of ITK include community members, particularly the "elders", farmers, writings, painting, carvings, songs, poetry, other people living and working in the community, and secondary sources such as photographs, databases, videos, publications, and exhibits in museums Indigenous Technical Knowledge encompasses a wide spectrum of subject matter including water, soil, wind, erosion, tillage, farming/harvest and farm equipment, cropping, pests and disease management, fuel management, fish and fisheries, agroforestry, land and natural resource management, biodiversity conservation, animals and animal products preservation and management, waste management, and rural development in developing countries, and more. ITK can improve sustainability and conservation because local people know what, how and when to plant, as well as how to manage, maintain, use and control their plants/crops/products and resources (Kumar).

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Implementing the PTD

In the initial stages of implementation, ICRAF officials worked with key stakeholders to agree on the principle that the “farmers come first.” PTD would be a means to benefit farmers and provide options for more sustainable livelihoods.

The pilot initiative took place in a small watershed of the Salween River in the Yangliu Township, known for steep sloping lands and consisting of one administrative village called Pingzhang which encompassed five nature villages populated by both Yi and Bai



people. When the PDT process was initiated the SLCP had lead to the afforestation of 235 hectares of cropland, about 25% of the area, and working toward reaching its goal of 1059 hectares. The PTD process lead to the selection of pear and walnut as upper story trees, and seven native medicinal species to subject to on-farm testing based on growth rate, management requirements and income generation criteria that the PDT team had established.

Lessons learned from the PTD

One species stood out as a super species for extension, *Dipsacus daliensis*, needing only one and a half years to grow before harvest, with limited labor required for maintenance, and unproblematic seed germination. Another finding from the pilot activity was that the system of self-learning and reflection in monitoring and evaluation; the extensive exchange between farmers, other experimenters, ethnics groups, and neighbors through the process of species selection lead to the spread of new ideas about production and marketing. Furthermore, it was possible to negotiate with local SLCP officials not only to tolerate but also to promote the ongoing experimentation on medicinal plants as bed covers at both the pilot and extension levels (Jun He et al., 2009, see footnote #3).

The economic benefits to farmers from the initial trial's super plant, *Dipsacus daliensis*, provided immense incentive for farmers to expand its cultivation into other areas. As they did so, the average production per land area quickly doubled, then quadrupled, thus motivating farmers to form and join medicinal marketing associations to help ensure cash income from their plants.

The PTD experience unleashed enormous local interest and knowledge about non-timber forest products (NTFPs), and the potential for expanding NTFP domestication, certification and marketing as another source of income. It was discovered in particular that the improved management of wild mushrooms was highly valuable to collectors, and that they were responsive to management interventions that controlled access and responsibility for regeneration. ICRAF-China is working to tap into global markets for certified NTFPs to help further advance the development of this sector.



Box 3. Non-timber Forest Products – NTFPs

NTFPs are defined as all non-timber vegetation found in forests and agroforestry environments which may potentially have some commercial use or value (Jones). <http://www.ifcae.org/ntfp/about/index.html>). They are products that do not require the harvesting of trees to obtain. NTFPs include medicinal plants and materials, vines, oil, seeds, nuts, syrup, sap, wild flowers, edible fungus, herbs, spices, food, wild vegetables and fruit, poultry, livestock, bamboo, rattan, aromatics and weaving materials (<http://www.inbar.int/show.asp?BoardID=171&NewsID=519>). NTFPs are used for fuel, food, medicine, decoration, and spirituality.

NTFPs offer potential solutions to trade-offs between forest conservation, economic development and livelihood security, especially in remote rural areas where large proportions of people depend on local forest and timber resources (Stark et al.). The realization of this ideal for NTFPs requires that effective systems of community property and collective NTFP management be in place to distribute the benefits fairly, and to avoid overexploitation and exhaustion of the resources (Brown et al., 2007). Gaps in knowledge, misunderstandings and miscommunication, under-developed market mechanisms, difficulties in creating goals that are acceptable to multiple parties concerned, inadequate enabling legislation, and unfair resource distribution mechanisms must be overcome (Stark et al.,; Shmatkov).

Domesticating NTFPs by producing them in agroforestry systems may be a pathway to their sustainable development and management (Leakey et al.). Linking NTFP development to eco-tourism can enhance the value of both (Plotkin, and Famolare, 1992).

Successful NTFP development and utilization is evident in Northeast China where farmers raise deer and frogs and grow edible fungus and ginseng, and in South China where they grow wild fruits, vegetables, flowers, medicinal plants, bamboos and rattans. These practices have led to forest conservation, rural development, and income generation for the local communities. China also produces 70% of the world's edible fungus and has the largest bamboo industry in the world.

Waiting for Agroforestry – Livelihoods in Transition

As the Baoshan Forestry Bureau became familiar with the livelihood issues facing villagers in its Prefecture through participating in the PTD activities, it recognized other resources that it could bring to bear on the welfare of villagers while they waited for their agroforestry systems to mature. Tied to an overarching goal of ecosystem restoration, the Bureau initiated three additional activities to help improve income for villagers while also improving their awareness of ecosystem and forest protection: 1)



planting timber trees for income, 2) teaching new techniques for producing cash crops and forage plants for pigs and chickens, and 3) organizing women groups to market their products outside the region. These activities lead to partnerships with other government departments which in turn have led to assistance with biogas installations and small water development initiatives in the area.

