Land Conservation in the United States and China: A Comparison of Practices, Policies, and Data Implications for Assessment and Evaluation*

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I. Introduction

At first glance the United States and China appear to have entirely different economies and economic institutions, particularly in rural areas. Upon closer inspection, there are many similarities. Both countries have large and diverse agricultural sectors that compete intensely with non-agricultural sectors for scarce inputs. In both countries, roughly half of farm household income comes from non-farm sources. Both countries have also established policies to retire farmland from production in environmentallysensitive areas. But while the distribution of property rights associated with land in these two countries differs significantly, the fact that there is a distribution of rights to land in each country gives rise to common data problems when seeking to assess and evaluate land retirement policies. Evaluating the environmental outcomes of retirement programs also results in similar data issues in the two countries.

This paper compares farmland retirement policies between the U.S. and China. We focus on the role of household decision making about land use and conservation practices, the differences and similarities of property rights to land, and the implications for data needed to evaluate and compare the effectiveness of the policies. We provide an overview of the two major retirement policies in the US and China: the Conservation Reserve Program (CRP) in the United States and the Sloped Land Conversion Program (SLCP) in China. We examine differences in the structure of these programs, mechanisms used to target land and solicit participation, monitoring efforts, and ultimate outcomes. We also provide an overview of property rights in the two countries and discuss the implications of different property rights regimes on the data needed to evaluate land conservation program outcomes in the two countries.

We find that while the two programs have different policy goals and mechanisms for implementation, they share similar problems in terms of data availability for assessment and evaluation. Property rights to land are very different in the two countries, but in both countries it is clear that not all farm operators or households enjoy sufficient rights of alienation to their land to make decisions regarding whether to enroll the land they farm into the program. Because of this, data enumerated at the operator or household level will miss important information that has implications for how these programs affect the rural economy. Identifying an appropriate level of enumeration is also critical to understanding the effectiveness of these programs on their intended environmental outcomes, but difficult to achieve.

II. The Conservation Reserve Program

Overview

The US has established a wide range of farmland retirement programs over the last 80 years, beginning with the Conservation Adjustment Act during the dust bowl in

the 1930s (Figure 1). A subsequent program, the Soil Bank Program, was established primarily to reduce agricultural production in 1956 but was phased out in favor of a program to divert a portion of a farmer's acres to retirement as an eligibility requirement for commodity support programs over the subsequent two decades. The Conservation Reserve Program (CRP) was established in 1985 and sought to retire 16.2-18.2 million hectares of cropland from production. In 1991, the amount of land enrolled in CRP surpassed those in the land diversion programs. The last year the acre diversion programs operated was 1995, and since then the CRP has been the dominant farmland retirement program in the United States.¹

As with the earlier programs, the CRP was initially intended as a supply-control program but it specifically targeted highly-erodible cropland. Within a few years providing environmental benefits became the primary goal of the CRP (Osborn et. al., 1999). As the emphasis on environmental outcomes increased over time and additional environmental goals were sought, more land became eligible for enrollment. When the program initially targeted only highly-erodible cropland about 40 million hectares of land were eligible. In 1990, eligibility criteria were expanded to include environmentally-sensitive land that could reduce water quality problems as well as marginal land in riparian areas. The expanded criteria increased the amount of eligible land to 97 million hectares. In 1996, lands that could provide wildlife benefits and air quality measures were also targeted, further increasing eligibility. With each of these changes came different participation and evaluation criteria.

By the end of 2005, the CRP managed nearly 700,000 contracts with over 400,000 farmers. The total amount of land retired via the CRP by the end of 2005 was 14.1 million hectares and annual payments totaled \$1.69 billion. The amount of land enrolled represents about 8 percent of the 179 million hectares of U.S. cropland. In 2001, about 13 percent of farms were enrolled in the CRP (Sullivan et al., 2004).

