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ORIGINAL PAPER

Central–local conflicts in China's environmental policy implementation: the case of the sloping land conversion program

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Abstract Deforestation since the 1980s has led to substantial loss of ecological services in China. As a responsive strategy, China launched the most ambitious reforestation efforts in the developing world. However, like many other environmental policies, forestry policy has not been effectively implemented, mainly due to the fragmentation nature in China's environmental governance institution. This paper highlights the impact of central–local conflicts on forestry policy implementation. With insufficient motivation, local governments tend to minimize their efforts in planning, monitoring, and supporting reforestation activities, which poses great challenges on the sustainability of the reforestation benefits. With extensive field experiences, this paper also raises three innovative strategies to solve the financial dilemma that leads to the effort minimization phenomenon, with both the advantages and disadvantages for each strategy critically discussed. It finally recommends ways by which the central government could improve design of reforestation policies, or other large-scale ecological programs, which involve local governments as a key liaison.

Keywords Vertical fragmentation · Principal-agent theory · Administrative funding · Post-reforestation transformation and support

1 Introduction

Climate change, as well as the radical deterioration it brings to the land and atmosphere environment in China, raises great concern about the environment among Chinese populations (Yu 2014). Among the various approaches to mitigate the negative detrimental impacts of climate change, green landscape modification through reforestation and afforestation has been recognized as a promising and sustainable measure and widely

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applied around the world. It has been estimated that every year, forests remove around three billion tons of anthropogenic carbon, amounting to about 30 % of all carbon dioxide emissions from fossil fuels (Canadell and Raupach 2008).

Since the end of 1990s, China has initiated several large-scale reforestation programs, such as the Sloping Land Conversion Program (SLCP), the National Forest Protection Program, and the Key Shelterbelt Development Program. In addition to mitigating greenhouse gas accumulation, these programs were also designed to conserve biodiversity, reduce soil and water loss, and increase domestic supply of timber products. However, the effectiveness of these programs are quite limited due to a weak, and sometimes counter, role of local governments in realizing the center's goal of environmental protection and ecological conservation.

Inheriting the characteristics of China's political system, environmental governance in China suffers both horizontal and vertical fragmentation (*tiao-kuai jiegou*). At the central level, the authority of environmental agencies, like the Ministry of Environmental Protection (MEP) or the State Forestry Administration (SFA), is encroached by other more leveraged ministries or commissions. For example, the Ministry of Finance (MOF) significantly influences environmental policy implementation, as it manages most environmental funding. The Ministry of Foreign Affairs often leads in negotiating international environmental agreements. The National Development and Reform Commission (NDRC) takes the primary authority over energy issues, such as regulating national energy markets, guiding major energy prices, and setting and revising energy policies.

At the local level, policy goals pursued by central environmental agencies may be compromised when they are in conflict with local interests. Generally, central environmental agencies would stick to their missions of environmental protection and ecological conservation, but local environmental officials are more responsive to the local governments. Most Chinese local governments tend to prioritize economic growth, and local environmental organs are so dependent on local governments in funding and personnel supply that they would subordinate the goal of environmental protection when the protection practices are viewed as hurdles of economic growth (Jahiel 1998). Thus, central and local environmental agencies in China are in fact separate parties with quite different, sometimes even conflicting interests.

This pair relationship of central and local environmental agencies fits well into the principal-agent framework.[1] While the central principal has the formal authority over environmental policy implementation, local agents have an informational advantage, and their behaviors impact both players' payoff. In addition, actions that help improve environmental quality as preferred by the central principal are costly to the agents, resulting in a preference for shirking. As indicated by the classical principal-agent theory (PAT), the principal can overcome the problem of shirking by imposing outcome-based incentives on the agents, but with some unavoidable efficiency loss, such as punishment on the losing but well-intentioned executives and higher demand of risky compensation package from local agencies. Moreover, the outcome-based incentives as suggested by economists may become less powerful in terms of behavioral control when they are adapted to political contexts, due to the cost of monitoring, limitations in the range of rewards and punishments, and for the most meaningful forms of rewards and punishments, the cost to the principals of implementing them (McCubbins et al. 1987).

[1] For a comprehensive formulation of the principal-agent theory, please refer to the classical work of Spence and Zeckhauser (1971), Hölmstrom (1979), and Shavell (1979).

In this study, I investigate the problem of central–local fragmentation in the reforestation policy implementation, particularly taking the SLCP as an example. As a starting point, I clarify the format of outcome-based incentives utilized in the SLCP, by reviewing its policy documents and formal administrative contract design. I further analyze how local agencies respond to such incentives, with extensive evidence from field survey and individual interviews. Two findings from the fieldwork are particularly striking. First, over 10 years of implementation, the central environmental agencies had not developed effective incentives in mobilizing local cooperation in the SLCP. The center over-depended on bureaucratic incentives, such as career promotion and administrative punishment, but seemed to ignore local agents' demand of financial compensation for their implementation efforts. Local environmental officials shirked their efforts, especially in the process of allocating reforestation quota and providing post-reforestation support. Lack of local administrative efforts in these two key stages resulted in a variety of civil conflicts, as well as economic and ecological failures. As suggested by classical PAT models, these failures reflect the limitation of outcome-based incentives in mobilizing political efforts.[2]

Second, far from just being responsive to the center's administrative control, local environmental agencies took more active roles in solving financial tensions as expected. Although they initially milked the compensation system, during later stages, local agencies actively sought cooperation with the central agencies and local business, and developed several approaches to replenish the SLCP administrative budgets and fulfill its goals of forest restoration. I illustrate two of such approaches, proposing supporting programs associated with the SLCP and developing off-farm industries. In fact, local agencies' active role in the SLCP implementation reverses the hierarchical model suggested by the PAT, a phenomenon that has already been documented by Cook and Wood (1989) when they analyzed how the US Environmental Protection Agency (EPA) manipulates Congress and senatorial committees through mobilized support.[3]

The paper is organized as follows. I first review the SLCP's policy formulation and then highlight the two major difficulties local governments encountered in implementing the SLCP: allocating reforestation quotas and providing post-reforestation supports. This is followed by a discussion of local governments' innovative solution to them. The article concludes by drawing broad lessons about the significance of local stakeholders in environmental project implementation in China.

2 The sloping land conversion program

Similar to most ecological projects in China, the SLCP was performed on an expedited time frame. It was initiated in 1999 as an immediate response to the devastating floods in China's most two important river systems: the Yangtze River and the Yellow River basins. During the pilot stage (1999–2001), the project covered three ecologically vital provinces: Gansu,

[2] As Michael Spence and Richard Zeckhauser pointed in their 1971 work, as long as the central principal cannot completely monitor its local agents' behavior at zero cost, the inefficiency of higher demand of risky compensation from local parties would be inevitable. In addition, effective incentives at the hand of political leaders are quite limited. Even when they are available, it may require a high cost to implement them.

