



Local impacts and responses to regional forest conservation and rehabilitation programs in China's northwest Yunnan province

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Abstract

Drawing on case studies carried out in the upper watersheds of the Mekong and Salween Rivers in northwest Yunnan Province, this paper examines two of China's nascent national, large-scale forestry programs: the Sloping Land Conversion Program (SLCP) and the National Forest Protection Program (NFPP). It identifies their impacts on rural communities and local line agencies, as well as preliminary community and agency responses to the programs. The paper argues that as well-intentioned as the programs are, they fail to accomplish the envisaged goal of mitigating erosion and surface flow in upper watersheds and subsequently having a positive impact in flood plains and preventing floods. In addition, it also reveals some of the negative impacts on livelihoods of mountain communities, their environment and overall agro-biodiversity. Priority issues associated with SLCP and NFPP implementation arising from the case studies are also highlighted. The case studies suggest that more extensive program piloting and experimentation is required before forest conservation activities are scaled up.

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Keywords: China; Yunnan; Sloping land conversion program; Forest rehabilitation; Watershed protection; Payments for environmental services

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1. Introduction: forest conservation and rehabilitation in a broader context

More than half a century of severe deforestation in East and Southeast Asia, coupled with growing public environmental awareness, has prompted consensus among governments throughout the region on the need to conserve and rehabilitate forests. Policy responses thus far have comprised a mix of large-scale regulatory measures – in particular logging bans, such as China’s Natural Forest Protection Program (NFPP) – and reforestation efforts to maintain and restore national forest stocks. Logging bans have been inadequate as a tool for forest conservation region wide (Durst et al., 2001), and reforestation programs on barren land and through forest conversion have also had mixed success (CIFOR REHAB, 2003). As described in this paper, when logging bans and reforestation programs are implemented in tandem, their shortcomings are often magnified, with strict limits on production restraining commercial, community, and individual incentives to invest in forests.

As payment schemes for environmental services become a topic of greater interest, both globally (Landell-Mills and Porras, 2002; Scherr et al., 2003) and in Asia (RUPES, 2003), China’s preliminary experience with the Sloped Land Conversion Program (SLCP) serves as one among a growing number of examples illustrating the need to explore ways to integrate regional or national conservation initiatives with local priorities (WRI, 2003), and the need for greater local input into and local discretion over forest management (Dupar and Badenoch, 2002; Ribot, 2002).

This paper is based on two case studies of the implementation of the SLCP in the context of the NFPP. The case studies describe farmers’ assessments of the program and its impact on livelihoods, as well as the range of factors influencing the specific ways the program has been implemented by local forestry agencies and issues of concern to them. The objective of the paper is to highlight lessons learned through these case studies which are of relevance to similar environmental payment schemes elsewhere. The case studies highlight the need for linking monitoring metrics to program objectives rather than program implementation, and for more extensive program piloting and experimentation before forest conservation activities are scaled up.

2. Northwest Yunnan’s natural resources

Northwest Yunnan, covering an area of 6,671,985 hectares (ha), is often referred to as the “Three Rivers Area” because the Salween (Nu Jiang), Mekong (Lancang Jiang), and upper reaches of the Yangtze (Jinsha Jiang) rivers flow at close distance within its boundaries, creating a unique vertical alignment and distribution of mountain agro-ecosystems (see Figs. 1 and 2). These rivers originate high on the Qinghai-Tibet Plateau and provide year-round water supply for upland and lowland agricultural areas. The Mekong and Salween are important not only for Yunnan and China but also for the whole of mainland Southeast Asia, providing watershed services for millions of people.

In the upper zones of the watersheds, alpine and sub-alpine vegetation consists of diverse forest types, distributed among several vertical montane zones at different