Participation and Implementation

Enrollment in CRP is voluntary, and farm operators and landowners with eligible land anywhere in the U.S. can apply. Roughly 90 percent of CRP land is enrolled in a competitive process in which landowners and producers bid to retire eligible parcels of land at a specified rental rate under 10 or 15 year contracts in periodic 'general' signups.² No regional enrollment quotas are set, although enrollments have been capped at 25 percent of any given county's crop acreage. The nature of selecting these bids has changed over the life of the program. Originally, the rental rates at which farmers or landowners would offer to retire a specified field, or portions of field, were compared with a multi-county maximum rental rate that was not announced to farmers. In the 1980s, nearly all farmers or landowners offering to retire highly-erodible land at a rental

¹ In addition, the United States also has a Wetlands Reserve Program initiated in 1990, but it is far smaller than the CRP.

² The remaining 10 percent is through a continuous signup for acreage devoted to specific conservation practices such as filter strips, riparian buffers, grassed waterways, field windbreaks, shelterbelts, living snow fences, salt-tolerant vegetation, shallow-water areas for wildlife, and well-head protection (Osborne, 1997). These practices involve a small amount of land but large environmental benefits (Smith, 1999). Farm operators and non-operating landowners adopting these practices can enroll in CRP at any time without competing in the EBI ranking process. In 2005, there were 3.04 million acres under continuous signup, versus 31.7 million acres under general signup.

rate lower than the multi-county maximum would be selected, up to the 25 percent county-level cap.³

The multi-county maximum rental rates had a major drawback: a significant amount of land with potentially high environmental benefits was not enrolled into the program. This was in part because qualified land was accepted as long as the rent offer was below the maximum and the county acreage cap was not exceeded. In addition, there were many parcels that had high environmental benefits that were not even offered under this incentive structure because they had relatively high yields.

Beginning in 1990, offers have been ranked nationally on the basis of an Environmental Benefits Index (EBI). In addition to the new environmental criteria, maximum rental rates were set based on soil specific estimates of cropland rents. Offers are then evaluated by two criteria: the rental rate farmers require for the specified field, or portions of field, they offer to enroll (the lower rate the better chances of enrollment) and the amount of environmental benefits retirement is expected to provide (the greater the benefits, the better the chances for enrollment). By allowing for higher maximum rents based on the soil-specific factors along with the EBIs, the Federal government was able to enroll land with a wider array of environmental benefits into the program. The EBIs are calculated using farm specific factors. Some of these are outside of the landowners control such as the intrinsic soil erodibility, or the distance to the nearest waterway. Other factors are under landowner control, such as the proposed cover crop. Native grasses are relatively cheap to establish, whereas imported grasses, wildlife food plots, or hardwood trees are more expensive and will increase the EBI score. The EBI is calculated as a weighted sum of the factors and the proposed payment, with the size of the weights reflecting the importance of each factor. Because far more land was eligible for enrollment than previously, the relative cost of each offer became a more important factor in the selection process.

Revising the selection criteria to more precisely determine the environmental benefits and allow for higher rent offers changed the targeting of the CRP. Parcels that were previously enrolled were not always selected for re-enrollment when their initial terms expired. In their place, many acres that were not selected or not even offered under the previous criteria were enrolled. These changes influenced the distribution of lands enrolled in the program, though at a regional level (with the US comprising 6 regions) only minor geographic shifts in the distribution of enrolled acres are evident.

In making their offers to enroll in CRP, applicants determine their bids by weighing the rental rates they bid against the losses they would incur from taking land out of production and establishing the practices they included in their offer. In the first 10 years of the program, the maximum rental rates the government would pay were not announced. With the initial multi-county averages, offered bids soon reflected the maximum rate, as applicants estimated what it was for their area (Shoemaker, 1989). The soil-specific maximum rental rates employed after 1990 were more difficult for farmers to estimate, but as the emphasis of the program moved towards targeting the most environmentally-sensitive land, the government began announcing the maximum rental

³ Only a handful of counties reach the 25 percent cap on enrollments. Those that do consider the bids relative to the rental rates, along with the number of acres proposed for enrollment in an effort to enroll more applicants but lower average parcel sizes for the enrolled land. The cap tends to be hit rental rates are high relative to current agricultural production values.

rates in 1996. This, in effect, emphasized the importance of the EBI and the provision of environmental benefits.

