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Reforestation Programs in Southwest China: Reported Success, Observed Failure, and the Reasons Why

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Abstract: Ever since the disastrous floods of 1998, the Chinese government has used the Natural Forest Protection and Sloping Land Conversion Programs to promote afforestation and reforestation as means to reduce runoff, control erosion, and stabilize local livelihoods. These two ambitious programs have been reported as large-scale successes, contributing to an overall increase in China's forest cover and to the stated goals of environmental stabilization. A small-scale field study at the project level of the implementation of these two programs in Baiwu Township, Yanyuan County, Sichuan, casts doubt upon the accuracy and reliability of these claims of success; ground observations revealed utter failure in some sites and only marginal success in others. Reasons for this discrepancy are posited as involving ecological, economic, and bureaucratic factors. Further research is suggested to determine whether these discrepancies are merely local aberrations or represent larger-scale failures in reforestation programs.

Keywords: Forests; afforestation; reforestation; grain-to-green; natural forest protection plan; China; Sichuan; Liangshan

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Background

History of China's Forests – early imperial history to 1998.

China's use of and interaction with its environment have contributed to change in the country's natural systems, and have resulted in the establishment of patterns strongly influenced by human practices. Prominent among these practices have been forest exploitation and destruction. Reaching back more than three thousands years, deforestation in China has occurred for agriculture, for fuel (for heating, cooking, and industrial processes), and for settlement and construction of homes. Consequences associated with the ensuing environmental destruction were apparent throughout China's forest history and were recognized early on. Even as early as the 11th century, the cCentral eastern area experienced a shortage of wood for fuel use (Elvin 2004: 20). That land conversion and land practices greatly influenced natural phenomena became evident at least two thousand years ago, when what was previously known as 'The River' became the Yellow River because deforestation and various land use practices along the river contributed to increased sediment volume (Elvin

2004: 24). The frequency of flooding along the river increased and became more regular; from approximately one disastrous break every sixteen years between 186 BCE to 153 CE, to about once every 3.6 years during the period of the Five Dynasties (906-960 CE), and then to one disaster every 1.89 years during the Qing period (1645 to 1855) (Elvin 2004: 26). In 1117 CE more than a million people were said to have been killed from one massive flooding event.

Even in light of this considerable deforestation and land conversion throughout China's history, the most ravaging and formidable events of forest loss took place in the later half of the twentieth century during three distinct periods that have come to be known as the 'three great cuttings' (三大砍伐). In the early 1950s the central government recognized the threat and pressures on its forests and addressed them with land rehabilitation projects (Hyde 2003: 5). In efforts to revive and restore the forest landscape, China conducted afforestation projects in the 1950s, and in the 1960s also promoted intercropping and shelterbelts (Hyde 2003: 5). But by 1958 strong pressure from a rapidly increasing population and developing economy, which ultimately encourages consumption and destruction, overwhelmed these attempts at restoration and re-initiated widespread depletion of already limited forest resources. Attempts to reverse environmental degradation and natural resource exploitation were continually challenged by the conflicting interests of collectivization and industrialization. As a result, the Communist revolution marks the start of strong and continuous pressure placed on China's forests. By the start of the Great Leap Forward in 1958, all forests and trees were reallocated from households to villages for local management (Hyde 2003: 180; Edmunds and Wollenberg 2003: 53). Great swaths of forest were destroyed during this time to feed the "backyard" furnaces established across the country to produce steel; the majority of forests that remained after the war with Japan, WWII, and the establishment of the communist government were all consumed for this effort, marking the first of the 'three great cuttings' (Hyde 2003: 5) (Table 1).

Table 1 Deforestation and forest generation in China for 1949~2003

Years	Deforestation	Forestation and natural regeneration	Net forest change
1949	0	0	0
1950~1962	-2.38	1.71	-0.67
1963~1972			
1973~1976	-3.63	4.52	0.89
1977~1981	-1.84	1.14	-0.7
1984~1988	-1.76	2.74	0.98
1989~1993	-1.13	2.07	0.94
1994~1998	-1.09	2.5	1.41
1999~2003	0.66	2.34	3

Values presented as percentage (%) of the country's total land area of 960 mha. Adapted from Zhang and Song (2006)

The second Great Cutting came during the Cultural Revolution of 1966~1976, when the remaining natural forests were further cleared in the campaign to expand cropland (Hyde 2003: 5). With the opening of the economy in the early 1980s came the third period of massive destruction, mostly accounted for by timber farms exceeding their quotas and logging out much of the Northeast and Southwest, forest fires (Hyde 2003:180), and accelerated harvest by farmers after receiving

rights to forests. The quick deforestation by villagers is generally assumed to be a result of insecure tenure to the forests, as forests were collectivized and then returned numerous times between 1950 and 1970 (Edmunds and Wollenberg 2003: 53).

Although the early 1980s ~~is~~ are marked by one of the most massive events of forest loss, China at that time also began its forestry reform following on the success of the agricultural reforms. By 1980, the country's forests were largely made up of degraded natural forest or sparse and inaccessible materials (Hyde 2003: 118), and took up only an estimated 12 % (Hyde 2003: 114) of China's total land area, or 115 mha[1]. Devolution of authority in controlling forests dispersed to various management bodies for collectives and state-owned forests throughout the country, using many different management approaches. In 1978 China reinitiated efforts to increase forest coverage and stand volume. The country launched shelterbelt projects to prevent soil erosion, planted engineered forests (essentially afforestation of previously barren lands or lands harvested and replaced with preferred species), and encouraged the planting of "economic" tree crops. During this period, both China's forest coverage and stand volume were reported to have increased considerably. Between 1980 and 1993, both state-owned and collective forests continually increased their area of newly afforested land – with 1.5 million ha annual increase meaning a total accumulation of 21 million ha by 1993 (Hyde 2003:115). Between 1980 and 1993, forest stock was reported to have increased from 79.8 to 90.9 million m^3 (Hyde 2003: 114). But it must also be noted that during this period the net increase of forests was 18 million ha (Hyde 2003: 114), meaning 3 mha of mature stands were cut, and replaced with 3mha of recently planted, immature forests.

On the surface, then, China's overall record in forestry looks good despite the ravages of the Three Great Cuttings. Between 1949 and 2003 China's forest coverage has reportedly increased from 8.6 % to 18.21 %. The 9.6 % increase is attributable to two factors: forestry and accounting. Afforestation and reforestation increased forest cover by 5.3 % of the total area; while deforestation removed 1.2 %, resulting in a net increase of 4.1 % of the total land area, or about a 50 % increase over the forested areas for 1949. The additional 5.5 % of the total area reported as new forest is accounted for by the addition of scrublands as forests, the inclusion of Taiwan, Hong Kong, and Macau in 1999, the huge underestimation of the forest cover before 1949, and, most importantly, the change in the official definition of forest from 30 % to 20 % canopy cover, which was made in 1994 (Zhang and Song 2006). The values of forest change can be easily manipulated to display differing magnitudes of China's change in forest cover. It is thus very difficult to know, on an aggregate scale, what has really happened. What is evident is that the figures can be manipulated to make the situation look better than it is; this gives credence to the conjecture that China's aggregate forest statistics do not reflect the true of state of its forests (Albers *et al.* 1998).