Schematic Distribution of Agro-eco and Forest Zones in Northwest Yunnan

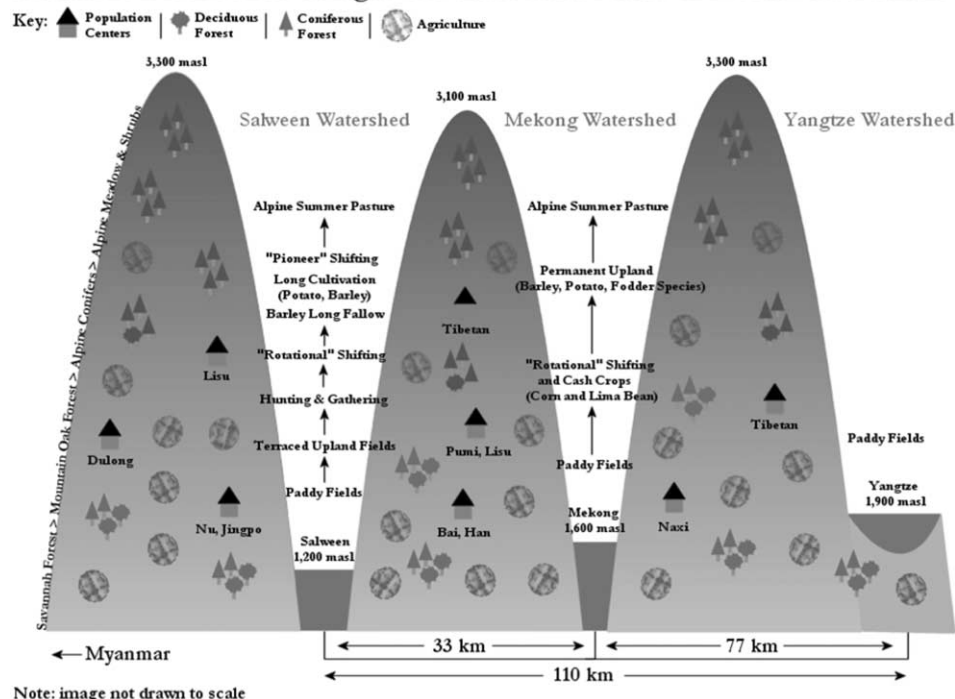


Fig. 2. Schematic transect of Salween-Mekong-Yangze watersheds in NW Yunnan (see also Fig. 1).

altitudes. Alpine ecosystems are found at higher elevations up to 6500 meters above sea level (m.a.s.l.), alpine heath and meadows at 3800–4800 m.a.s.l., alpine conifers at 3000–3800 m.a.s.l., deciduous forests at 2600–3900 m.a.s.l., and unique oak forests with high commercial value on the north-facing slopes at 3000–4000 m.a.s.l. Lower ranges are covered by a mix of valuable species, such as the Yew tree (*Taxus yunnanensis*, *T. wallichiana*) and Douglas fir (*Pseudotsuga* spp.), in addition to riparian forests at lower altitudes.

Forests account for more than 60% of the land area of northwest Yunnan. These mountain watersheds harbour great biological and cultural diversity, and the region is one of a select few recognized as both a Global Biodiversity Hotspot and Global 200 Priority Ecoregion. The area has recently been declared a World Natural and Cultural Heritage site.

Historically, in the lower areas of the watershed, from the river level (between 1200 and 1900 m.a.s.l.) up to mid-level elevations (~2500 m.a.s.l.), agriculture – including various forms of swidden as well as sedentary agriculture (Yin, 2001) – once created a diverse landscape mosaic. However, population pressure and agricultural expansion – often aided by the extreme pro-cultivation policies of the Maoist era – have led to a decrease in tree cover on lower slopes and have opened up marginal land, often on steep slopes.

Northwest Yunnan is home to more than 15 officially recognized ethnic groups. Traditional livelihood strategies vary from hunting and gathering, fishing, transhumant grazing, and shifting cultivation to intensive permaculture and long-distance trade. In recent years, mountain communities have experienced rapid changes in their livelihoods, knowledge resources, and economies. Among the most powerful contemporary forces that influence both local cultures and biodiversity are various government policies, migration, development, and the emergence of either overregulated or unregulated markets (see Xu and Wilkes, 2004). These forces produce both positive and negative impacts on local biological and socio-economic systems.

Yunnan's population has grown from approximately 10 million in the early 1900s, to about 43.3 million in 2002 (Yunnan Statistics Department, 2003). Increased consumption of food, energy, building materials, and subsequent land conversion have resulted in widespread conversion of forest to agricultural uses and livestock grazing during the last 50 years. These changes, in turn, have placed high stress on fragile ecosystems and their unique flora and fauna. Tourism-related infrastructure development has resulted in habitat loss, fragmentation, and degradation of remaining forests. Market-driven pressure on biological resources have led to the over-collection of non-timber forest products, such as the wild mushroom Matsutake (*Tricholoma matsutake*) and the bark and leaves of the Yew tree (*Taxus wallichiana*). By the late 1990s timber extraction was among the most important sources of villagers' income and local governments' tax revenue (Zhao et al., 2001).

By the turn of the century, national and provincial policy documents made clear that excessive timber extraction in upland areas was seen as a primary cause of soil erosion (e.g. Li, 2001). Frequent flash floods and landslides are often cited as indicators of the deteriorating environment and linked to deforestation (ibid.). One government source, based on calculations from remote sensing data, states that 52% and 38% of the land area of the Salween and Mekong watersheds respectively is subject to soil erosion (YNPAEMS, 2001). Despite scientific evidence suggesting that deforestation does not have unequivocal impacts on soil erosion, infiltration rates or on the quality and quantity of hydrological flows (see for example Hamilton, 1988; Hamilton and Pearce, 1988; and Bruijnzeel, 2004), the links between deforestation in upland areas and soil erosion have been accepted as the basis for policies and programs in China.