Landowners are the primary applicants to the CRP, both farm operators and nonoperating landowners. Farm operators who rent land, farm operators who own their land, and non-operating landowners are all eligible to enroll land in the CRP. However, while roughly 40 to 50 percent of farmland in the United States is rented out in any given year, very few renters in the United States have leases on farmland for more than 10 years. Therefore, the 10-year minimum contract length for the CRP is sufficiently long that the vast majority of enrollees are landowners (Sullivan et al. 2004). Landowners that rent their land out can make voluntary offers to enroll in CRP, and there are likely instances where farmers who rent (at least some of) their land lose access to that land because the landlord enrolls it in the CRP. In these cases, the decision to enroll land into the CRP is not voluntary from the farm operator's perspective.

Once land is enrolled in the CRP, the enrollee takes on certain obligations. The parcel must be taken out of production and planted with approved ground cover such as grasses, trees, or other conservation cover crops. The approved ground cover must also be maintained during the life of the contract.

The costs to implement land retirement programs are not trivial. Since CRP's inception through 2006, the U.S. Federal government has spent \$31.5 billion in CRP payments to producers and landowners, and another \$.7 billion in technical assistance paid to other government agencies to offset CRP enrollment and implementation costs (USDA 2007). CRP funding was approximately \$1.68 billion in 2005. Payments can vary widely in CRP, depending on location. Rental payments in 2005 on contracts enrolled through competitive general signups averaged \$107.45/ha annually.⁴ Participants do not always receive financial assistance to defray the cost of implementing conservation practices. Those that did receive such cost share assistance averaged about \$8.80/ha (USDA 2007). In 2007, federal government outlays to administer CRP exceeded \$2 billion (USDA, 2007b).

Evaluation and Data Issues

There are several interesting policy issues regarding the effects the CRP has on farm production, farm households, and the rural economy more generally. One set of questions is to understand what types of farmers offer to retire land through the CRP program, and, if enrolled into the program, how do these farms change their production or economic behavior. Related to this is the extent to which CRP enrollment actually reduces the amount of cropland in production, as farmers may choose to reallocate pasture and other lands to crop production. Understanding these issues will help to understand another set of questions: how does the CRP affect the local economy. Taking land out of production may have adverse effects on the local agricultural production, and the marketing and processing businesses that rely on local production. If households use the CRP to exit agriculture and move away from local areas, then this could have a more pronounced negative effect on the local economy. Alternatively, if enrollees stay in the locality and increase their non-farm earnings, then this could have a positive effect on

⁴ Payments for the more environmentally sensitive continuous signup lands are more expensive, including those raises the average annual rental payment to \$119.62/ha in 2005.

local economic development. In addition, the environmental benefits attributable to CRP are also important for policymakers to understand but very difficult to measure.

A primary data problem when analyzing these issues is the level of enumeration. Most data with detailed information regarding farm operations and farm household characteristics is from surveys of farms or farm operations. Thus non-operator landowners, both local and absentee, are not included in the sample. Indeed, nonoperator landlords, particularly ones that are retired or are preparing to retire, may be more likely to enroll all their eligible land into CRP rather than just specific parcels. Non-operator landowners may also be more likely to move their residency out of the area after enrollment in CRP, which would have effects on the local economy as well. Moreover, farm operators that once rented land that was ultimately converted to CRP may not indicate that they "lost" land to CRP in surveys, leaving another important disaffected group out of the sampling frame.

For example, a common data source for the analysis of farm operators in the United States is the Agricultural Resources Management Survey, or ARMS. ARMS data includes detailed information on farm management, practices and other economic and demographic information, as well as information on participation in CRP. ARMS data, however, is a survey of farm operators and as such does not include non-operating landowners. The ARMS data also does not include detailed information on the parcels enrolled in CRP other than their size, etc. Conversely, CRP offers and enrollee data includes detailed information on the individual parcels offered and enrolled in the CRP including information on the size, land type and conservation practices employed on CRP land, but this data lacks detailed information on the farm operator or the landowner, including whether the enrollee is an operator or an owner renting the land to another operator. Furthermore, the CRP offer data does not readily match-up with ARMS data, which is a representative sample of US farm operators, and also provides no information on farmers that did not offer land for enrollment into the CRP.