China's Current Forest – policies and problems

While making efforts all through the 1980s and 1990s to increase forest area and volume, China did not make a more concerted effort to actually reverse its environmental degradation and alleviate the pressures on the environment until 1998, after flooding in the middle Yangtze region ended in more than 3000 casualties. In late 1998, China instituted a logging ban in the Southwest, along the upper reaches of the Yangtze and Yellow Rivers, and adopted a set of ambitious environmental policies that distinctly marked its transition to acknowledging ecological protection and not just economic development. Part of this overall effort consisted of two ambitious forestry programs: the Natural Forest Protection Program (sometimes referred to as the National Forest Conservation Program) and the Sloping Land Conversion Program ("Grain for Green"). These programs emphasize forest creation by means of afforestation (planting on previously barren wastelands), reforestation, and cropland conversion, and employ forest cover as a proxy for progress. The country has identified target figures for forest cover of the country's total land area

1) It is important to note that China's forest statistics include natural forests and forest plantations, as well as shelterbelts, commercial tree crops, bamboo, and rubber plantations (which are not commonly included in the forest statistics for other countries)(Hyde 2003:114~115). In 1994, forest cover, previously measured as the proportion of land with at least 30% coverage, shifted down to 20% coverage. In some published values forest cover is calculated based on the country area of 960 million ha for China, including Taiwan, Hong Kong and Macao (Zhang and Song 2006).

at: 2010, 19 %; 2020, 23 %; 2050, 26 % (Zhu *et al.* 2004).

The Natural Forest Protection Program. In response to the 1998 flooding of the Yangtze River in Central China and the Songhua and Nen Rivers in the Northeast, the central government immediately instituted the Natural Forest Protection Program (NFPP) (天然林保护工程). Officially introduced in 2000, as a ten-year plan, the program's explicit goals are to restore the damaged regions of the environment and to protect remaining areas of ecological concern. The outlined objectives of the program, implemented in 18 provinces and autonomous regions (all of which contain upstream regions of major river systems) are to restore the natural forests in ecologically sensitive areas, plant forests for soil and water protection, increase timber production in forest plantations, protect existing natural forests from excessive cutting, and maintain the multiple use policy in natural forests (Zhang *et al.* 2006). The government has allocated a budget of 96.2 billion RMB (USD 11.6 billion) toward this project, with additional funding by local governments (State Forestry Administration 2004). Within the Yangtze and Yellow River catchments a logging ban has been placed until 2010 (the projected end date for this policy) in approximately 30 million ha of natural forests, of which 27 million ha are collectively owned. Permanent protection has been assigned to an additional 31 million ha of existing forests, shrub forests, and newly planted forests. And the project aims to create approximately 13 million ha of restored forest and grassland by closing access to over 3 million ha of mountain land, seeding 7 million ha, and replanting 2 million ha (Zhu *et al.* 2004; Xu *et al.* 2004).

The Sloping Land Conversion Program (Grain-for-Green). It is estimated that 2 billion tons of silt are released into the middle and upper reaches of the Yangtze annually – with about 1.3 billion tons contributed by sloping cropland (Xu *et al.* 2004). Data also suggest that a dominant portion of this output is released from West China. The Sloping Land Conversion Program (SLCP) or "Grain-for-Green" (退耕还林（还草）工程), which emerged after the NFPP, addresses this problem by converting or returning agricultural croplands to forests or grasslands. As one of the world's largest conservation programs, with a budget of 337 billion RMB (USD 40.6 billion), entirely funded by the central government (Sichuan Province Forestry Bureau 2004), the SLCP addresses both environmental and economic concerns. In addition to its ambitious goals of restoring forest cover through land conversion, the program also directly aims to develop rural economies and reduce poverty in the areas where it is implemented. The program is oriented toward restructuring rural economies so that participating farmers can gradually shift into more environmentally and economically sustainable activities such as livestock breeding and off-farm work (Xu *et al.* 2004). Additionally, the program was designed to address short- and long-term concerns of reducing stockpiles of grain and increasing grain output by restoring ecosystem functions, including erosion prevention and flood control (Zhu *et al.* 2004). The SLCP was initially launched in 1999 as a pilot in Sichuan, Shaanxi, and Gansu provinces and, with an official start in 2001, expanded nationwide. By the end of 2004, the program was being implemented in 2000 counties across 25 provinces and municipalities. The program aims to convert 14.67 million ha of cropland by 2010, with 4.4 million ha to be on land with a slope of greater than 25 degrees (or 46.6 %). The program compensates participating farmers for converting their cropland back to forests or grasslands with a cash subsidy, grain subsidy, and free saplings at the start of reforesting. There are two forms of forests that crops may be converted to: ecological or economic forests. Ecological forests are defined by the State Forestry Administration as timber-producing forests, while economic forests are orchards or plantations with trees of medicinal value (Xu *et al.* 2004). Grain and cash subsidies are provided for 8 years if land is converted to ecological forests, 5 years for economic forests, and 2 years for grassland conversion (Xu *et al.* 2004). The budget allocates 70.13 % to grain subsidies, 8.89 % to cash subsidies, and 20.98 % to costs of seedlings (State Forestry Administration 2004).

Officially reported results. The government has been monitoring the progress of these policies in 44 counties for the NFPP and 100 counties for the SLCP, all in the West. According to the "mid-term" assessment the projects have already

produced obvious ecological, economic, and societal benefits. According to official figures, at the end of 2003, through combined efforts from NFPP, SLCP and the "Great Greenwall Project" (Beijing-Tianjin sand storm alleviation program) 4.75 million ha had been afforested, 262,100 ha aerially planted, and 3.02 million ha protected by *fengshanyulin* (FSYL: 封山育林 "closing the mountains to ~~protect~~ nurture the forests"), prohibiting grazing, logging, and firewood collection. Following afforestation of 242,000 ha and protection by FSYL, a 97 % survival rate and a 99.4% preservation rate were reported for the monitored counties. Under the SLCP between 1999 and 2003, 914,500 ha of cropland had already been converted and 925,000 ha of land afforested. With this tremendous progress the monitored counties collectively met their reforestation/afforestation goals for the SLCP program within half of the allocated time. Of the converted lands, 85.29 % were converted to ecological forests, even surpassing the requirement that 80 % of all converted land be converted to ecological forests rather than economic forests. But while the report presents high figures of survival and maintenance rates, it also states that there has been a high demand for seedling replanting due to planting on arid and water deficient land, a possible indication of inconsistency. In 2003, the average density for the monitored counties was reported as 148 seedlings per *mu* (2220 seedlings per ha or about one seedling for every 4.5 square meters). And as the emphasis of the SLCP is to convert marginal farmland, particularly steeply sloping lands, 54.8 % of the lands planted had slopes greater than 25 degrees, and 16 % between 15 and 25 degrees. In a survey after implementation of SLCP had started, 86 % of villagers and 96 % of farmers believed that ecological conditions had improved (State Forestry Administration 2004).