[3] When examining the US EPA's work around the 1980 election, Wood found that although the White House and senatorial oversight committees had "applied all of the available tools of administrative control toward moving EPA from vigorous implementation of the law. But the data analysis shows that in the end EPA's revealed preference were completely opposite from what the model predicted."

Shaanxi, and Sichuan,[4] with a primary goal of "reducing soil erosion and desertification and increasing China's forest cover by retiring steeply sloping land from agricultural production" (Bennett, 2008). After that, the SLCP was rapidly expanded to over 400 counties in 20 provinces in 2002, and increased again in 2006 to a total of 2279 counties in 25 provinces, which made it almost a national program. During the geographic scale expansion, the SFA also reinterpreted the SLCP as a poverty reduction program serving remote regions, especially those with high proportions of sloping and degraded land (SFA 2003).

In contrast to ecological and environmental programs that rely on command-and-control approaches, the SLCP represents an important policy shift. It is the first Payment for Ecosystem Services (PES) program in China. The central government pays rural households to retire their steeply sloping crop lands and plant trees on it. The payments are adapted to two regional regimes, including (1) 2250 and 1500 kg of grain (as of 2004, this payment had been switched out for the cash equivalent of 3150 Yuan and 2100 Yuan, where 1USD = 6.27 Yuan) for every hectare (ha) of enrolled cropland in the Yangtze River Basin and in the Yellow River Basin, respectively; (2) a cash subsidy of 300 Yuan/ha; and (3) free seeds or seedlings, provided to farmers at the beginning of the planting period (Chen et al. 2009). In addition to the two regional regimes, the subsidies take three different lengths according to the plantation types: 8 years for ecological forests, 5 years for economic forests, and 2 years for grasses.[5] These payments are on average quite generous, even compared to PES compensation standards in wealthier countries. For example, if compared in monetary terms, SLCP compensation in the Yellow River and Yangtze River basins, respectively, are around 2.6 and 3.7 times the average rental payments of the US Conservation Reserve Program. However, contrary to payments to individual farmers, no payments or administrative funding has ever been arranged to support local governments in implementing the project. They were treated as obedient agencies in the policy design.

Along with SLCP's rapid expansion, however, few modifications had ever been made on its policy design so as to adapt with the quite diversified ecological and economic conditions across the country. In addition, other than site selection, few assessment reports had been ever published by the government to evaluate the project's ecological and economic significance, not to mention the appropriateness of incentive mechanisms and the sustainability of the project (Liu et al. 2008; Gao and Guo 2012). It also left a significant gap in understanding and coping with bureaucratic concerns in the process.

While the SLCP's expansion helped China increased its vegetation cover in a relatively short time period, the abovementioned deficits in its policy design resulted in ecological failures and social unrests. In addition, the institutional and ecological deficits sometimes reinforced each other. For example, seedling survival rates in some regions were much lower than their natural levels because (1) tree species were not properly selected to fit local ecological conditions (such as water availability) and/or (2) newly planted forests did not receive sufficient stewardship from local farmers and governments (Weyerhaeuser et al. 2005; Bennett 2008). As Trac and his colleagues observed in one of the pilot provinces, Sichuan, monitoring only occurred 1–3 times per year, and such monitoring only consisted of "driving, parking, binocular observation, and brief talking between higher level officials and village leaders" (Trac et al. 2007). In addition, given the rigid compensation design, which involved only two regional regimes, farmers received

[4] Soil erosion in the three provinces has been believed to contribute most to floods in the Yangtze River and the Yellow River basins.

[5] In SFA's system, ecological forests refer to timber-producing forests, and economic forests refer to orchard crops or trees with medicinal value.

substantially higher or lower net incomes on reforested land, compared to their previous crop incomes, which served to skew the economic incentives (Uchida et al. 2005). Also, as local governments tended to retain central subsidies for their own use, shortage of compensation delivery to the farmers was not uncommon. Local government forced farmers to reforest lands but through flaws in policy design and implementation refused to provide adequate financial compensation to farmers who had trouble in maintaining survival rates of trees (Grosjean and Kontoleon 2009; Gao and Guo 2012; Xu et al. 2004). Consequently, the coerciveness in policy implementation led to great threat to the sustainability of ecological benefits generated under the SLCP, as many farmers opted to return to planting cash crops after the compensation periods lapsed (Uchida et al. 2005; Grosjean and Kontoleon 2009; Chen et al. 2009; Ye et al. 2003).

With extensive field surveys, past studies have comprehensively revealed SLCP's implementation shortfalls from the farmers' perspective. However, they largely ignored arguments from the side of local policy executants. In addition, most of the aforementioned studies were based on survey data collected before 2005, and could not contain the significant revisions on the SLCP since 2007. After that year, in recognition of the serious challenges to the sustainability of the SLCP's ecological benefits, the central government extended compensation payment to the year of 2021 and initiated new auxiliary programs of complementary reforestation, basic farmland construction, rural energy development, and eco-migration. These new experiences have been seldom discussed in the literature. Finally, previous studies tended to focus on isolated problems with the SLCP implementation and ignored the overall institutional complexity underlying the identified problems.

This study takes a new perspective by focusing on the project's local executants and analyzes how the reforestation project was carried out by local executants as a result of the motivations and constraints they were facing. Through analysis of in-depth interviews with local forestry officials and farmers in four SLCP participating provinces—Heilongjiang, Ningxia, Chongqing, and Yunnan—this study suggests that most of the aforementioned implementation problems were related to a shortage of financial incentives at the local level. Lacking adequate administrative funding support, local governments would sacrifice precision in making pre-reforestation plans (tree species selection, reforestation land recruitment) and shirking their efforts in providing post-reforestation support (reforestation inspection, professional training for off-farm employment). In addition, under financial pressures, local governments tended to reallocate a portion of the central subsidies in the SLCP for local uses.

This study also suggests potential solutions to the implementation problems, borrowing the wisdom of various regional innovations that proved successful in replenishing local budgets and promoting the sustainability of the reforestation efforts in the SLCP. The lessons and experiences drawn from these regional innovations should provide a useful resource for forestry policy makers as they continue to evolve and improve the SLCP policy design, as well as assist in appropriate design of other programs involving local agencies as an implementation hinge.