Furthermore, as part of its efforts to support 'livelihood transitions', ICRAF-China worked with the Heifer Project International (HPI) to develop a project with the Baoshan Animal Husbandry Bureau that combined training with HPI's 'passing the gift' approach to household livestock development. ICRAF recognized animal husbandry as an important means of diversifying income for households during their transition time from agriculture to forestry and agroforestry. Through the project, an appreciable number of households in Baoshan received livestock gifts and will continue passing them on to that many others. The project also provides training to enable households to deal with common diseases, and it includes a gender component to encourage women to participate in the livestock rearing activity.

Highlights from the Field

As Xu and Zhou spoke throughout their visit with leaders of local villages, people who have benefited directly from the project, and people who are familiar with the project and expect to benefit someday, they gathered useful insight about how the efforts have been perceived. The men clustered comments they heard into two groups: 1) factors that have contributed to the characteristics and success of the project, and 2) benefits that the project has generated.

Ingredients of Success

- The project embodies leadership, organization and vision. It addresses a compelling issue, and has developed a successful production technology with viable market prospects. It has mobilized multiple sources of government support, and has demonstrated the government Departments are open to change that is beneficial to communities. Like projects in general tend to do, this one has 'bought time' to suspend normal reality and try something new.
- The project has mobilized volunteer participation, which has become infectious. Now everyone wants to be involved because they like the training they receive and the other people working with NTFP trees, And they are making more money from the walnuts.
- The project is built on the bedrock of indigenous knowledge and indigenous plants.
- Farmers are engaged in learning about walnut production and benefiting from it. Experts teach about walnut management through farmer field schools and in farmer fields. All farmers come to the school, 200-400 farmers for each Administrative village, 4x/year, so each 3 months at least 200 farmers attend. The majority of households now have walnut trees, some only 1-2, some have 100+. All of the farmers recognize this as part of the national SLCP. Some farmers participate because it's the least bad alternative, but most because they really



want the trees. Baoshan factory will buy all the walnuts they produce.

- ICRAF provides high quality tea seedlings and some timber trees to intercrop with the tea. Both grow faster than conventional plants do. Before ICRAF, growing tea in the region generated little income, and there was no technical support for tea-growing
- ICRAF facilitates farmer exchanges. It takes leaders of local (Nature) villages outside of their villages to generate awareness about environmental issues, and to have regular meetings among people who travel.
- ICRAF has been able to take some of its government partners to Thailand and to other places to learn. Government has contributed human resources in the form of staff support and training that is responsive to the needs of the village, using participatory training methods. ICRAF has promoted good communication; there is a lot now among technicians and local people so it is possible to combine village experience with technical knowledge. Technical people go out to visit so they can learn and pass knowledge along. ICRAF also has made improvements in government office equipment, computers, and privacy.

Livelihood benefits

- There is a new awareness about ways to improve local livelihoods, and more good trees.
- Biomass from pig manure allows for electric cookers in household kitchens. This frees up women from fuel wood collecting, and reduces ecological pressure from overharvesting. .
- Living standards have improved. There is more income and income sources now, and also more social activities, better feeding of animals including more variety of feed, more organic fertilizer from animals, and better fertility for crops.
- Wholesalers and retailers now come to the village to buy certified medicinal products. Often medicine doctors come directly to buy, through connections made by ICRAF.
- For walnuts, wholesalers now come to Baoshan to crack and buy the nuts.
- Three households finished biogas installations last year; now 80% of their energy use is from biogas for cooking and lighting, and only 20% of use is firewood, for heating.
- Thanks to ICRAF funds and Baoshan technical support, of the 33 households in one village, 21 have greenhouses. This improves living standards; people consume more vegetables and sell some.
- The benefits of the project, in this order, are: improved water reservoir and pipe, vegetables grown in greenhouses, cash crops, more livestock. Having enough to eat and cook are no problem now. Also, before the project, no one came to village meetings when called, now everyone comes because the benefits are so positive.
- Biogas saves a lot of time and labor for women to enjoy a social life; sewing, dancing, and more relaxation. Hygiene is improved; both animal and human waste go into the biogas system, and after gas is created for HH cooking, leftover compost goes to fields to fertilize. This waste is used also to fertilize the grass for pig food. This has changed conditions of living and hygiene.



Moving Forward

The livelihood benefits to villagers from the presence in the area of ICRAF-China and the Baoshan Forest Bureau are notable, and seem destined to grow. Furthermore, the way that external organizations intervene to deliver rural development benefits has changed in ways that seem likely to continue to be responsive to local needs.

The broad questions that the ICRAF – Baoshan Forest Bureau project evaluators will need to contend with are two-fold: 1) How can the livelihood benefits reach more people, and the needed interventions be sustained? and 2) How can the ultimate benefits to ecosystem integrity be assured?