3. Recent innovations in rural resources policy

The years 1998–2000 saw the announcement of the most significant changes in China's forest and land resource tenure since the market-oriented reforms of the early 1980s. Funded as part of the Special Provision for the Development of Western China (*Xibu Da Kaifa*), the government announced:

- a ban on all logging in the upper reaches of the Yangtze and Yellow Rivers, under what is known as the Natural Forest Protection Program (*tianranlin baohu gongcheng*), and

- a program to prevent cultivation on all slopes over 25°, known as the Sloping Land Conversion Program (*tuieng huanlin huancao zhengce*).

Many previous forest and land tenure agreements were nullified or superseded by these new policies.

Following disastrous flooding along the Yangtze River in 1998, the Chinese central government has increasingly valued natural forests for watershed protection. In 2000, the government declared a ban on logging in natural forests (Zhao et al., 2001), as part of the NFPP. The NFPP's inception actually dates back to the 1970s and 1980s, when the Chinese government developed shelterbelt afforestation programs along major watersheds. In the 1980s, a logging quota system was introduced in response to huge increases in national wood consumption. These measures increased overall forest cover to 14%. However, increased forest coverage comprised mostly young trees planted in single-species plantations, and overall timber volume and biodiversity did not increase. Logging in mature forests continued, and, as timber volumes declined, many state-run logging enterprises began to face financial crises. Thus, in addition to the goal of reducing soil erosion to prevent a repeat of the 1998 floods, the NFPP has important implications for the restructuring of the forestry industry.

In addition to the ban on logging, the Chinese government has prohibited large-scale clearing of remaining primary and secondary forest on sloping lands. The SLCP was introduced to promote the conversion of arable land subject to soil and water erosion to forest or grassland. The SLCP also has promotion of poverty alleviation as one of its explicit goals (State Council, 2000). The assumption is that following conversion of marginal lands, more labour would be available for engagement in off-farm employment.

Although this paper focuses on the SLCP, the SLCP and NFPP are, in fact, inter-related. The NFPP was introduced as a one-off logging ban in 2000; the SLCP is an ongoing program of land conversion. Because of the SLCP's orientation around upland reforestation, however, the NFPP does affect SLCP implementation, and the impacts of these two policies must often be treated together. As the remainder of this paper will show, these policies have met with mixed responses from local communities and forestry agencies.

3.1. The natural forest protection program

In December 2000 the State Forest Administration announced that the State Council had approved a plan for protecting natural forests and increasing forest cover nationwide. Over 10 years, the government plans to invest 100 billion yuan in the program, mostly from central government funds. Logging will be reduced, and a logging ban has been implemented in 60 million ha along the upper reaches of the Yangtze River and the upper and middle reaches of the Yellow River. There are also plans to plant 8.6 million ha of forest. This would increase China's forest cover from 17.5% to over 21%. In many areas of southwest China, logging quotas have been reduced to zero, enterprises shut down, and timber shipments stopped. Around

one million state-owned logging enterprise workers face redundancy. Between 1998 and 2001, 10 million yuan (US\$1 = 8.2 yuan) was invested in the logging ban program. Much of this was spent on turning former loggers into tree planters and forest guards, and on maintaining their social security and retirement funds. Another large portion of this money was spent on fiscal transfers to local governments – some of whom had previously obtained as much as 80% of their revenues from logging – as compensation for the policy-induced losses. Such measures would not only conserve and increase forest resources, but are perceived also – through the restructuring and reorientation of forestry enterprises – to have paved the way for the introduction of more sustainable forest utilization processes in the future (see e.g. Yang, 2001).

The NFPP, combined with the logging ban, has had a dramatic negative “side-effect” on the forest resources of neighbouring countries (Pearce, 2001). Timber imports have increased substantially since 1998 (Sun et al., 2004). Satellite image analysis (Deng Xiqing, pers. comm.) from the western Yunnan border area with Myanmar, as well as field-based trade analysis (Kahrl et al., 2004), reveal large areas of recently cleared forests in Myanmar and an influx of log imports into China. Trucks with freshly logged timber (*Tsuga* spp., *Toona* spp. and other hardwood species) can be seen all along the border areas transporting timber to processing plants in China.

3.2. *The sloping land conversion program*

The Sloping Land Conversion Program (sometimes also called the Upland Farmland Conversion Program) was introduced in late 1999. Reportedly, up to 6 million ha of farmland in China lie on slopes over 25°. The new policy requires the conversion of all farmland on slopes exceeding 25° to forest or grassland. The main goal is to reduce soil erosion and runoff and increase forest cover on marginal land. The policy is not new – as early as the 1960s farmers had been required to convert sloped land in some areas. Unlike previous bans on swidden and sloped farmland cultivation, however, these measures now come with regulations for implementation and with significant financial support. Central government policy statements are explicit that farmer participation in the program is voluntary. But for reasons discussed below, in practice this principle is often compromised.