Direct and indirect ramifications of the pressures that China has placed on its environment have thus forced the country to recognize its history of destructive practices, and the regime has responded with ambitious and wide-ranging programs in the area of forestry. But closer examination of results of these programs by independent observers have indicated that the picture is not as bright as the official reports would indicate. While China's policies are well intended, policy design and program implementation retard their actual usefulness. Both the NFPP and the SLCP have been criticized for their poor and sporadic implementation (Xu *et al.* 2006). The NFPP has been criticized for its broad brush, top-down approach, which does not take into consideration the heterogeneity of nature, society, economy and culture (Xu and Melick 2007). Because these two policies emerged in response to the floods, their objectives include preventing soil erosion, and they assume a simple inverse relationship between tree-planting and erosion (Weyerhaeuser *et al.* 2005). The assumption has been that these policies will contribute to upstream forest cover and reduction of runoff (Xu *et al.* 2006), and the successful reports cited above, based on monitored implementation in various counties and specifically on results gathered from all counties in Sichuan, would indicate that the programs are well on their way to achieving desired results (State Forestry Administration 2004; Sichuan province SLCP report 2005). Independent field research, however, has shown that that official claims and documented results are not consistent with the corresponding ground-based observations. Weyerhaeuser *et al.* (2005), for example, question the economic and ecological sustainability of the forests produced by these programs, and our research reported below adds another local case study that should contribute to our calling these national results into question. It is thus questionable, first, whether China is making the environmental gains that it claims, and, second, if the benefits of these programs are outweighing their costs. In addition, if the results concerning domestic progress are uncertain, the country's impact abroad is unequivocal — China's demand for timber continues to increase, and this together with the drop in supply due to the NFPP and SCLP has doubled China's timber imports since 2000 (Xu *et al.* 2006: 602, 605), directly inducing the destruction of forests abroad including, illegal harvesting of timber in several countries, as well as increasing the risk of introducing invasive and pest species (Zhu *et al.* 2004; Xu *et al.* 2006).

Sichuan province – Policy implementation and Regional application

With 19 % of China's reported forest cover

(Zhu *et al.* 2004), Sichuan and Yunnan are unquestionably significant areas for the implementation of both NFPP and SLCP, and in addition their high levels of biodiversity make them priority regions for environmental restoration (Yang *et al.* 2004). The Sichuan Basin was almost entirely covered in trees in the first millennium B.C.E., with estimates of 57 % of the land being forested (Elvin 2004: 59; Wang 1999). But pressures during the past 50 years have resulted in dramatic rates of forest cutting for fiber and fuel as well as land conversion from forest or shrub to agriculture in southwestern China, especially in Sichuan province (Liu *et al.* 2002). Since the 1950s, the chief economic sector for West Sichuan's development has been the logging industry (Winkler 2003) and by the time NFPP was implemented in Sichuan, its timber resources were nearly exhausted (Zhu *et al.* 2004). For a region largely unaffected by a long history of forest exploitation until the last 50 years, the great loss of forests in Sichuan called for environmental protection and the adoption of both the logging ban and reforestation policies. The perceived need for protection was probably increased by the celebrated biodiversity of Sichuan, the development of system of national and provincial reserves and their associated tourists, and the presence of charismatic species such as the Giant Panda.

Official figures suggest that Sichuan has also made the same successful progress observed in the monitored counties at the national level. Sichuan was one of the three provinces that participated at the inception of the pilot phase of the SLCP in 1999, with quotas for cropland conversion and wasteland afforestation that were reported met by the end of 2005. By the projected mid-term point in the implementation of these projects, the province had already converted 878,933 ha of cropland and afforested 820,667 ha of wasteland. Through five consecutive years of monitoring at the provincial level, 97 % of the reforested lands are reported to have been planted to standard (defined as 85 % or better survival of seedlings), and more than ~~>~~98 % of those have been maintained. In Sichuan the SLCP has reportedly achieved all of its program objectives, with great increases in forest cover, decreases in surface runoff and soil erosion, increases in economic development of rural regions, and overall improvement in agricultural productivity. Official reports indicated 20~45 % reductions in surface flow and soil erosion, along with an increase in provincial forest cover from 24.23 % to 28.98 %. On average, for every 3 *mu* of converted cropland 1 individual has found off-farm work (off-farm work not defined). And while cropland is continually converted to forests and grasslands, grain output has nevertheless increased annually; in Liangshan Autonomous Prefecture, where our study sites in Yanyuan County are located, 1.61 million *mu* of cropland was converted between 1999 and 2005 but grain output has still increased every year (Table 2) (Sichuan Province Forestry Bureau 2005).

Table 2 Official figures for SCLP implementation in Sichuan, Liangshan, and Yanyuan, 1999~2005

	Sichuan Province	Liangshan Prefecture	Yanyuan County
Total Afforested, Converted or Protected	2550	300	18.8
Cropland Converted to Forest	1318.4	156	9
Wasteland Forested	1151	128	8.3
Mountains closed to protect the forests (FSYL)	80	15.5	1.5

Units: 1000 *mu* (67 ha)
Source: Sichuan province Forestry Bureau 2005

Our objective was to evaluate the success of these two programs, NFPP and SLCP, by examining individual projects in a region of SW China known to have undergone dramatic negative impacts from previous policies, located in the mixed mountain — subsistence agricultural zone, and part of the watershed of the Yangtze River. We used a combination of interviews and site visits to

accomplish our objective. Our results, presented below, indicate that these officially reported results are overoptimistic, and hide ecological, economic, and cultural problems with the programs.

1 Study Site

In order to examine the success of the NFPP and SLCP locally, a case study was conducted in Baiwu Township, Yanyuan County, Liangshan Yi Autonomous Prefecture in southwestern Sichuan province (Figure 1).

Baiwu township lies at elevations ranging from 2,400 to 3,900 m, with the valley areas mostly farmed intensively, and the mountain areas given over to a combination of rotational-fallow farming, grazing, and low-intensity forestry. Over 90 % of Baiwu's 13,000 people belong to the Nuosu, or Liangshan Yi, one of the many minority groups living in the Sichuan-Yunnan borderland. Nuosu occupy a harsh landscape at elevations above 1500 m (Harrell *et al.* 2000). The Nuosu have practiced a mixed subsistence economy including agriculture, grazing, hunting, and forestry, and have an established ethic for long-term sustainability of resources. Forests are central to this way of life, as a source of fuel for heating and cooking, material for building homes, and non-timber products such as mushrooms, bamboo, and medicines; as well as an acknowledged habitat for birds and mammals and a protector of water, soil, and other important resources. Prior to the Communist revolution people owned rights to forests above their homesteads (owners having direct control over logging and collecting of wood in these forests). During the collective period the forests were also collectivized, and now some forests are under state, and some under collective control, even after agricultural land management has reverted to individual households. The nationwide, policy- driven Three Great Cuttings during the later half of the twentieth century greatly reduced forest cover in this region of rural Sichuan[2]. The NFPP was first carried out in this area in 1998, and SLCP programs were first implemented in 2003.