3 Policy implementation at the local level

As a large national program, the SLCP is unavoidably subject to central–local conflicts. The project's original design was quite simple: The central government pays rural households to plant trees on their croplands. In other words, the center buys forest

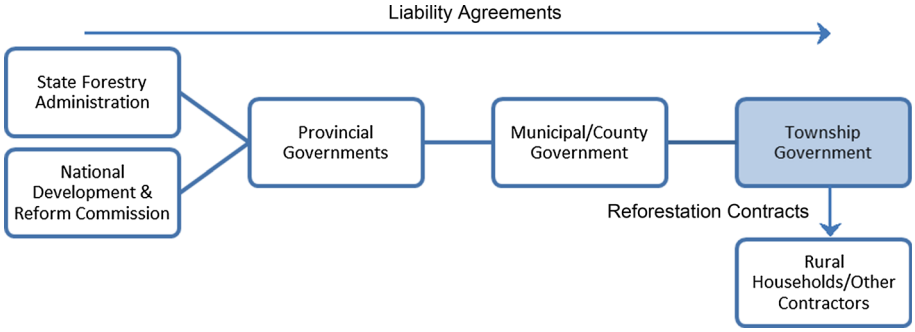

Fig. 1 Administrative structure of the SLCP

ecological services from individual rural households. However, the center's compensation payments cannot be made directly to each household and rural households cannot directly report their reforestation achievements to the center. Local agencies are indispensable liaisons in such a large-scale ecological project. They are responsible for collecting and reporting information about local economic and ecological conditions, communicating central directives to individual households, allocating reforestation quota, distributing subsidy payments, providing technical and other supports to participating households, and monitoring project implementation. These agencies must be properly motivated before the reforestation program becomes a success.

In practice, the central government heavily depends on bureaucratic incentives in mobilizing local cooperation. First, it designs the SLCP as a comprehensive governmental project (*zhengfu gongcheng*), not just a sectoral one (*bumen gongcheng*). As shown in Fig. 1, the SFA and the NDRC cooperatively represent the central government to sign liability agreements with provincial governments. In turn, the provincial governments assign the tasks down through the administrative ladder one by one, till the township governments. In this process, the chief executives of local governments, not forestry bureaus, take the primary responsibility in implementing the SLCP. They are expected to maneuver all local resources to realize the goals of tree planting, forest management, and supporting infrastructure building. In contrast, the role of local forestry bureaus is reduced to a participating party in the SLCP.

Second, the center utilizes *ex post* sanctions in the SLCP implementation. Along with the SLCP regulation, the SFA issued a notice on punishment for unsatisfactory administrative performance (the "Notice"). According to the Notice, given unsuccessful implementation,[6] local government leaders would be penalized with bureaucratic warning, demerit record, serious demerit record, criminal charges, demotion, and even decapitation, depending on the seriousness of the failure. These are credible threats: Cases of punishments on local government and forestry officials due to poor SLCP implementation had been occasionally mentioned by forestry officials during the interviews.

In contrast to the bureaucratic incentives, the SLCP provides little financial incentive to mobilize local efforts. As a land use change policy, the SLCP would be naturally resisted

[6] Unsuccessful implementation has been defined quite broadly in the SLCP. In addition to low survival of newly planted trees, many other faults may also cause administrative penalty on local officials. These include purchase of unqualified tree seedlings, ineffective complementary planting, appropriation of SLCP compensation, and even serious complaints from local farmers.

by local stakeholders as it restricts agricultural production, requires great administrative efforts, decreases farmers' incomes, and shrinks local tax bases. These negative economic impacts on local agencies were not attended or compensated by the central government. It dictates that the SLCP's administrative costs should be primarily paid out of county governments' budgets.[7] Poor administrative budgeting at the county level was repetitively complained by local forestry officials as the reason of many implementation problems, with allocation of reforestation quota and provision of post-reforestation support as the two major ones.

3.1 Allocation of reforestation quota

Due to lack of administrative resources, local forestry officials had to reduce their efforts in targeting sloping cropland and monitoring reforestation sites. In discussing prevailing problems local forestry officials faced in implementing the SLCP, an official in Ningxia explained some of the reasons:

> It is not realizable [to conduct such precise targeting]. We [the county] have three townships and four villages, including 114 natural villages. The area [of the county] is 1131 km^2 [i.e. 113,100 ha]. Only driving through the whole county along built roads would take two days, not to mention examining the land plot by plot… Only two people here are able to do this job [i.e. reforestation land targeting]…You also need to count in the cost of gas. Patrolling the mountain areas once will cost over RMB5, 000. Who pays that? We are not covered [by our parent units].

One strategy local officials adopted to reduce, or even minimize, administrative effort was to enroll only large blocks of land, as this helped save monitoring costs. For example, in two counties in Ningxia, the minimum size of the enrolled land was set to one ha. While the easier-to-implement method of retiring continuous swaths of land served to increase administrative convenience, it negatively impacted the ecological effectiveness of reforestation. As stipulated in the SLCP plan, the program aims to curb soil and water erosion and specifically targets croplands hillsides steeper than 25°. However, under the policy of continuous retiring, a significant portion of high-quality and gently sloping land was enrolled, while steep-sloping and low-quality land remained in cultivation. In addition, this retiring method directly contradicted the principles of volunteerism that had been appraised by many scholars as a merit distinguishing the SLCP from the traditional forest management practices in China. There is no reason to assume that farmers' willingness to participate in the reforestation program changed synchronously with the steepness of their cropland, i.e., there is no reason to believe steep-sloping land owners were more willing to participate and gently sloping owners less willing to. In my field work, it was observed that some rural households were forcibly enrolled in the SLCP by local forestry bureaus, and some were forcibly excluded.

[7] Although, in realization of the substantive work involved in the SLCP implementation, the central government also allocates some administrative fees to provincial governments since 2002, they are far from enough to cover all implementation costs. As required in the *Technical Regulation for the SLCP (tuigenghuanlin gongcheng zuoye jishu zhinan)*, county governments should establish a special fund out of their local budget to pay the SLCP project management fees, as a rate of RMB45-75/ha. Using this rate as a standard, reforesting 26 million ha of land means a total spending of RMB1-2 billion, which is non-trivial. In order to alleviate the financial burden on county governments, some regions make alternative arrangements. For example, in Yunnan, payment of the SLCP management fees is equally shared among provincial, municipal, and county governments.