Financing to support design and implementation of the SLCP includes funds disbursed directly to farmers and funds to support the work of line agencies (Zuo, 2002). Because conversion will incur losses in farmers’ grain yields, the government provides participating farmers with grain compensation of 100–175 kg per mu (1 ha=15 mu). The government also provides farmers 20 yuan in cash per mu per year to support access to health and education services. To support tree planting, a subsidy of 50 yuan per mu is given for seedlings and saplings. Depending on what type of tree species is planted, the compensation package is set to last for five years for timber/fruit trees (economic forests), or eight years for trees with a primarily ecological function (ecological forests). Subsidies for land converted to grassland will be given for two years. Funds are also provided to the forestry agencies to cover technical support and program design. As the case studies described below reveal, these funds are often insufficient (see also Zuo, 2002).

Table 1
Local government agencies' functional roles in the SLCP

| Agency | Responsibility |
|---|---|
| Planning Commission | Overall planning and compiling |
| Minority Nationality Affairs Commission | Mediating in disputes with potential ethnic implications |
| Department of Finance | Overall budgeting, releasing compensation in cash, reducing or exempting from agricultural taxation |
| Department of Grain Supply | Releasing grain compensation |
| Department of Land Management | Releasing new land contracts to farmers in terms of changes of landholding during SLCP |
| Department of Forestry | Overall activity planning and implementation, such as selecting the land to converse according to state policy, measuring land areas, providing the seedlings of tree or grass species, issuing contract of upland conversion activities with farmers, checking the results of converted upland each year |

Source: Qian (2003).

Implementation has been rapid. In March 2000, the government announced a plan to convert over 5 million mu, and by mid-2000 75% of this land had been converted. In fact, implementation has exceeded the government's plans. Initially, 174 counties in southwest China were approved as pilot counties, but implementation has proceeded in 303 counties. Although the State Council issued documents stressing the protection of farmers' interests, implementation has run into several problems. In Sichuan, conversion of 200,000 ha began in 120 counties, involving 1.23 million households. By June 2000, the quota for conversion had already been exceeded by 3%.

Table 1 shows the division of responsibilities for financing, planning, and implementation of the SLCP in Baoshan Municipality. Different departments and line agencies are involved and one can envisage that coordination among them is difficult to achieve. Some departments (e.g. Forestry and Animal Husbandry) have been involved in similar work before, but other departments (e.g. Finance and Land Management) have new and important roles in the implementation of the SLCP.

4. Study area and methodology

The remainder of this paper is based on two case studies located in different areas of northwest Yunnan, each of which was conducted under slightly different circumstances. We use the two case studies to highlight issues of concern to local stakeholders (the focus of the Nujiang case) as well as issues affecting those charged with implementing the policies (the focus of the Baoshan case).

4.1. Nujiang case study

The first case study was carried out in Nujiang Prefecture. The total population of the prefecture is about 466,000, of whom more than 90% are ethnic

minorities. Approximately 80,000 ha are under cultivation, of which 31% are on slopes steeper than 25°. The upland conversion quota for the next ten years stands at approximately 47,000 ha (including farmland, marginal forest and wasteland).

The objectives of the case study were to understand the implementation process of the SLCP and NFPP, identify impacts on farmers' livelihoods and elicit the suggestions of different stakeholders for program improvement. Zhongyuan Village in Lushui County was chosen as a representative site for the case study (see Lu and Zhao, 2003). The village had been selected by the county forestry department as a pilot site for both the NFPP and SLCP. Elevation ranges between 1700 and 2800 m.a.s.l.. Forest land within the village boundaries covers 2860 ha. The village's total population is 2500 people in 611 households and the majority are ethnic Bai. The village cultivates 184 ha, of which 87 ha are paddy fields and 96 ha are dryland fields. Yields vary widely, with rice yields on fertile flat land at approximately 425 kg/mu (6375 kg/ha), and average corn yields at 175 kg/mu (2625 kg/ha) for steep land over 25°. In the past, farming communities received additional income from their forests, but after the logging ban they have not been allowed to fell trees or collect NTFPs. Their main cash income comes from selling livestock and from seasonal wage labour.

The main data used in the case study derived from a community survey. The community survey involved analyzing secondary materials and a questionnaire. The questionnaire, focusing on household livelihoods (including household assets and forest resource use), policy impacts and villagers' suggestions, was administered on the heads of 50 households, selected non-purposively. Of the 50 questionnaires 48 were found to be valid and were used for analysis. Focus group discussions were also held with separate groups of men, women and elders. The preliminary results of the survey findings were discussed in a meeting with county and township forestry officials, and further opinions and suggestions were elicited.

The case study was conducted by Yun-man Development Institute (YDI) and Yunnan University's School of Resources, Environment and Earth Science (SREES), in collaboration with the World Agroforestry Centre (ICRAF) in late 2002.