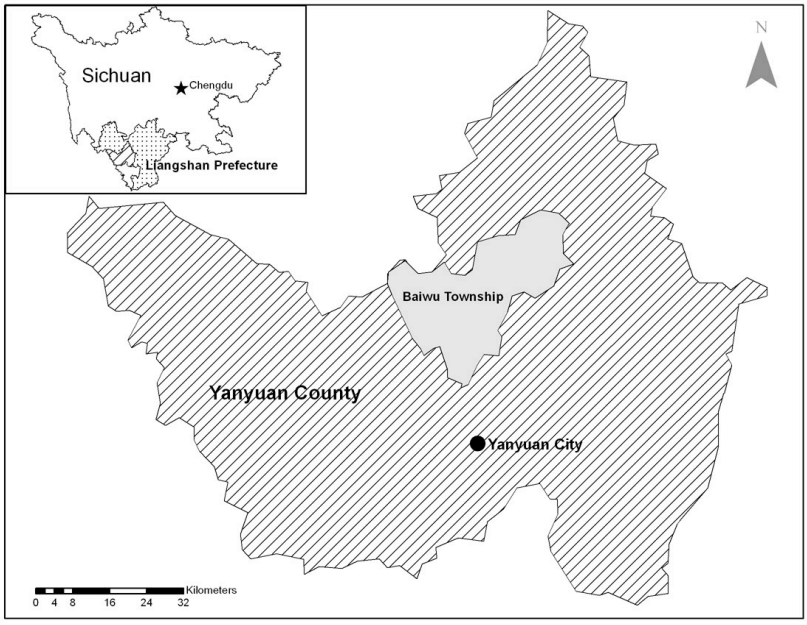

Figure 1 Map of Baiwu Township, Yanyuan County, Sichuan Province

2) Despite the reverence for forests in Nuosu life and lore, recently scholars and members of other ethnic groups in the Western parts of Nuosu territory have blamed the deforestation after the 1950s on the Nuosu swidden agriculture or agro-forestry (Harrell n.d.). In the last half of the twentieth century, China's population has increased by 2.5 times but in rural areas the increase has been fivefold (Zhang *et al.* 2000). It is thus highly possible that the high density may have exceeded sustainable levels even for a people with strong sustainability ethic to maintain its system for more than a few decades for any given space (Harrell n.d.).

2 Methods

This study was conducted between August 2005 and August 2006, during which period Trac made five trips to Baiwu Township, investigating reforestation sites in three areas: Gangou, Mianba, and Wucun (Figure 2). Research was conducted by interview, survey, observation, and forest data collection. A total of 21 interviews were completed, including those with a provincial program designer, county representatives for each of the two policies, a recently retired township ranger, and villagers and village leaders for each of the three study sites within Baiwu Township. The interviews covered local perspectives on the importance of the programs, the benefits and effects of these policies, local participation, and government involvement and management. The management interviews provided insight into program organization and implementation. Official reports recorded village, township, county, prefecture/city for Sichuan province and overall national progress. Fieldwork at the eighteen sites in the township planted as part of the NFPP or SLCP included observations and surveys, which were used to evaluate the forested site conditions and surrounding forests or land, and to document land use practices.

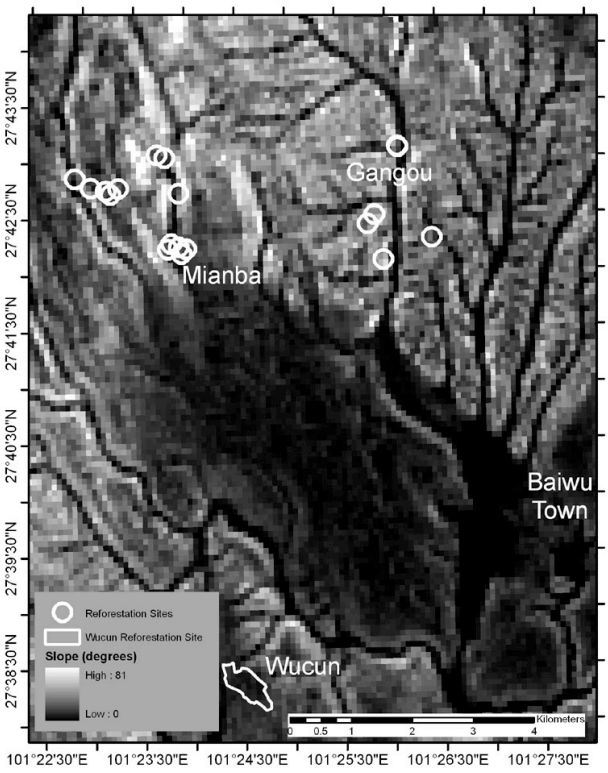

Figure 2 Map of reforestation sites in Baiwu Township

3 Results

In Baiwu Township, NFPP is being implemented in Mianba and Gangou, and SLCP in Wucun. The types of planting at the three sites include afforestation (荒山造林), reforestation, and conversion of cropland to forests (退耕还林). Figure 2 and Table 3 show the three areas and the programs being carried out in each.

Table 3 Programs carried out in three study sites, Baiwu Township

	Logging ban	NFPP	SLCP
Mianba	√	√	
Wucun	√		√
Gangou	√	√	
	Afforestation	Reforestation	Cropland Conversion
Mianba	√	√	
Wucun	√		√
Gangou	√	√	

3.1 NFPP in Baiwu Township: study of Gangou and Mianba

Gangou and Mianba both participate in the NFPP. Seven interviews were carried out with villagers and cadres in Gangou, and 5 in Mianba. In Gangou five NFPP sites were located, and it was also revealed that reforestation efforts have been made in this area prior to the new efforts with the NFPP. In fact, Gangou's history of planting dates back to the 1950s, involving aerial planting along the valley and community participation starting in the 1980s. Earlier forest restoration efforts planted *Pinus yunnanensis*, a key early-successional species frequently present in unmanaged forests (Figure 3). NFPP plantings, by contrast, have used only *Prinsepia utilis* and *Robinia pseudoacacia L.*

P. utilis is a shrub native to Sichuan whose seed oil has considerable potential economic value. *R. pseudoacacia* is an exotic tree species that has become naturalized in SW China. The interviews in Gangou revealed that villagers considered the earlier pine projects successes, whereas recent planting of *P. utilis* and *R. pseudoacacia* have not been successful and are considered unsuitable for the region.

In Mianba, which has only recently been introduced to reforestation/afforestation practices, twelve different afforestation sites were located. Prior to these recent reforestation/afforestation efforts there has been no history of organized tree planting in Mianba. Among the 17 NFPP reforestation/afforestation sites located throughout Gangou and Mianba (Table 4), the conditions observed at the sites were consistent with villager perceptions on the success of the planted forests.