Since compulsive land recruitment practices often induced serious resistance among rural communities, in some villages, they were substituted with another low-cost targeting method, limited voluntary participation. In this model, farmers were free to choose whether to participate in the SLCP or not, as long as their croplands were on hillside steeper than 25°. This strategy also helped reduced local government's cost in pre-program planning. However, the seemingly reasonable targeting rule caused serious incompatible plantation on neighboring plots, as well as civil conflicts among rural neighbors. As commonly perceived by local farmers, participating was a better choice for two types of households: (1) households with hilly croplands that were hard to cultivate, and (2) households with adult male and female members migrating to work in cities. Households that had relatively flat croplands and enough labor force remaining at home would maintain crop cultivation. Thus, as driven by local farmers' willingness to participate, a unique landscape with various small plots of croplands and bamboo[8] forests adjacent to each other[9] were formed in these villages. Farmers' concern arose when they found that the growing of crops and bamboo on adjacent lands affected each other. Owners of bamboo plots complained that use of fertilizer on neighboring croplands affected the growth of bamboo springs. Owners of croplands argued that bamboo springs took so much water and soil nutrition that crops would not live or became sterile. These civil conflicts had been commonly recognized by local farmers and forestry officials for a long time, but remained unresolved. As an official in Chongqing noted:

> When you let them [farmers] freely choose to plant bamboos or crops, you also need to get ready to receive complaints from them. Land [and earnings from land] is the most important thing for farmers…This is a big [not easy] issue in rural areas.

In addition to concern about incompatible plantation, farmers also expressed doubt about the fairness of reforestation quota allocation. This was especially true among farmers who intended to participate but rejected. The SLCP adopted an apply-approval system for reforestation quota allocation. For most local governments, reforestation plans would not be 100 % approved by the center. Thus, some qualified sloping land had to be excluded from the program. On the other hand, since the central government provided relatively generous compensation in the form of living subsidies, namely to farmers, some farmers treated the SLCP as a poverty reduction policy. Thus, in regions with few off-farm job opportunities, farmers would compete for the opportunity of being enrolled in the SLCP. When a farmer with strong willingness to participate was rejected by local governments, he would complain that the opportunity was used by forestry bureau officials to cater influential households or benefit villagers they had personal connections with. Given the tradition of authoritative decision-making processes and few limits on bureaucratic power in rural China, such concerns could not be easily ruled out. However, this nepotism phenomenon was also hard to demonstrate as forestry bureau officials declined to share local SLCP roster.

Overall, the cost minimization strategies did not help reduce forestry officials' efforts in implementing the SLCP, as they expected. Instead, more efforts were required sometimes to resolve the conflicts and concerns resulted from the cost minimization strategies. While local officials saved time and money by not patrolling hillsides (by recruiting only large blocks of lands or with the limited volunteerism principle), they had to expend significant

[8] Bamboo was the major species used for reforestation in this region, as it not only was recognized as "ecological forests" under the SLCP but also generates considerable economic values.

[9] Chongqing has a typical hilly topography, with fragmented flat and hilly areas adjoining each other.

energy and resources in mediating conflicts between participating and non-participating households and addressing concerns about the fairness of reforestation quota allocation. An administrative officer described the difficulties they encountered in implementing the SLCP as follows:

> We definitely hope we can satisfy all farmers with our job [in implementing the SLCP], as over-complaints [here the official meant farmer petitions[10] or social movements] from them would result in negative evaluations of our job. We may be excluded from the year-end evaluation and banned from bonus, regardless of any other good job we did. More seriously, we have heard the stories that some forestry bureaus and their leaders received political warning due to farmers' petitions. However, it is not easy to satisfy all of them, you know, as a Chinese saying goes, it is difficult to cater for all tastes.

The implementation cost minimizing strategies adopted by local forestry bureau officials and the resultant dilemma they encountered in allocating reforestation quotas reflected the limitation of bureaucratic rewards and punishment as incentives in political principal-agent relationships. McCubbins et al. (1987) expressed doubt that political incentives were as powerful in behavior alignment as they had seemed in economic and business contexts. They explained the ineffectiveness of incentive mechanism in political settings with the "cost of monitoring, limitations in the range of rewards and punishments, and for the most meaningful forms of rewards and punishments, the cost to the principals of implementing them" (McCubbins et al. 1987, pp. 251–252). In the case of the SLCP, if the central environmental agency expose and punish bureaucratic noncompliance, it would cause local farmers to doubt the effectiveness of reforestation policies as a whole, a phenomenon the center would try to avoid anyway.

The compromise local forestry officials made in implementing the SLCP also exemplified the deficits of an environmental campaign with an expedited policy design. As a national land use change policy, the SLCP radically transformed the way of rural production, and unavoidably involved various civil conflicts, both expected or unexpected. To prevent pervasive negative influences of such conflicts, policy makers should extensively and comprehensively refine the program through more trial rounds before implementing it on a nationwide basis. In view of the great variety in social and ecological conditions in China, the SLCP policy makers should pursue a delicate balance in the policy design. On the one hand, it needs more flexibility that allows local executants to modify the program to fit local conditions.[11] On the other hand, it should also contain greater national level oversight to minimize bureaucratic favoritism. As Ostrom has explained, in regards to management of common pool resource, like forests, collective institutions that are commonly recognized in local communities may be more effective in solving "small-scale, but still complex, uncertain, and difficult problems," compared to the rules supplied by external authorities (Ostrom 1990). Although the forests newly cultivated under the SLCP are defined as private property,[12] the forest resources *per se* inherit more characters of

[10] Petition, also called *shangfang* in Chinese, is an approach frequently used by Chinese farmers when their conflicts with local governments cannot be resolved. They will visit higher authorities to appeal for help.

[11] Bennett (2008) has pointed out that the SLCP has been designed with little differentiation. Apart from the two regional regimes and three subsidy lengths, program stipulations devise little flexibility that allows for differentiation across targeted areas and participants.

[12] As stipulated in the SLCP plan, the property of newly planted trees belongs to the people or institutes who are entitled with the usufruct rights of croplands that are reforested under the SLCP.

common property. This is illustrated by the close interconnection among small-scales land uses (the externality of one land use on another as highlighted before). Thus, simplified top-down quota assignment would not work for the SLCP. However, if we go to the other extreme and utilize a recruitment mechanism based on absolutely voluntary participation, it may also cause problems of incompatible land use. An ideal way is to decide SLCP participation based on a collectively recognized rule that is acceptable to the whole community. However, reaching such agreements in communities without sufficient social capital or collective decision-making traditions is challenging. It may still require significant inputs of time, energy, coordination efforts, and administrative funding from local forestry bureaus, which have been demonstrated to be lacking in the implementation history of the SLCP.