4.2. Baoshan case study

The second case study is based on reports by ICRAF staff derived from their ongoing collaboration with forestry bureaus in Baoshan Municipality. Similar to the Nujiang case, the context for this collaboration focuses on joint efforts to understand the options for improved forest management arrangements in the area. This collaboration has focused on forestry issues in Yangliu watershed. The watershed covers an area of approximately 40 km² and lies within the Salween watershed. Five villages are located in the watershed, with a total population of over 7300 people. As in Nujiang, the majority of arable land is dryland field, where corn is the major staple crop grown. Livestock raising and seasonal wage labour are also major sources of income for villagers.

Since mid-2002, ICRAF staff has been involved in a variety of activities, including mapping the distribution of forest and recent afforestation sites, research on natural resources governance, and formal and informal discussions with officials on the policy implementation process and the constraints they face. Thus, the material on which this case study is based is more akin to long-term participant observation, including observation of village meetings, discussions with officials in their offices, meeting rooms and in the field, as well as structured and unstructured interviews with farmers.

5. Results of the case studies

5.1. Nujiang prefecture, Lushui county

In the SLCP's first pilot phase, Zhongyuan Village converted 100 ha of land and planted trees provided by the forestry department on previously managed agricultural land, communal forest land, and forest land that had been reclaimed in the past by farmers short of agricultural land.

5.1.1. Farmers' views of the SLCP

Almost all farmers interviewed reported that line agencies came to visit the village, discussed the program and provided sufficient information on the new program and how it was linked with the NFPP. Forestry department staff carried out an inventory and survey of the conversion area with village officials and farmers. In general, farmers interviewed agreed with the goals and measures of the program. The main reasons given for complying with and supporting the program were the envisaged future environmental benefits for the village area and the notion that the program would help to preserve farmers' valuable agricultural land for their children.

Although most farmers agreed that the SLCP will have positive effects, actual participation varied significantly:

- Households with sufficient fertile land in flat areas were more willing to participate and convert their steeper lands, especially if they already faced a shortage of labour for cultivating their land. Households were much more willing to convert land further away from the village than land closer to main agriculture areas.
- Households cultivating mostly marginal land on steeper slopes were willing to convert because grain and cash subsidies exceeded the varying yields obtained without any input. These households saw more opportunities to increase income by engaging in off-farm labour.
- Households involved in animal husbandry were not willing to convert even extremely marginal farmland. They required all their land to produce fodder, and calculated that the cash and grain subsidies were much less than their income from corn and livestock. Only part of the grain subsidy was given in corn and grain subsidies cannot be traded.

- Almost all households without children or excess labour welcomed the program and participated in the conversion of their land. They continue to farm only their most suitable land.

These findings illustrate the diversity of responses to the program, even within one community. In line with policy directives, participation in the conversion program was voluntary. While this has allowed individual households to pursue their own interest, it created problems for the forestry agencies which then have to monitor implementation on dispersed parcels of converted land.

5.1.2. Concerns raised by villagers

From the questionnaire survey and focus group discussions, a number of concerns were identified (see Table 2, column 1). The combination of the SLCP, in conjunction with the NFPP and the logging ban, has severely limited areas accessible for traditional herding and NTFP collection. This was a major concern for households without access to wage labour incomes. As Table 3 shows, in many cases NTFP collection levels plummeted after restrictions were placed on access to forests. When asked about the long term prospect of the SLCP, farmers were primarily concerned about their future livelihoods. In particular, they stated that a five to eight year period is too short for the tree species promoted to yield enough harvest and income to compensate for their losses from converting previously cultivated land. All households interviewed argued that the SLCP and

Table 2
Farmers and line agency staff's concerns regarding the policies

| Farmers' concerns | Line agency staff's concerns |
|--|--|
| <ul style="list-style-type: none"> • Doubts about whether the subsidies will actually be paid for the length of the time contracted • The selection process of the conversion area and the applied survey methods were often questioned. • Farmers were not sure if they will be able to survive on commercial and fruit trees for the foreseeable future. • Farmers questioned the quality of the saplings provided by the forestry department and noted the low survival rate. • Technical support from forest department for tree planting and for follow-up to increase survival rates was insufficient. • Farmers had limited input on the choice of species and their preferences often differed from the forestry department's (e.g. species difficult to raise in nurseries). • Farmers were unclear about the overall monitoring of the program, how seedlings' survival rate would be monitored, and if seedlings would be provided for replanting. | <ul style="list-style-type: none"> • Time, staff and material requirements of program are overwhelming • Underskilled staff • Leaders thought that without adequate and enforced training, forestry staff are often unwilling and unprepared to change their attitudes • Too many agencies are involved in the program, which creates huge coordination problems • The program is not sufficiently funded – 50 yuan per mu for seedlings is not enough to produce high quality planting stock • Program follow-up, for example monitoring and replanting, is difficult, and there are neither clear guidelines nor funds from the government for this work |

Source: Lu and Zhao (2003).