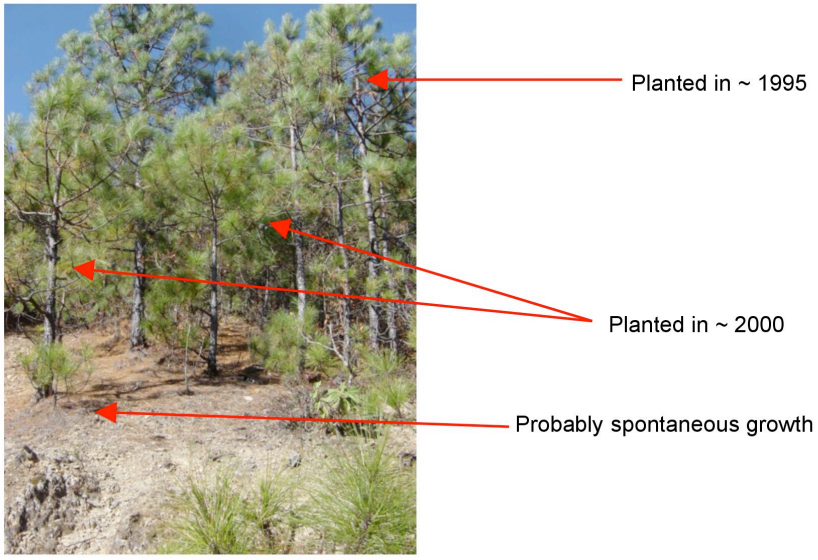

Figure 3 *Pinus Yunnanensis* growth in Gangou, showing times of planting according to villagers' accounts. Photo by Christine Trac, 2005.

Table 4 Planting sites and species planted through the NPFP in Gangou and Mianba

Location	Site	NFPP Planting	Species planted	Observed conditions
Gangou	1		*Pinus yunnanensis Franchet*	Successful growth
	2	√		Unsuccessful growth
	3	√		Unsuccessful growth
	4	√	*Prinsepia utilis Royle*	Unsuccessful growth
	5	√	*Robinia pseudoacacia Linn.*	Struggling growth
	6		*Pinus yunnanensis*	Successful growth
	7		*Pinus yunnanensis*	Successful growth
	8	√	*Prinsepia utilis*	Unsuccessful growth
Mianba	9	√	*Prinsepia utilis*	Unsuccessful growth
	10	√	*Prinsepia utilis*	Unsuccessful growth
	11	√	*Prinsepia utilis, Robinia pseudoacacia*	Unsuccessful growth
	12	√	*Prinsepia utilis, Robinia pseudoacacia*	Unsuccessful growth
	13	√	*Prinsepia utilis, Robinia pseudoacacia*	Unsuccessful growth
	14	√	*Prinsepia utilis*	Unsuccessful growth
	15	√	*Prinsepia utilis, Robinia pseudoacacia*	Unsuccessful growth
	16	√	*Prinsepia utilis, Robinia pseudoacacia*	Struggling growth
	17	√	*Prinsepia utilis, Robinia pseudoacacia*	Unsuccessful growth
	18	√	*Prinsepia utilis*	Unsuccessful growth
	19	√		Unsuccessful growth
	20	√	*Robinia pseudoacacia*	Struggling growth

Successful: trees were clearly alive; unsuccessful: majority of trees were dead or there were only very few left (Figure 4); struggling: some

growth but nothing that looked to have much potential and appeared unhealthy (Figure 5)

Unsuccessful growth of *P. utilis* and *R. pseudoacacia* was observed at all sites in both villages, to the extent that if was often difficult to tell if anything had been planted there at all. These two species were primarily used to afforest barren slopes and wastelands, areas that appear not to have had any previous natural forests. The locations of all sites were remote and not accessible by car, and considered distant even by the local villagers. Despite the fact that *P. utilis* when purchased for planting is 45 cm tall, the measured height of the seedlings, if still alive, was approximately 10~20 cm.

Figure 4 unsuccessful planting of Prinsepia utilis on a hilltop in Gangou (Photo by Christine Trac).

Although the actual practices were different at these two locations, interviews at both locations consistently provided evidence of ineffective government implementation and subsequent management. In Gangou the villagers recognize that the restrictions of "Closing the mountain to nurture the forest," or *fengshan yulin* (FSYL封山育林) prohibit grazing, cutting, and sometimes even entrance to areas of reforestation/afforestation. As a consequence, these restrictions place further pressure on the community, particularly on the women, who are responsible for collecting firewood for household use (e.g., cooking and heating). As a result of the logging ban and FSYL, women must now travel greater distances and scavenge more area to simply collect fallen forest debris that is insufficient and inefficient as a fuel source. In contrast, the villagers

Figure 5 struggling growth of planted Robinia pseudoacacia in Mianba (photo by Christine Trac)

Figure 6 Goats grazing on planted Prinsepia utilis in Mianba (Photo by Christine Trac).

in Mianba clearly stated that no restrictions exist, that in reforestation/ afforestation sites villagers graze animals (Figure 6), collect wood and even collect other species in these sites (e.g. mushrooms/fungi to sell in the town). Accordingly, Gangou villagers identify the hindrance and restriction of available grazing land as an aspect of the policy that affects their lives, whereas in Mianba there are no restrictions and therefore no

effects (at least directly). Although practices involved with the tree planting do not incorporate chemical use in either of the villages, observations of animal deaths in Mianba led villagers to believe that the seedlings prior to planting were treated with chemicals, which later resulted in the death of a few animals grazing on the seedlings.

The frequent use of reforestation/afforestation sites as grazing land clearly contributes to the lack of seedling success following planting in Mianba. But in Gangou, restrictions on grazing over these lands and a past history of successful growth of *P. yunnanensis* indicate inappropriate species selection for the conditions. In addition, *P. yunnanensis* is considered valuable for building purposes, but the recently introduced species are not immediately identified by villagers as having traditional use value. The villagers recognized that if they could be planted successfully, *Robinia and Prinsepia* might have potential economic value, but neither of the two planted species was identified by villagers as having naturally grown in these areas.

In both Gangou and Mianba, government involvement includes project initiation and project monitoring. In Gangou, villagers hold the environment guard, the mountain guard, and the village leader responsible for protection of the planted trees. In Mianba, the environment guard was the only person considered responsible, and some villagers believed there to be an absolute lack of management involved with the program. Villagers have observed infrequent management visits, between 1-3 times per year, that involve the "drive, park and look" method of monitoring, a process that takes between 30 minutes and 2 hours. Other methods observed by villagers were meetings between government officials and village leaders to discuss progress and officials' using binoculars to investigate the progress of planting. This cursory monitoring, much less detailed and careful than our own interviews or observations, forms the "empirical" basis for the reports of high rates of success in Baiwu mentioned above.