One thing that can be determined using the ARMS data is whether a CRP enrollment is whole-farm or partial-farm. If, for any given year, a CRP enrollee does not report any agricultural production in that year, then their enrollment can be presumed to be "whole-farm". Alternatively, if the enrollee reports some agricultural production in that year, they are considered partial farm. Using this definition a little more than 50 percent of CRP enrollees are whole farm and the rest are partial farm in 2001 (Sullivan et al, 2004). Sullivan et al (2004) also found the whole-farm enrollees operate slightly smaller farms than those not enrolled in the CRP, but that partial-farm enrollees operate much larger operations than non-enrollees. Sixty-nine percent of partial-farm enrollees stated that farming was their main occupation, compared to only 4 percent of whole farm enrollees. Fifty-eight percent of whole-farm enrollees claimed non-farm employment and 38 percent claimed retirement as their main occupation, compared to only 23 percent and 9 percent respectively for partial-farm enrollees.

Although these data have limitations, they represent the best available sources for analyzing questions such as the economic impacts of CRP. Because of the inherent incompatibility between the two data sets, researcher sometime resort to aggregating the data at some higher level, often the country level. For example, Sullivan et al. (2004) used a matched-pair control group analysis to demonstrate the difference in economic performance between counties with high CRP enrollment and otherwise identical low-

CRP enrollment counties. The analysis estimated whole- and partial-farm impacts separately (because these groups may use CRP differently) and considered the percentage of CRP payments that were sent outside the county where the land was enrolled to proxy for absentee ownership. Based on a series of econometric analyses from various angles, the authors determined that in aggregate the CRP has had only small adverse economic impacts that fade over time. Areas with high CRP enrollment were associated with a net loss of jobs between 1986-1992 but the impacts were temporary. Also, while farm-related businesses were contracting during the 1990s, other business expansions – notably outdoor recreation – moderated CRP's impact on total employment.

In addition to how land characteristics vary and whether payments exceed the opportunity cost of enrolling land, household characteristics appear to matter in participation decisions. The CRP is used by a variety of farm types for a variety of reasons. Such findings, however, can only come out of individual survey data. For example, a national survey of CRP participants reveals that increased wildlife hunting and viewing, improved air and water quality and more scenic landscapes are advantages to participation (Allen and Vandever, 2003). Cooper and Osborne (1998) also use a survey of a random 5 percent sample of CRP contract holders to gauge information on rental rates and reenrollment intentions and estimate that maintaining 100 percent reenrollment into CRP after the specified term expires is expensive.

Analysis of other environmental benefits of the CRP program is difficult due to the difficulty determining a level of enumeration and then identifying the specific effect of the CRP program. For example, the positive effects of reduced sedimentation occur all along the downstream portion of the watershed to which the farm belongs. This makes it difficult to determine exactly where to consistently measure sediment loads. Moreover, having measured changes in sediment loads, to disentangle the effects due specifically to CRP policies is not trivial (Smith and Weinberg, 2004). Over the life of the CRP, several other environmental and conservation programs have been established both at the national and state level, and these programs affect sedimentation loads and other environmental indicators as well. Finding a suitable "natural experiment" with data before and after adoption of CRP in an area where upstream farmers made no other changes in agricultural practices over the period is nearly, or entirely, impossible.

There are, however, limited examples of research that seeks to relate CRP enrollment to environmental outcomes. In one notable study, Babcock et al (1996) use data from the 1992 National Resources Inventory (NRI) to construct county-level environmental indicators for erosion, water quality and wildlife. The NRI provides information on the status, condition and trends of land, soil, water and related resources on private land in the United States. The 1992 NRI was an extensive data collection effort conducted by the Natural Resource Conservation Service of the US Department of Agriculture, with over 800,000 sample points representing 75 percent of the nation's land area. The environmental indexes constructed using these data were then compared to county-level average summary data, including acres in the program and rental rates, for acres enrolled through the eleventh CRP signup compiled by the USDA's Farm Services Agency. At the time, the acres enrolled through the eleventh signup comprised more than 90 percent of CRP land. They find that enrolling land into CRP on the basis of cost does a good job at reducing wind erosion since land vulnerable to wind erosion is negatively correlated with productivity, but does a poor job at capturing water erosion and surface water benefits, for which vulnerable land tends to be positively correlated with productivity. They also find that wildlife habitat is uniformly distributed across current CRP land, thus the tradeoffs of alternative targeting mechanisms are not large.