Table 3
Comparison of villagers' NTFP harvests before and after the logging ban

| NTFP product | In 1998 (in kg) | In 2003 (in kg) |
|---|-----------------|-----------------|
| <i>Auricularia auricular</i> (Mu'er) | ~40–50 | ~20 |
| <i>Termitornyces albuminosus</i> (Jizong mushroom) | ~300–400 | ~300–400 |
| <i>Lentinula edodes</i> (Shiitake mushroom) | ~100 | ~40 |
| <i>Castrodia elata</i> (Tianma root) | ~30–40 | ~20 |
| <i>Panax notoginseng</i> (Pseudo ginseng) | ~20–30 | ~10 |
| <i>Rhizoma Dioscoreae Zingiberensis</i> (Bitter ginger) | ~400 | ~200 |

Source: Lu and Zhao (2003).

NFPP have to be combined with a rural development program to create alternative livelihood options.

A smaller number of community members also expressed concern that the two programs could have extensive negative social impacts, as many people adapt to life with less farming. One expressed concern was that idle farmers will turn to gambling, and that there will be a subsequent rise in crime. This concern is to be read in the context of a general lack of secure off-farm income sources.

5.1.3. Concerns raised by line agencies

During a workshop, line agency officials and technicians raised their concerns (see Table 2, column 2). All of the senior government officials in line agencies stated that they are overwhelmed by the scale of the task and lack sufficient, skilled personnel to implement and monitor the SLCP. Many forestry staff are unable to undertake simple surveys, a prerequisite for program planning and implementation. Nearly 50% of forestry staff are former soldiers without any education in forestry or agriculture. They are assigned to the office by the government, and forestry agencies have no choice in selection of staff. Only a third of the forestry officials have a proper background in forestry.

On the basis of the community survey and discussions with line agency staff, several recommendations were made. These included recommendations regarding: (1) program management, e.g. establishing feedback mechanisms across different administrative levels, and allowing more flexibility in implementation regulations; (2) program contents, e.g. the need for additional program components to generate alternative income sources and reduce fuel wood demand; and (3) support to implementation, e.g. simple guidelines on how to conduct resource inventories, surveys and monitoring. The officials fully realized the negative impacts the program had on some villagers. However, in areas which have been income-poor for many years and are far from potential markets, it would be difficult to devise specific activities that would stand a good chance of ameliorating the program's effects on incomes.

5.2. Baoshan municipality, Yangliu watershed

The case study in the Yangliu watershed illustrates how the Forestry Department in Baoshan is responding to the SLCP, as well as the problems