Villagers in both Gangou and Mianba recognize the potential value of reforestation, and explicitly expressed in their interviews the need to improve environmental stability with respect to soil erosion and having available timber/wood resources for the use of future generations, objectives very congruent with Nuosu traditional ethno-ecological values. But despite the benefits that forests can provide, participation in the particular programs was largely based on the incentive of pay or for the benefits of future use. In neither of the two villages was participation open to all individuals interested in participating but instead individuals were invited and selected by village~~r~~ leaders for participation, a practice that seeks to avoid dividing a fixed cash allocation into too many small shares. Participants in both communities received full compensation for their planting labor, but they expect and have received no pay in successive years for management or protection of the planted sites. Ten of twelve planters interviewed stated involvement in land forestation that solely entailed planting, and the other two also mentioned further practices for protection and management.

3.2 Implementation of SLCP in Baiwu Township: study of Wucun

The SLCP was only implemented in Baiwu Township in 2003, with planting carried out in four locations: Sancun (Village 3), Wucun (Village 5), Shiyicun (Village 11), and Shiercun (Village 12) — our results are from Wucun. The planted forests converted croplands and wastelands into either ecological or economic forests (Table 5), depending on the species selected for planting on these lands. Several different species were planted in the conversion of croplands to forests and the afforestation of barren wastelands. Croplands were primarily converted to shrub species, whereas barren wastelands were mostly planted with trees (Figure 7). Data from the Township Office were collected for all these sites, and field observations were also carried out in Wucun. Table 5 shows the official figures compared with our field observations where available.

It is possible that Wucun also participates in the NFPP but it is clearly evident that efforts with the SLCP have taken precedence. While traversing the landscape in Wucun and interviewing villagers, SLCP-directed planting efforts to convert cropland were identified. Three sites of planted forests were located in Wucun, all of which were former croplands planted with *Prinsepia utilis*. (See Table 5) The approximate total size of the three sites is 320 mu, with 300 of those *mu* in one site. The village leader, village secretary, and 3 participating

SLCP farmers were interviewed about these 'grain-to-green' efforts.

Table 5 Implementation of SLCP in Yanyuan County and Baiwu Township, with official figures and observations of specific sites in Wucun village, Baiwu

Type of planted forest		Yanyuan County Total	Reported success rate	Baiwu Township Total	Reported success rate	Species Planted in Baiwu	Area (*mu*)	Reported success rate	Observed condition in Wucun
Total		30000	99.33	3928.7	100		3928.7	100	n.a.
Converted cropland	Total area	15000	98.67	2391.3	100		891.3	100	n.a.
	Ecological forest	12987.7	98.46	891.3	100				n.a.
						Juglans Regia Linn.	85	100	Not observed
						Zanthoxylum piperitum Linn.	486.1	100	No planting apparent
						Prinsepia Utilis	320.2	100	Considerable amount of replanting; struggling growth; approximately 40-50% survival apparent
	Economic forest	2012.3	100	1500	100	Malus spp.	1500	100	Not observed
Afforested wasteland	Total area	15000	100	1537.4	100		1537.4	100	n.a.
	Ecological forest	15000	100	1537.4	100	Pinus yunnanensis	1537.4	100	Not observed
	Economic forest	0		0					

Sources: Baiwu Township Records, Field Observations

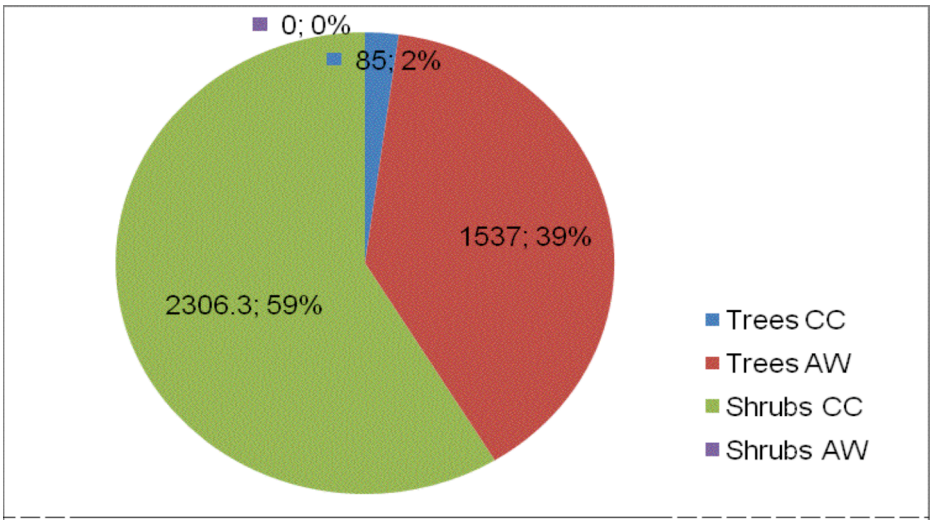

Figure 7. Distribution of vegetation types. Planting of trees and shrubs in cropland conversion (CC) and wasteland afforested (AW) in Baiwu township. (Area in mu; %).

In Wucun the villagers interviewed recognized both the environmental and the economic aims of the SLCP program, and the capacity of converting cropland to provide protection against soil erosion and economic products that might be future sources of income. When *Prinsepia utilis* was planted in Wucun, the farmers were interested in participating in the program for the potential economic benefits of an oil commodity produced by the planted species. In addition, Baiwu farmers who converted cropland were compensated in cash for the income foregone by not growing crops, at a rate of 260 rmb per *mu* for afforestation that meets the standard of 85 % survival of seedlings; payment is not provided for afforestation of previously barren lands, since farmers have not sacrificed any potential income. An interview conducted with one family, at the exact land they had converted, revealed that these participants had not been fully compensated for their planting (at the time they were interviewed, they should have received their second year of subsidies). But another pair of farmers, who had also planted *P. utilis* in close proximity to this land, stated that they had received subsidies for their participation. The program has thus had different implications for different people: those who had been compensated received the desired economic benefits, but those who had not received full compensation incurred adverse effects, causing the family to exclaim that there is not enough land for crops and consequently not enough food. In the massive conversion of cropland only a few 1 *mu* sized pieces were preserved for continued subsistence use — apparently not enough.

The large 300 *mu* site of agricultural cropland was converted to an "ecological forest" of *P. utilis*. It was evident that plant survival and growth were poor (Table 5, Figures 3~6), and clearly did not meet the 85 % survival standard for full compensation. To the western end of the site plants appeared healthy, but were replanted after failed growth; toward the eastern side the abundance and health of the plants decreased. But of greater concern, this site, with an average slope of 17 degrees, while an acceptable site by program guidelines, is not an ideal target for conversion, since the project specifically aims to concentrate on marginal cropland with slopes greater than 25 degrees. But according to government documents the land is in fact classified as highly sloping land – according to Yanyuan County Forestry Bureau documents 100 % of SLCP planting in Baiwu Township took place on land with slopes greater than 25 degrees. Reports of perfect results and high survival rates of planting, as well as counting moderately sloping land as highly sloping land, make the inconsistencies between government records and ground conditions blatantly obvious.