3.2 Provision of post-reforestation supports

In addition to the predicament local forestry bureaus encountered in allocating reforestation quota, poor administrative budgeting also restricted provision of post-reforestation supports. Reforestation means not only transferring croplands to forests, but also transferring traditional farmers to agroforestry workers, transferring livestock from open rangelands to closed barns, and in some regions, transferring major energy sources from dry crop straws to more advanced energy supply. In view of these social and economic transformations associated with reforestation, policy makers suggested auxiliary components in the SLCP Regulation (*tuigenghuanlin tiaoli*) plan. As written in the fifth section of the regulation[13]:

- In the process of reforesting sloping croplands, local governments should increase inputs in basic farmland construction, raise farmland productivity, and pursue stable grain supply.
- Based on practical situations, local governments should develop small-scale renewable energy supply in rural areas to satisfy farmers' energy demand. Energy supplies from biogas, small hydropower, solar power, and wind power should be considered.
- The center encourages eco-migration, and will subsidize infrastructure building in the immigrants' communities.
- After reforestation, local governments should prohibit grazing in reforestation sites and introduce the experiences of captive breeding to farmers.

These practices have been considered essential to bolster the sustainability of the SLCP, as they could solve farmers' post-reforestation concerns about grain availability, energy sources, and livestock husbandry, and help them adapt to the significant transformations in the newly established forestry operation. However, realizing such a smooth transition requires substantial investment, which is beyond the capacity of individual farmers. The focal question becomes who should bear the economic costs. It would not be surprising for local governments, already short of administrative funding in implementing the SLCP, to remove these suggested but not required tasks from their to-do list. Unsolicited remarks from several forestry bureau officials suggested that neither forestry bureaus nor local governments considered basic farmland construction or alternative energy source development as component tasks in the SLCP. Instead, they thought such public services should be generated under separate programs and that the central government should provide

[13] These components were listed as policy recommendations in the initial plan of the SLCP. However, they were listed as the SLCP facilitating programs in the 2007 policy revision.

additional funding for these programs. For example, when discussing how to replenish energy supply given the decrease in availability of dry crop straw as the primary energy source, an administrative official in Ningxia showed me a proposal for developing biogas plants in his county. In this proposal, although reforestation had been listed as one of the reasons for developing biogas, it was still counted as a program independent from the SLCP. The proposed budget for this program was about RMB 2.46 million, with RMB 0.9 million of capital investment, RMB 1.5 million of labor fees, and less than RMB 0.06 million of other expenses. As shown in the proposal, the county government requested central government investment of RMB 0.75 million, accounting for 30.5 % of total budget and 83.3 % of all capital investment. In contrast, the county government would only match the center's spending with a local investment of RMB 0.21 million, accounting to 8.5 % of total budget and 23.3 % of capital investment. The remaining RMB 1.5 million of labor costs would be undertaken by farmers. This proposal had been submitted in 2009, and was still pending in 2011. Given that the county government had not developed other alternative energy sources and that the policy of tree-cutting prohibition (*fengshan yulin*) had been strictly enforced since the beginning of the SLCP, farmers in that county had been suffering from energy shortage for at least 9 years.[14]

In addition to the constraints of tight budgets, the long tradition of project-based rural management in China also explains local governments' over-dependence on the center in providing rural infrastructure. Since the early 1980s when China initiated the economic reform, rural development has been raised as one of the top issues on central government's agenda and become heavily dependent on central government sponsored programs. An NDRC's internal report shows that central government sponsored programs have covered almost all aspects of rural living and production, including key agricultural species (oil plants, sugar crops, and cotton) production, seed engineering, livestock breeding, basic farmland construction, agricultural irrigation system construction, natural reserve protection, rural community infrastructure construction (drinking water supply, electricity supply, road construction, and biogas development), and even renewal of school buildings (NCRD 2011). According to the national statistics, from 2001 to 2006, the central government spent <30 % in total government expenditure, but it contribute a much higher percentage in rural infrastructure construction (Table 1). Given the tradition of a big role of central government in building rural infrastructure, rural local governments have gradually shrunk themselves back to a facilitating role.

Overall, in regard to the SLCP implementation, most problems have been attributed by local government officials to poor administrative budgeting, or lack of financial incentives from the center. At the local level, administrative funding shortage has induced various effort minimization strategies. For example, local executants have seldom conducted comprehensive pre-program assessments to evaluate the appropriateness of plot targeting or tree species selection. In some counties, these procedures were even reduced to a conference discussion among several technical staff members. In addition, without additional funding, provision of post-reforestation supports, like alternative energy supply and off-farm employment training, was limited, although they were essential to help farmers adapt to the radical post-reforestation transformations in living and production modes. In fact, insufficient input of efforts from local governments could explain various problems as suggested by other scholars, such as lack of respect to the volunteerism principle, low

[14] Ningxia was enrolled in the SLCP in 2002. A local farmer reported that his household's spending on coal purchases had been double since they participated in the SLCP.

Table 1 Central and local government expenditure and their investment in rural infrastructure construction

	Ratio of central and local government expenditure		Ratio of central and local government investment in rural infrastructure construction	
	Central government	Local governments	Central government	Local governments
2001	30.5 %	69.5 %	48.4 %	51.6 %
2002	30.7 %	69.3 %	32.8 %	67.2 %
2003	30.1 %	69.9 %	48.0 %	52.0 %
2004	27.7 %	72.3 %	51.2 %	48.8 %
2005	25.9 %	74.1 %	40.7 %	59.3 %
2006	24.7 %	75.3 %	36.4 %	63.6 %

Data from *China Statistical Yearbook 2007* and *Rural Statistical Yearbook of China 2002–2007*. Since 2007, statistical caliber has changed and the number of central government spending on rural infrastructure construction became unavailable. Thus, the table only summarizes government expenditure data between 2001–2006. Local governments' investment in rural infrastructure construction is calculated by subtracting central government's spending from the total investment. 2001–2003 data of total investment in rural infrastructure construction are directly cited from *Rural Statistical Yearbook of China 2004*. Due to change in statistical caliber, this item has not been included in the statistical yearbook since 2004, thus, data for the year of 2004–2006 are derived by summing all infrastructure relative items in rural investment

survival rates of newly planted trees, ineligible targeting of croplands, and a high tendency among farmers to return to crop planting.

4 Local governments' solutions

With the suddenly increased but uncompensated workload of the SLCP implementation, minimizing administrative expenditure through parsimonious procedures was a natural response of local governments, but this was far from the final solution to their financial plight. Given the strict political penalty embedded in the program design, long-term ineffective implementation of the SLCP is incompatible with local leaders' political interests and they therefore are incented to seek solutions to local budget constraints to improve the SLCP implementation. As discussed below, the form of these solutions changed along with the SLCP development.