III. Sloped Land Conversion Program (or Grain for Green)

Overview

More recently, China established policies to retire farmland for environmental purposes. Unlike the United States which exports a large portion of its grain production, China is roughly self-sufficient in food production, and seeks to maintain self-sufficiency, so reducing production was not the motivation for land retirement. Instead, the primary goal was to reduce soil erosion and increase forest cover. Roughly 2 billion tons of silt is released into the Yangtze and Yellow River annually, much of which is estimated to come from steeply-sloped cultivated land in these river basins. In addition to reducing soil erosion, increasing rural incomes and promoting rural development by facilitating a transition away from subsistence agriculture and into more lucrative income generating activities (such as non-farm work or livestock operations) are also goals of China's land retirement program.

Targeting the enormous silt load in the two major river basins, China established the Sloped Land Conversion Program (SLCP – also sometimes called Grain for Green) in 1999.⁵ The SLCP began with a pilot program in 1999-2001 that covered 20 provinces, 400 counties, 5,700 townships, 27,000 villages, 4.1 million farm households and converted more than 30 million *mu* of land (2 million hectares) into forest and grassland. The program was formally adopted in 2002 and quickly expanded to include more than 15 million rural households and over 8 million hectares of cropland have been retired by the end of 2004. Since the main objective is to reduce soil erosion, the primary criteria for land to be eligible for enrollment in the program is its slope. The program stipulates that the slope of land eligible for the program must be at least 25 degrees for land in the Yangtze River Basin and 15 degrees for land in the Yellow River Basin. In addition to these criteria, county-level officials may determine a cap on the amount of land eligible within their county. China's current plan calls for expanding this program to cover nearly 15 million hectares by 2010.⁶

Participation and Implementation

Participation in the SLCP is voluntary, however, China's unique land tenure system leaves it unclear who the decision-maker would be to enter land into the program. China has a complex and somewhat ambiguous system of rights to farmland, with farm households holding some rights (particularly use rights and rights to residual income), while local collective groups (called *xiaozu*) or the village itself hold actual ownership rights and with that some alienation rights to allocate land to or away from farm

⁵ The program was also prompted by severe floods in the Yangtze Basin in 1998 and drying-up of the Yellow River before reaching the ocean for 267 days in 2007.

⁶ Due to recent controversies over fiscal pressures, hikes in grain prices, and delivery of program compensation, the government scaled back expansion of the program in 2005 and is discussing the possibility of reducing the extent of the program overall (Xu, et al., 2006).

households in the village (Lohmar, et al, 2002). In some cases, even township authorities can influence land transfer decisions at the village level. Thus, it is unclear whether the actual owners of the land (the village or the *xiaozu*) are the primary decision-makers to initiate enrollment, or whether it is the farm household that has use rights on the land for a specified period (similar to renters in the United States).

Not only do local leaders maintain some land ownership rights, but they also must take several factors into consideration when selecting individual parcels for inclusion into the program. Including these factors can result in selecting parcels that are not ideally suited for reducing soil erosion, and also enrolling land without formal approval from the households operating the land. China's land is distributed into several small plots, usually only a fraction of a hectare, and each household may have several of these tiny plots located in different areas around the village (Lohmar, 2006).⁷ Parcels of land that are ideally situated to reduce erosion likely include land allocated to several, or several dozen, households. The cost of coordinating collective action and participation from each of these households can be high. Cost considerations may also lead to not selecting the most beneficial land into the program. For example, the ideal type of land for conversion under the program is in areas where low-income farmers have been pushed into production on poor, highly-sloped land. These areas tend to be remote and far from formal roadways, thus take time to travel to for program implementation. Selecting appropriate land, monitoring the progress of conversion and maintaining the planted saplings, however, requires multiple visits by technical specialists and local officials. Thus, land conversion carried out in areas near to established roadways is much less costly to convert, even though it is not the most ideal land to achieve the ultimate goals of the program.