3.3 Bureaucracy, management, and implementation

From the above field observations, it appears that neither the NFPP nor the SLCP in Baiwu Township has been successful. But this lack of success is not evident in statistics even at the township level, let alone the county and higher levels. The forms used by the County Forestry Bureau in its records for the 2003 planting in Wucun provide a column for farmers to verify the number of *mu* planted and the compensation received, but a lack of signatures indicates either that farmers refused to endorse the results or, more likely, that this step of on-the-ground verification was skipped altogether when the reports were compiled. Figures in county documents report successful planting and SLCP implementation throughout the county and township, results which are inconsistent with both site observations and farmer reports of compensation in Wucun (See Table 5, above). Similarly, success at the county level is reflected in prefectural and provincial statistics (See Table 2 above).

We are thus faced with a situation in which a policy, decided upon at the national level, was implemented unsuccessfully at the local level, but reported back to the top as being a success. How

did this come about? We suggest that it is the result of two well-known characteristics of the Chinese bureaucracy: lack of coordination and communication between and within levels, and the practice of evaluating and rewarding cadres according to certain measures or goals. To discover how this process worked, we need to examine the processes of policy implementation and statistical reporting at levels reaching from the township clear up to the central government, and the way that this bureaucratic structure works against the on the ground success of the program.

As policies implemented in response to recently perceived environmental problems, the NFPP and SLCP are similar in goals, but are distinct policies implemented independently, albeit through some of the same agencies. Implementation of both policies by forestry bureaus from the national to the county level share the same basic organization, with comparable responsibilities delegated to each of the levels. The State Forestry Administration in Beijing designs and promulgates the policy, and transmits it directly to county governments, which are responsible for preparing proposals for implementation in their areas. These county proposals then work their way up through the system, from the prefectural level (if applicable), to the provincial level, and then to the national level. These are theoretically subject to complete review and comparative field inspections by each of the receiving levels to confirm the practicality of county proposals. If it approves the county's plan, the State Forestry Administration then disburses the funds (often insufficient) to the county for implementation. The county government thus marks a critical hinge point between completing paperwork and planting trees. To implement the centrally-approved plan, the counties then need to work with communities to meet program targets, which have been agreed upon all the way up the bureaucratic ladder, but without consultation with community members or local cadres.

We were able to interview officials in the SLCP office at the Yanyuan County forestry bureau. Although we were not able to interview NFPP officials, we believe that the problems faced by offices implementing the two programs are nearly identical. Both programs were designed to provide a broad outline to give provinces and counties enough room to work out locally practical plans for implementation. But the Yanyuan forestry officials find the SLCP guidelines to be strict and difficult to adapt to local conditions and still meet program goals. Counties are forced to work within the framework of the policies provided by the national government, with the authority to make only certain additions, and restricted from adjusting or modifying existing guidelines. This may contribute to the lack of success on the ground as revealed in the field surveys described above.

Insufficient funding has also proved to be a source of difficulty for Yanyuan workers to manage SLCP sites. In Yanyuan, the SLCP office receives central funds only for seedling costs and subsidies to farmers, but none for management of the program. Even the cash subsidies provided to farmers are directed through the County Finance Bureau without consultation with the Forestry Bureau. This makes it difficult for the Forestry Bureau to even confirm that compensation has been provided to the right farmers. The SLCP office thus has no actual financial responsibility, but is still inherently associated with the economic issues of this policy, because it is responsible for the site evaluations that ultimately determine farmers' compensations.

According to SLCP workers in Yanyuan the program has made adequate progress. While acknowledging the challenges and difficulties associated with policy constraints as well as the limitations caused by a lack of funding, these officials still blame farmers for program problems and weaknesses. According to the Yanyuan SLCP official directly responsible for program implementation in Baiwu Township, farmers do not take the policy seriously enough for the program to be successful. The official reported issues with uncooperative farmers who refuse to maintain the land conversion for forests and proceed to replant crops to convert the land back to agricultural use. (But somehow despite these struggles the county has still managed to maintain records that document ideal implementation and program success.)

In addition, there is little coordination at the Yanyuan County Forestry Bureau between the NFPP and SLCP offices, which also differ in both financial resources and forestry responsibilities. For SLCP management, the Yanyuan office is held responsible for organizing participants to complete program tasks. Individuals from the county

forestry bureau and the township forestry station are accountable for checking on replanting, farmer maintenance, and evaluating sites — basically, as stated by the provincial SLCP program designer 'the county forestry bureau is responsible for ensuring the success of the policy.' But there is no longer a Baiwu forestry station; according to villagers throughout the area, the station was sold, leaving workers without a work station, so they consequently returned to their homes in Yanyuan City. Without either an office or personnel in Baiwu Township, and without access to enough cars of its own to carry out even the 'drive, park, and look' method, it becomes almost impossible for the SLCP office to monitor and manage remote sites such as those in Wucun.

The NFPP management in Yanyuan is a little better off, and has been able to mobilize more local participation. The NFPP office in Yanyuan is responsible for overall forest protection and overseeing reforestation, but has some funds to hire local individuals to be specifically responsible for these tasks. But in Baiwu, decreased pay for these positions has resulted in villagers retiring from these positions, a considerable reduction in yearly pay from 1200 rmb to 500 rmb rendering areas unmanaged.

4 Discussion and Conclusion

The NFPP efforts of reforestation in Gangou and afforestation in Mianba were clearly unsuccessful; their dominant result was struggling growth due to unsuitable species selection, herds of grazing livestock, and weak or absent program management. The sites we visited were already complete failures or showed little potential for future growth. And the villagers in both locations widely agreed that the NFPP reforestation efforts failed in their communities. As for the SLCP, investigations in Wucun revealed a project that has had to rely heavily on replanting and clearly did not meet the standards established by the policy. A combination of ecological, economic, and bureaucratic issues involved with the implementation of these two policies has doomed both projects to local failure.

4.1 Ecological factors

In a general sense, the ecological reasoning behind the two programs may have been simplistic or premature. Logging bans have been demonstrated to be an inadequate approach for forest conservation region-wide, and while China's efforts to increase forest cover are commendable, literature suggests that it is too early to determine whether flood-control has been improved. Xu *et al.*, in a mostly positive comprehensive assessment of the impacts of the NFPP and the SCLP, still warn that "The environmental impact of the SCLP remains poorly understood in that it is impossible to quantify how much erosion originates from deforestation as compared to other driving forces (Xu *et al.* 2006: 605)." But still government reports have produced figures stating 20~30 % improvement in soil erosion in Sichuan province (Sichuan Province Forestry Bureau 2005). Furthermore the quality of the newly planted forests is questionable. In Baiwu Township, for example, official figures support complete success with forests planting under the SLCP, but our ground investigation has shown struggling growth.