4.1 Milking the compensation system

According to the stipulations of the SLCP, the central authority has on-paper control over almost every detail of the project, from assigning reforestation quotas to setting the compensation standards. Local forestry agencies are required to strictly carry out the plan stipulated by the center, without any local discretion, but on their own administrative budget. However, these arrangements turned out to be ineffective in curbing local governments' strategic response of inflating their subsidies, especially in the early stage of the SLCP when monitoring systems were not fully established. At this stage, in order to recoup the administrative costs, local forestry agencies had often employed two strategies: (1) include already forested land into the reforestation plan, or (2) file an ambitious reforestation plan, implementing only part of it, and later reporting low survival rates for the

whole plan. Since low survival rates had generally not resulted in significant withdrawal of subsidies from the center, local forestry agencies could retain the compensation payments for the part of the land that was actually not reforested, and use the savings to cover local administrative costs. Although these illegitimate practices were never mentioned by local forestry officials during my interviews, they had been revealed in several other empirical studies as one of the major implementation deficits in the early stage of the SLCP. A direct result of this deficit was the excessive expansion of the SLCP since the beginning of SLCP in 1999. The three pilot provinces of Sichuan, Shaanxi, and Gansu overshot their quotas by more than 100 % within 3–4 months. This continued through 2000, when 312 counties initiated land conversions on their own initiative, despite the fact that the central government's plan was to implement the pilot program in only 174 counties. Since then, the SFA had continued to receive numerous requests from local governments asking for higher land conversion quotas. The excessive expansion driven by local governments ceased in 2003, when the central government cut down reforestation quota allocation. As shown in Fig. 2, the area of croplands converted to forests under the SLCP decreased from 3.77 million ha in 2003 to 3.33 million ha in 2004, with an even sharper decrease in the area of reforested barren lands from 3.36 million ha in 2003 to 0.67 million ha in 2004.[15]

Since 2004, the strategy of retaining central subsidies for local use gradually became not as "attractive" and "profitable" as before. On the one hand, this strategy had aroused serious concerns from both the central government and individual farmers, which posed great pressures on local governments as the middle party. From the center's view, low survival rates of trees with fixed or even increased budgetary spending meant significant wastes of financial resources. From the farmers' perspective, successive shortages of subsidy delivery, whether due to legitimate excuses (e.g., low survival rates of trees) or not, triggered public anger and even social unrests.[16] Additionally, acquiring central subsidies had become increasingly hard, especially after 2007. In the new round of the reforestation program (2007–2015), the center not only ceased assigning new reforestation quotas to local governments, it also decreased by half the value of compensation payments. Thus, little room was left for local governments to manipulate the distribution of central subsidies.

4.2 Proposing supporting programs associated with the SLCP

The year 2007 was a milestone in the SLCP implementation. As mentioned above, 2007 marked the inception of the second round compensation. In this year, the State Council issued the Notice of Perfecting the Policy of Converting Farmlands to Forests, which represented essential policy revisions from the first round (1999–2006). While the new

[15] This change should be mainly attributed to a policy retrenchment, not a decrease in the area of convertible lands. As to the year of 2007, there was still 1.06 million ha of sloping croplands, with a slope >25°, that had not been reforested (Gao and Guo 2012).

[16] Cases of social petitions and movements caused by shortage of the SLCP compensation delivery had been repeatedly reported by influential media agencies since 2003. For an incomplete list, such cases have been revealed in the county of Yingshan in Sichuang, the county of Cheng, Min, and Qinzhou in Gansu, the county of Nanzhang, Jiangxia, and xishui in Hubei, the county of Feng, Hanzhong, Ziyang, Xunyi, and Fengxiang in Shaanxi, the county of Gushi and Shangcheng in Henan, the county of Wushan in Chongqing, the county of Xingcheng and Kazuo in Liaoning, the county of Li and Xinning in Hunan, the county of Suiyang in Guizhou, the county of Huaining in Anhui, the county of Yongfu in Guangxi, and Suiling Farm in Heilongjiang.

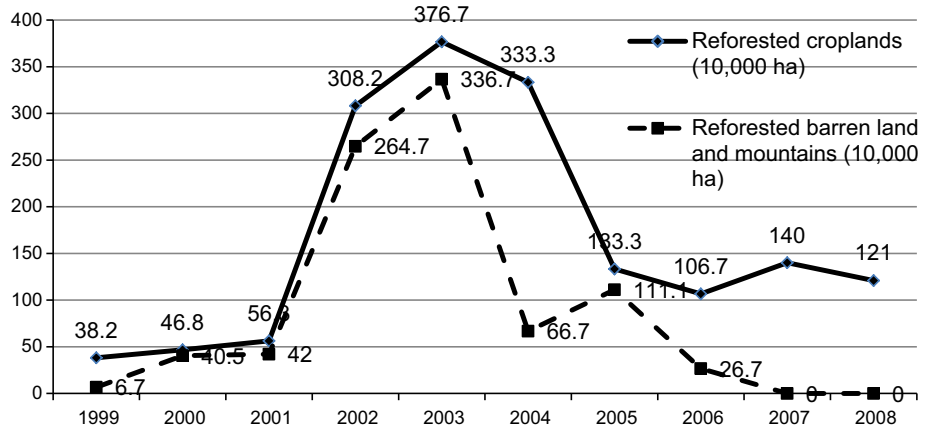

Fig. 2 Areas of reforested croplands and barren lands UNDER the SLCP. Note: Data cited from Gao and Guo (2012)

compensation regime reduced per ha compensation payments by half,[17] it extended the compensation period to 2021. In addition, the central government formally arranged funds to support local governments in developing reforestation auxiliary programs[18] that were listed but not financed in the first round. For example, to support the construction of basic farmlands, the central government paid a subsidy of RMB 9000/ha in southwest areas and RMB 6000/ha in northwest areas. Taking all these funding supports together, the central government's investment budget for the second round SLCP implementation actually doubled compared to that in the first round.[19]

These supporting funds could in part help alleviate local governments' financial pressure, at least for the provision of post-reforestation supports. Not surprisingly, such policy revisions received active responses from local officials. In all the four visited provinces, local officials had reported either application or reception of one or more forms of the supporting funding, as listed in Table 2. In contrast to their general tendency to conceal local administrative records, local forestry officials readily shared their proposals for funding applications with the interviewer. Unsolicited remarks from them suggested that they tended to equalize successful applications of these supporting funding with improvements in their executive performance, and would even consider the success in

[17] From 1999 to 2003, central subsidies included three parts: one time provision of free seedlings, an annual cash subsidy of RMB 300/ha, an annual in-kind grain subsidy of 1500 kg/ha in the Yellow River Basin and 2250 kg/ha in the Yangtze River Basin. Since 2004, the grain subsidy was transferred to cash subsidy at a fixed exchange rate of RMB 1.4/kg grain. Thus, for each hectare of cropland converted to forests, farmers could receive RMB 300 as livelihood subsidy, as well as RMB 2100 or RMB 3150 as compensation for loss of grain production depending on their residency location. From 2007, the compensation for grain loss has been reduced by half, but the livelihood subsidy remains the same. Thus, for each hectare of reforested land, farmers could totally receive a cash subsidy of RMB 1350 in the Yellow River Basin and RMB 1875 in the Yangtze River Basin (Li 2009).