Target areas of SLCP

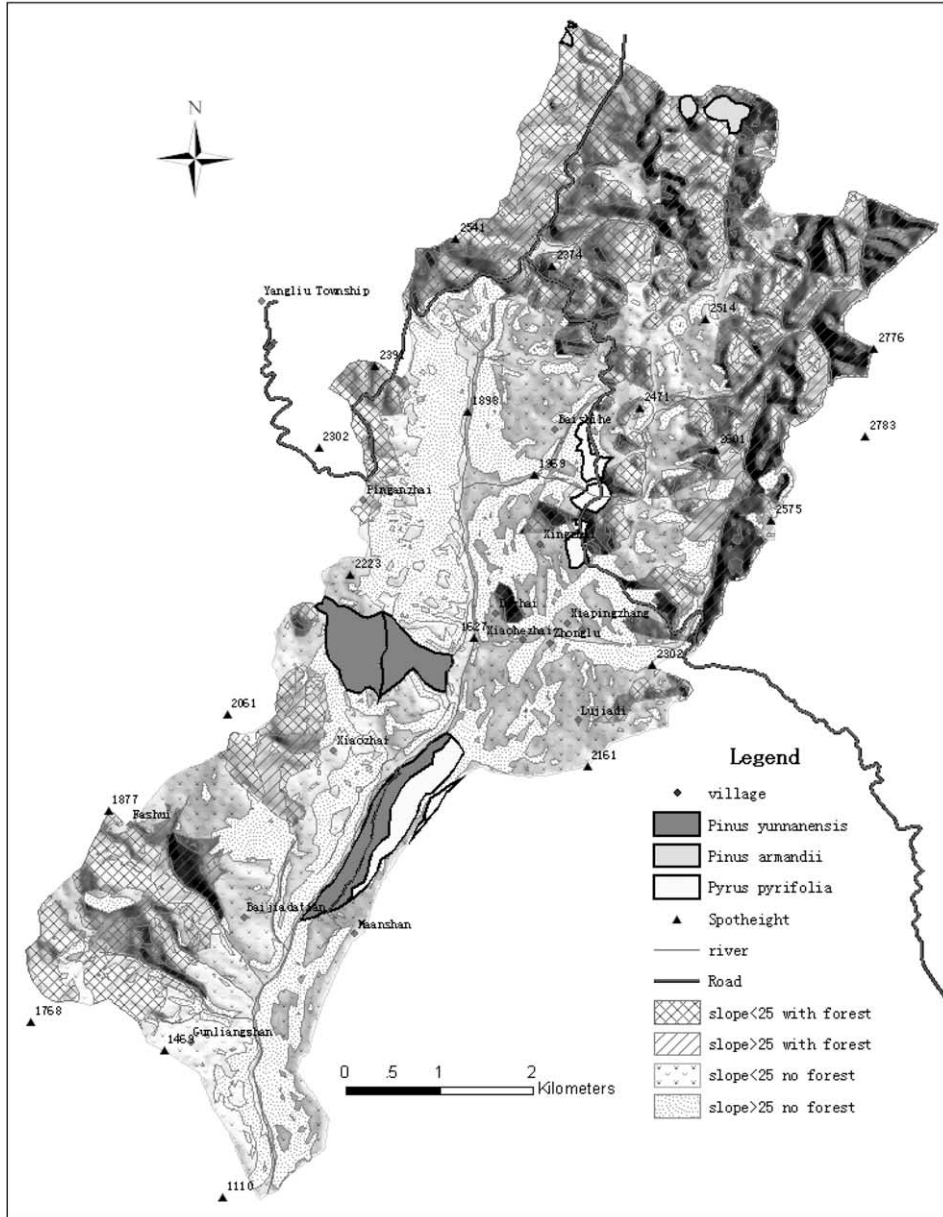


Fig. 4. Target Areas for SLCP in Yangliu.

Most arable land is concentrated around villages, and small patches of natural forests remain close to some villages (see Fig. 3). Large areas covered with grass are found in the centre-west of the watershed. Elevation ranges from 1200 to

main species used were *Pinus yunnanensis* and *P. armandii*, and some fruit trees species were given to farmers.

Under the SLCP, the Forestry Department has been required to develop a work plan for 2002–2003 for land conversion, and it has set aside and delineated areas in Yangliu watershed (see Fig. 4). Areas in red show the designated target areas for the SLCP. More than 43% of the total area is steeper than 25° (see Fig. 5), some of which is already under forest cover. If the program were to be implemented to its full extent, approximately 25% of the total area would be targeted (steeper than 25° and no forest cover) and converted. For the 2002–2003 work plan, an area of approximately 5.5% or 235 ha, was selected for conversion. Local regulations governing the implementation of the program state that land must be converted in parcels of at least one hectare in size.

Comparing the selected areas with the slope distribution, the target areas are not necessarily aimed at sites prone to the highest erosion and/or with the steepest slopes. For these areas to be targeted, the Forestry Department would need to undertake a much more detailed survey and selection process, which would take much longer. Individual areas for conversion would become smaller, much more scattered, and more difficult to plant and monitor in the future.

Under the pressure exerted on line agencies to fulfil their quota system, in most cases there is not enough time or resources to carry out a full survey to select and delineate areas susceptible to erosion. This, combined with a very limited provision of tree species, create several major problems for the SLCP. If farmers are given more choice among species for planting, even larger areas could be compartmentalized and planted with a diverse stock of fruit trees, mixed economic and ecological species and grasses for livestock. Instead, the only fruit trees provided to farmers in Yangliu are pear (*Pyrus pyrifolia*) for 67 ha of converted land, and for the traditional forestry species only pine (*Pinus yunnanensis* and *P. armandii*).

Large areas of land are converted and planted with few species. As a result, a traditionally highly diverse landscape mosaic within a fragile agro-ecosystem is being converted into large compartments of single species plantations. Not only will this homogenization decrease the overall landscape biodiversity and increase biodiversity cold spot areas; it will also lessen the ability for wildlife to migrate through semi-natural corridors provided by previous agricultural practices. Equally important, species are selected without thorough market research, and communities fear they will not be able to make a living after the period of government subsidies comes to an end.

Given the time constraints on conducting full surveys, cases of possible exaggerated reports of areas converted have subsequently become known to the forestry agencies, which then have to devote time and resources to investigating the claims.

The Forestry Department and line agencies at prefecture, county and township level are often blamed for the failure to successfully implement the SLCP. However, they themselves are keenly aware that they are not given enough time to prepare for programs and are in many cases understaffed. They are in no position to address concerns raised by communities and other stakeholders, but still have to carry out their given task, bound to a quota system which does not leave much room to manoeuvre.

With the logging ban in place, local government agencies have lost much of their own income. One way to compensate for these losses is to provide planting material for the SLCP. Concentrating on a small selection of known tree species (e.g. conifers, walnut, chestnut, and other easily and rapidly germinated species) is much more desirable for Forestry Department nurseries. As frequently expressed in informal discussions, farmers prefer lesser known species with the potential to provide a higher return and create more diverse marketing portfolios, but these species are often more difficult to grow and only available in smaller numbers. Time constraints, task-based management, insufficient funds for planting stock and limited expertise and knowledge of alternative species result in the undesired development of large-scale single species conversion areas. Given the fact that only limited markets exist in most rural areas and no real market survey and analysis have been carried out, the future returns from tree planting are uncertain.