More speficially, both the NFPP and the SLCP have emphasized *P. utilis*. This shrub species was selected for use in all sites of afforestation, reforestation, and cropland conversion. In the NFPP sites, this species was planted in combination with a naturalized tree species, *R. pseudoacacia*; and in the SLCP sites *P. utilis* was combined with occasional planting of *huajiao*, or *Zanthoxylum piperitum*, another shrub species with economic value. As in the area studied by Weyerhaeuser *et al.*, (2005) there is widespread planting of only a few species, promoting decrease in biodiversity. But even as one- or two- species plantations, these efforts have failed, because of the unsuitability of the selected species for the region. In Gangou, previous reforestation with *Pinus yunnanensis* has been successful, demonstrating that planted forests can succeed in this region [3]; the problems lie with the particular species

3) It should also be pointed out however, that many of the hillsides that were clear-cut in the first of the Three Great Cuttings in the late 1950s have regrown *P. yunnanensis* spontaneously, shedding doubt on the necessity to replant this species.

selected. Our results resemble those found by Tang (2004) in the valleys of the upper Min River, where there was large investment in tree planting that resulted in few successes, but planting continued despite the acknowledgement that the area may not be suitable for tree planting or growth. In Gangou, many of the sites selected for replanting were barren slopes and wastelands, areas previously not forested, – perhaps there is a reason why nothing has grown on this land before. These planting efforts failed to make the appropriate ecological considerations for local implementation.

4.2 Economic factors

The second set of reasons are economic and cultural. In the implementation of policy in rural regions, existing cultures and lifestyles of the communities inhabiting these areas are relevant and important factors. Many areas of implementation are in remote regions where conservation efforts frequently impinge on the land and livelihood of poor communities (Xu and Melick 2007). Both NFPP and SLCP place significant pressures on subsistence communities, with the logging ban reducing fuel and construction resources, conversion of crops to forests reducing crop yield, and afforestation efforts reducing grazing land (Weyerhaeuser *et al.* 2005). A forest guard in Sertar County expressed this concern when he said "we like planting seedlings, but we are worried that they will grow into big trees and reduce our grazing area" (Winkler 2003). Both policies have broad effects on local communities, making it essential to have the local support and cooperative participation in local projects for successful and sustainable forest management. But nationwide logging bans, afforestation, and reforestation projects inherently disregard existing traditions and strong values of forest stewardship among some minorities (Xu and Melick 2007).

While the villagers acknowledge the importance of reforestation, there is a lack of incentive for villagers to participate or protect growth in the new plantations. For reforestation to be successful, it is crucial to guarantee locals adequate economic benefit (Winkler 2002). Villagers are willing to participate in initial planting, in which they are paid for their labor, but they receive no payment afterwards to protect the planted forests. The land represents both potential forest and available grazing land, but with the planting of species which have neither traditional use value nor present economic value, grazing takes precedence. Planting of *P. utilis* has been utilized to emphasize the economic potential of this plant, but for villagers to profit and benefit from this there must be a market for the oil, and there must be an intermediary to deal with the seeds; otherwise the plant is rendered completely useless. In Wucun, croplands converted to economic forests are of great concern, as the villagers have voluntarily chosen to convert their land. It is critical for the villagers to be fairly and adequately compensated for the planting; otherwise the villagers return to planting crops. The subsidies provided to the villagers must compensate for the losses of converting the land, and there must be more time to promote growth to yield enough harvest (Weyerhaeuser *et al.* 2005) for the sustainability of this project.

4.3 Bureaucratic issues

The ecological and economic issues that have proven to be of concern for successful implementation of both the NFPP and SLCP are directly associated with the problems with the bureaucratic management of program implementation. As the basic unit for implementation, the county is forced to work with a rigid program design and placed under pressure to meet quotas set by the upper levels in the forestry bureaucracy. To realize the program goals, counties must directly implement and manage projects throughout the villages, taking responsibility for site selection, species selection, planting evaluations, etc. Responsibilities are placed entirely on counties and the availability of township forestry workers (who may or may not exist, given budget constraints) for implementation and management. While dealing with the same objectives, the NFPP and SLCP operate independently, with greater support given to the NFPP office. County SLCP offices require more support but lack the funding that would make management more feasible. These offices also function independently from the financial bureau that compensates farmers for their planting. While the offices are not responsible for payments, they are still responsible for dealing with upset farmers who do not receive their full compensation. These

deficiencies in funding, staffing, and interagency coordination are all obstacles to successful program implementation.

4.4 Reported Success

Despite ineffective management and observations of unsuccessful growth, reports abound of completely successful implementation of the two reforestation programs. These reports are presented from the township, to the county, to the prefecture, to the province, and to the national level as being successful. All of the reported figures suggest smooth implementation of SLCP and NFPP throughout the entire country, with no indication of possible program difficulties. The inconsistencies between reported progress and ground observations range from figures of planting survival, to the slope of the land used for conversion, to farmer compensations. The reported results tell a story of flourishing planted forests across the country that has already provided considerable soil erosion prevention, development of rural communities with great societal benefits, and a transition to sustainable forestry and land use practices. But in reality, in Baiwu Township, the forest planting has had greater costs than benefits. Planting efforts, which have disregarded biodiversity considerations and suitability of plant species, have been unsuccessful, and farmers have not been fully compensated.

We might expect such a discrepancy between reported results and facts on the ground, given the structure of the cadre evaluation system, which measures local officials' success in reaching particular policy goals. One of these goals is in fact the forested area of the official's jurisdiction (Whiting 2001: 103). Given the remoteness of the forestation sites, which discourages monitoring and auditing, as well as the lack of funding and staffing for the projects, it makes sense for local officials simply to report success and get credit for it — they do not have the means to monitor the reforestation sites, and it is quite unlikely that officials from higher levels will come all the way out to Wucun to audit the performance of the county cadres. So the system conspires not only toward failure of these projects, but toward reporting their success [4)].

We have, of course, only investigated a few hundred *mu* of the hundreds of thousands reported to have been reforested in Sichuan, let alone all of China. But we also know that the impressive country-wide figures, such as those for forest cover presented in Table 1, above, are compiled from level to level up the bureaucratic hierarchy, and we suspect that the Baiwu results may be representative of a larger problem. Misrepresentation at the village and township level can easily result in incremental magnification of figures up to the national level, something that has been a problem in China ever since the Great Leap Forward (Yang 1996: 36~37). Other local case studies, such as that reported by Weyerhaeuser *et al.* (2005), lead to further suspicion to the optimistic overall reports of China's forests. We recommend both further local case studies on the implementation of forestry policies and how the on ground sites compare to those officially reported, and larger-scale remote-sensing projects to supplement this ground-truthing. While acknowledging that China is making large-scale, sincere, and concerted efforts to increase the extent and health of its forests, we conclude that these efforts will need to take better account of local ecology, give greater consideration to the needs of local farmers and herders, and reform certain aspects of its fiscal and forestry bureaucracies before they can be completely successful.

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