[18] These programs include basic farmland construction, rural energy development, eco-migration, and complementary planting in reforestation sites.

[19] Central government investment in the first round of the SLCP accounted to RMB 157.73 billion (US$22.44 billion). The proposed investment increased to RMB 272.77 billion (US$44 billion) for the second round.

Table 2 Proposed reforestation supporting programs in sampled provinces

Provinces	County	Supporting program	Proposed year	Starting year	Investment (¥ million)
Heilongjiang	Longjiang	Basic farmland construction	2009	2010	–
	Jiguan	Basic farmland construction	2009	–	–
Ningxia	Jingyuan	Complementary planting	2008	2009	2.5
		Eco-migration	2008	2011	28.5
	Longde	Rural energy development	2010	–	2.8
		Eco-migration	2008	2011	19.5
	Zhongwei	Basic farmland construction	2008	2010	29.0
Chongqing	Beibei	Basic farmland construction	2011	–	1.9
	Zhong	Basic farmland construction	2010	2011	1.0
		Eco-migration	2006	2008	47.5
	Yubei	Basic farmland construction	2010	–	1.3
		Eco-migration	2006	2008	4.2
Yunnan	Maguan	Rural energy development	2008	2008	3.6
	Yanshan	Basic farmland construction	2010	–	2.5
	Jianshui	Basic farmland construction	2010	–	2.0
	Qiubei	Basic farmland construction	2009	2009	2.5

Ndash in the column of starting year means the program had not been started yet

Ndash in the column of investment means data not available

obtaining supporting funding as a significant accomplishment in the SLCP implementation. Given the assumed connection between reception of supporting funding and effective use of it, the policy revision in the second round could help resolve most post-reforestation problems and promote the sustainability of the ecological benefits generated under the SLCP.

However, the effectiveness of these new funds may be compromised with two limitations. First, as stipulated in the Notice, the supporting funds were designed with serious bias to assist the SLCP implementation in the Western parts of China.[20] Thus, as reflected in Table 2, reforestation supporting programs were not as developed in the middle province of Heilongjiang as in the other three western provinces. Political reasons for such bias had not been explicitly spelled out. However, it at least seemed that the bias in the policy design was not based on the consideration that these supporting services were not as necessary in the Eastern and Middle parts as that in the Western region. In contrast, some provinces in the Eastern and Middle parts were equally in need of these supports. For example, a forestry official in Heilongjiang mentioned that dry stalks of corn, sorghum, and rice had comprised the traditional energy sources in his county and accounted for over 70 % of local energy consumption. After reforestation, most participating households had to switch to coal or tree debris as their major energy sources. The official had never heard

[20] According to economic development levels, China divides its territory into three zones: the eastern coast zone (most developed), the middle zone (less developed), and the western zone (least developed). The middle zone is comprised of 9 provinces and regions, including Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western zone includes the 9 provinces of Sichuan, Chongqing, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

of any central government sponsored plan of developing renewable energy in his region, but thought that such a plan would be a significant benefit.

Second, the supporting funds were created in part to resolve farmers' post-reforestation concern; but such policy revisions had not been effectively communicated to farmers. Most farmers had not heard of any governments' efforts in securing grain supply, developing renewable energy, or migrating residents in areas with poor living conditions, even when these efforts were already under way. For example, in two sampled counties in Ningxia enrolled in the eco-migration program since 2008, issuance of forest property certificates for trees planted under the SLCP had been suspended, in order to avoid future disputes over land property rights. However, local farmers had no knowledge of the migration plan, nor why they did not receive forest property certificates as stipulated in the regulation. Given that the center's aim is to build farmers' confidence in the reforestation policy through the supporting programs and increase the sustainability of the SLCP, more efforts from local governments are needed to advertise these endeavors to individual farmers.

4.3 Developing off-farm industries

While the supporting funds help alleviate local governments' administrative budget pressures by legitimizing their use of central funding, those funds still represent a constant financial burden on the center, which is intended to be shared between the central and local governments in the SLCP project. In fact, developing self-sustaining off-farm industries based on the newly planted forests has been mutually agreed by the central and local governments as the best strategy of sustaining post-reforestation income for local players, i.e., local governments and participating households. Similar to their positive remarks regarding the development of reforestation supporting programs, local officials also cited developing off-farm industries in reforestation regions as one of their major accomplishments in the SLCP implementation.

Such efforts were observed in almost every visited province, either as proposed or already realized. For example, in Heilongjiang, a forestry official noted that farmers were encouraged to plant Korean pine (*pinus koraiensis*) with the pine grafting technology introduced in 2009. According to the official's calculation, when grafted Korean pine become mature in 2021, sale of pinecones would generate an income of RMB 105,000/ha, much higher than income from traditional corn-planting. During the 12 years of growing, operation of Korean pine plantation would still be profitable with the sale of thinned-out tree seedlings and under-grown medicinal plants. In contrast to planting long-lived species in northern provinces, southern provinces were more likely to adopt fast-growing species, such as Chinese pepper trees (*zanthoxlum bungeanum*), tea trees, and bamboo (*dendrocalamus latiflorus*). These economic species could generate income in a relatively short time. For example, in the county of Beibei in Chongqing, farmers had already increased their annual income by RMB 1302 per capita by planting Chinese pepper trees in the reforested land. Increased local income contributed to an increase in local tax revenues, which in turn could be used by local governments to supplement their administrative costs in the SLCP implementation.

While replacing crops with economic tree species has been generally recognized as a way to sustain local economic development during the post-reforestation periods, field observation also suggested two major problems in regard to the development of these reforestation-based industries. First, over-emphasis on economic values in species selection may compromise the ecological effectiveness of the newly planted forests. Most successful cases of developing post-reforestation industries were supported by

overwhelming planting monocultures of species with significant economic values, such as pines, locust trees, and walnut trees in the northern part and bamboo, pepper trees, and tea trees in the southern part. In the sampled counties in Heilongjiang and Chongqing, over 80 % of reforestation lands were planted with these economic species. Interestingly, these trees are defined as ecological forests and implicitly encouraged by the SLCP.[21] Planting economic species on the reforested lands would be the best strategy for local governments to simultaneously increase local income and fulfill the central government's requirements on reforestation. However, few economic species planting program could satisfy both economic and ecological goals. When not possible, ecological benefits tended to first be sacrificed. The rapidly expanding rubber plantations in Yunnan provided such an example. While rubber planting is encouraged under the SLCP, converting diversified farming systems to monoculture of rubber caused serious concern about the loss of biodiversity, carbon emission, depletion of groundwater, and hydrological conservation, which was also targeted by the SLCP (Ziegler et al. 2009).