6. Discussion and conclusions

This paper has focused on the early experiences of communities and line agencies with China's nascent forest conservation and rehabilitation programs, the NFPP and SLCP. The SLCP is one of the world's first national, large-scale environmental benefit schemes aimed at rewarding upland communities for maintaining watershed services. Worldwide, markets for environmental services – including watershed services – are in their infancy (Landell-Mills and Porras, 2002), and a tremendous amount of experimentation and analysis remains to be done to guide the design and implementation of payment mechanisms.

Driven by a range of production and conservation motives, reforestation programs have increased in scale and scope during the 1990s. A number of national governments in Asia have implemented or are planning large-scale, long-term programs to increase forest cover, ensure sustainable timber supplies, and, in some cases, promote community development. These programs include the 5 Million Hectare Reforestation Program (5MHRP) in Vietnam, Vision 2020 in Laos, and components of the RHL-5 Tahun in Indonesia. Cambodia is also planning to reforest large tracts of degraded land. The mixed results of past and current reforestation programs worldwide suggest a continuing need to critically examine their design and implementation (Toma et al., 2004).

Although the motivating factors behind initiation of the SLCP are unique to China, reforestation programs in developing countries tend to share a bias toward one of three objectives: timber production, increased forest cover, or community development. Among large-scale reforestation programs, the SLCP stands out as an explicit attempt to integrate watershed restoration and community development within a single financing mechanism. Other programs, such as the 5MHRP, combine multiple objectives within a single program, but treat separate objectives as discrete components. As developing country governments increasingly turn to SLCP-like approaches to optimize financial resources, examinations of the SLCP should inform program design and implementation.

This paper can only speculate as to the SLCP's medium to long term implications. However preliminary experience with the SLCP offers two salient insights for similar efforts.

Firstly, difficulties in maintaining fidelity to the SLCP's multiple objectives illustrate the importance of building clear evaluation criteria into program design, and of developing a means to reconcile trade-offs in reforestation programs that have integrated, potentially competing objectives. The ultimate objective of the SLCP is to reduce soil erosion and run-off into main river systems. The general measure adopted under the program is the planting of trees. Farmers' participation in the program is supposed to be voluntary, and farmers are often able to choose which of their lands to convert. This means that while overall forest cover may increase, areas subject to erosion may not be included, and thus the ultimate goals of the program may be compromised (Yangliu case).

On the one hand, county governments give targets of how many hectares are to be converted in each township, and the township allocates these targets to the villages. Frequently, forestry agencies require that land is converted in contiguous parcels, which means that several households must convert land together, and that some are therefore "coerced" or "persuaded," either by neighbours or by village cadres. On the other hand, if farmers select their own plots for conversion, the converted land may be dispersed, which increases the costs of monitoring for local forestry agencies (Nujiang case).

An issue of concern to many villagers is the selection of tree species for conversion. Farmers are often familiar with a variety of species, their potential uses, marketability and value, and growth rates, and the characteristics of different varieties of locally common cash crop species. The issue of species selection relates not only to the ecological impact of the program, but also to the program's potential to support local livelihoods. But as both case studies illustrate, local forestry staff and agencies lack the capacity to consider farmers' voices and opinions, and to follow up with technical support to meet farmers' needs. Clearly, then, forest conversion programs, and environmental benefit schemes in general, require clearly defined objectives and metrics for measuring program performance that are tied to program objectives rather than program implementation itself.

Secondly, shortcomings in SLCP implementation point to the contradictions inherent in large-scale, centrally-driven, community-based reforestation programs. Based on the case studies presented above, the SLCP illustrates the need for more extensive program piloting and experimentation before scaling up forest conservation activities to determine: (1) the adequacy of staff capacity and how to better train and equip implementing agencies; (2) administrative and institutional constraints and potential ways to overcome them; and (3) program financing and costs, including potential spill over effects, and strategies for mitigating unintended socio-economic consequences.

While the case studies showed community members' general support for SLCP objectives, the preponderance of problems arising during program implementation can be traced to excessive rigidity in program design and insufficient space to allow upland communities greater input to local implementation. As noted in a growing body of literature (see [WRI, 2003](#)), ecosystem conservation often entails

negotiations across many different scales of administration to balance regional environmental interests with local needs and requirements. Local responses to provincial or national forest conversion and rehabilitation programs are varied because local governments', communities', and individuals' physical and socio-economic vantage points differ. There is no panacea for better aligning regional and local, or even intra-local, interests. However, any effective process of institutional negotiation requires both government commitment to reform at high levels and clear channels for policy feedback.

Policy research, in which there is a substantial role for research institutes and non-governmental organizations, can be a tool both for improving specific programs, and supporting longer-term institutional and governance reforms. Case study research, such as that reported here, is part of an array of wider efforts to provide policy recommendations for improving NFPP and SLCP implementation. Continuing efforts to support the enhancement of current forest conservation and rehabilitation programs in China will provide valuable insights for potential opportunities and pitfalls in the design and implementation of similar programs in the future, both within China and abroad.

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