A second concern relates to fairness of income distribution. Developing off-farm industries means radical transformation of rural economy from agriculture to forestry, and requires substantial inputs of financial resources and experiences, which is out of the capacity of most individual rural households. Thus, local governments usually invite experienced farmers or companies with necessary capacities and specialties as project leaders in this process. Their leadership may take two forms: (1) leading collective decision making among the SLCP participating households, and (2) renting reforestation lands from farmers and making independent decisions as to land use. The bamboo industry development in Chongqing served as a good example for the first form of leadership. While individual households still kept their use rights over the reforested land and remained as the primary beneficiaries of the reforestation compensation, their bamboo production was largely guided by the purchase policies of Yongfeng Corporation, a dominating buyer in local raw bamboo material market. As predicted by economic theories, the monopsony[22] power may redistribute wealth away from product sellers to the buyer since the single buyer can manipulate the market by forcing down the price and cut down the demand as compared to the competitive equilibrium status. Issues regarding market manipulation did not represent large concerns of either local governments or farmers at the time of my visit, since bamboo planting not only generated an acceptable amount of sales revenue but also qualified for reforestation compensation. However, this market power may result in threats to farmers' welfare when the SLCP compensation ceases and when the plantation becomes mature and generates redundant supply that flood the local raw bamboo material market. Compared to the shared power in collective decision making in the first form of leadership, a single renter's domination in the second form of leadership seems more problematic. In the first form of leadership, farmers still retain the entitlement to full compensation payment and only negotiate with the leader in regard to benefit distribution in the post-reforestation economy. In contrast, renters in the second form of leadership become direct (at least joint) beneficiaries of the central government's compensation payments, and

[21] As stipulated in the SLCP Regulation, no <80 % of the reforested area should be planted with ecological forests. And the SFA further explained the regulation by defining ecological forests as those planted with the aim of reducing soil and water erosion and alleviating the hazards of sand storms, including water conservation forests, shelterbelt forests, bamboo forests, and even dry fruit forests with certain planting densities. For an incomplete list of ecological and economic species defined under the SLCP, see the SFA's Notices of determination criterion for ecological and economic forests under the SLCP (2003 SFA).

[22] In economics, monopsony is a market form which is dominated by one buyer, as compared to the dominating seller in monopoly.

certainly other economic benefits from tree planting. They pay land rent to either individual rural households or village collectives as stipulated in contracts. This was the case of Hexing Forestry Company in Heilongjiang. By planting timber trees, Hexing Company not only received government compensation, but also earned significant revenue by selling tree seedlings. However, the company's manager refused to reveal more detailed financial information, including its revenue from reforestation compensation, timber seedling sales, and the rate of land rent paid to village collectives. Given that the center's compensation payments went through the land contractor and village collectives before it reached individual farmers, there was a reasonable chance that farmers' benefits would be misappropriated.

5 Conclusion

With the example of the SLCP, this study highlights how a large-scale environmental program may encounter implementation problems when its local executants are not properly motivated. In the SLCP, the central government excessively depended on political rewards and penalty in mobilizing local efforts, and largely ignored the financial burdens imposed on local governments. Obviously, implementing the reforestation program requires extra inputs of human and financial resources that are beyond local governments' financial capacity. However, such extra resources were not committed by the center.

With serious political pressures and financial stress, local governments were incentivized to focus on achieving the minimum goals of reforestation with less concern on qualitative issues such as ecological sustainability of the reforestation efforts. They tended to utilize the most parsimonious ways in implementing the SLCP. As observed in the four sampled province, local governments refrained from the tedious work of land resource survey and reforestation design during pre-reforestation planning. They either continuously recruited large blocks of land or completely set farmers free to decide which plots to be enrolled. They also saved their efforts in post-reforestation support provision. As revealed in interviews with forestry officials and farmers, very few county governments took the supporting tasks of complementary reforestation, basic farmland construction, rural energy development, and eco-migration as necessary components of the SLCP, and failed to seriously invest efforts in them, except when these post-reforestation supports were supported with extra funding. While the parsimonious measures helped reduce local governments' direct costs in project implementation, they induced civil conflicts and farmers' complaints that required significant efforts to resolve. In addition, insufficient inputs of administrative efforts underlay the problems of inefficient reforestation land targeting, soft monitoring, unemployment among rural labor force, and a high tendency among farmers to return to crop planting, all of which challenge the long-run sustainability of the ecological effectiveness of the SLCP. In other words, the goal of the SLCP in improvement of ecological services was displaced by local governments to simply extending tree planting. This is in parallel to Jahiel's findings on the implementation of China's water pollution discharge fee system (Jahiel 1997). She pointed out that "the primary goal of the discharge fee system–to reduce water pollution–was essentially displaced by the means designed to achieve that goal–the collection of fees originally established to create negative incentives to pollute."[23]

[23] Intercept from email communication with Jahiel, July 2013.

As a way to mitigate their budgetary limitations, local governments strategically explored other financial sources, either within or outside the framework of the SLCP. For example, they may retain part of the center's compensation payment for local use, compete for extra funding through the supporting funds in the second round of the SLCP, and strive to develop off-farm industries based on the reforested plantations. However, none of the solutions are perfect. While the first two imposed a continuous financial burden on the center, the last one aroused great concern about ecological efficiency and economic fairness in the newly developed forestry economies.

As a whole, the SLCP highlights the shortcomings of a campaign strategy with short-term efforts to resolve environmental problems that need long-term attention and inputs. Due to the hasty policy design, local governments' incentives were not carefully attended. It seems that policy makers did not fully anticipate how their design would encounter various conflicts and dilemmas as illustrated in this study. Future revisions in the SLCP, or designs of other large-scale ecological projects in China, should consider two types of improvement. First, the center should spend more time and energy in pre-project assessment and allow more trial rounds of implementation to assure that potential deficiencies in motivation structures are fully revealed before the project is expanded to a larger scale. Second, the central government should arrange mechanisms that allow for sufficient local flexibility in project implementation. For example, instead of reforestation quota assignment through the political hierarchy, the central government may use auction in quota distribution. This would help align the monetary value of forest ecological services with participation costs and reduce the potential conflicts in quota assignment. It is hard to image a uniform set of rules fitting all situations, especially for a county like China with such diversified local conditions. As a concluding mark, local governments' interests should be fully attended in the design of environmental policies, as they take the final responsibility to have the projects implemented in the field.

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