The mechanisms determining participation and implementation are a complex arrangement of selection by local leaders, including consultation with village leaders and sometimes farm households. Because of this, the program is not always voluntary at the household level. Implementation of policies and programs, including both land tenure policies as well as SLCP policies, is highly decentralized in China and local practices can vary considerably. For example, in some areas in China land rights extended to farm households include the right to rent and a commitment to honor 30-year lease, where in other areas, farm households may lose land to periodic village-wide reallocations of land between households are expected to grow specific crops at the behest of village leaders in return for rights to their land (Schwartzwalder, et al, 2002).

Implementation of the SLCP varies widely at local levels as well. The central government defines the overall area and scale of the program, then instructs the relevant provinces to formulate provincial SLCP plans, which are submitted to the relevant central government agencies for approval.⁸ Once ratified, the provinces formulate annual implementation plans then assign program tasks to lower-level governments, which in

⁷ On average, China's farm households have roughly 4-5 plots of land which, added together, come to only 0.5-0.7 of a hectare.

⁸ The primary agency managing the SLCP is the State Forest Administration (SFA), but relevant departments also include the ministry of Finance (for fund disbursement), the State Grain Bureau (for grain disbursement), the National Development and Reform Commission, which is the primary policy-making agency under China's State Council and the State Council's Western Development Leading Group.

turn assign tasks to levels below them. County-level forestry departments work with township governments to conduct field surveys in villages and delineate tasks at the village and household level.⁹ The local-level implementation plans are then submitted back up the levels of government to the State Forestry Administration for approval. Once approved, the plans are sent back down to the county-level forestry office. The SLCP implementation system allows local government significant leeway over how to enroll land into the program. Some areas make the selection process more transparent and include farm households in the deliberations, while other areas engage in a more top-down approach to enrollment (Zuo, 2004). It is reasonable to expect that areas where households hold more secure rights to their land, local officials are more likely to seek farmers' approval when enrolling land into the program.

The incentives to participate in China's SLCP also differ from the CRP, and are quite lucrative. The original payments outlined in the program were to be fixed and a portion is in grain as well as a portion in cash, and free seedlings provided for the cover crop. There are only two different levels of grain payments made to farm households under the program: 2250 kg/ha/year in the Yangtze River Basin and 1500 kg/ha/year in the Yellow River Basin. The two payment levels are intended to reflect differences in yields between the two regions. In addition to the grain payments, farm households receive a cash payment of 300 RMB/year and are provided with free seeds to plant as a cover crop. Uchida et al (2005) estimates these payments to be more than 3 times the average rental payments of the CRP.¹⁰ Xu et al (2006) also estimates the payments to be well above the opportunity cost of retiring the land from production.

In reality, grain payments were prevalent during the trails stage of the program (1999-2001), but many areas switched to cash payments after that and payments to households may not be as generous as the guidelines indicate. In the initial years of the program, China had large grain stocks and low grain prices making a program that takes land out of production in return for grain from government held stocks an effective means for land retirement. Since that time, however, stocks have declined, prices have risen and government held grain at the local level is less prevalent due to reforms of the grain marketing system. Thus, local governments more frequently pay farm households enrolled in the program directly in cash. Paying in cash, however, invites the possibility that compensation will not be the same as specified in the program guidelines because the price applied to the grain can vary. The funds disbursed from the Ministry of Finance go directly to county-level accounts established exclusively for SLCP funds.

Once the land is enrolled, farm households are obligated to take land out of production and convert to cover crops. The period for which they are obligated to keep land out of production depends on the type of cover crop they plant. For grass cover, the period is only two years, for "commercial forests", i.e. orchards that eventually bear fruit

⁹ China's governance structure goes from national, to province, to prefecture, to county, to township, to village. Counties typically have 10-30 townships under their jurisdiction and townships typically have 15-30 villages under their jurisdiction, although these numbers can vary widely. Villages also have groups of households called *xiaozu* (meaning "group" or "team") that are used to implement programs, particularly land programs, in the village.

¹⁰ These estimates use the exchange rate at the time. However, the World Bank estimates that China's purchasing power parity, or PPP, conversion rate is around 1.78 RMB to \$1, less than one fourth of the 8.2 RMB to \$1 official exchange rate that was in place at the time of Uchida et al's estimates. Using the PPP conversion, the payments are roughly 15 times the average CRP payments.

and can generate income, the period is five years, and for "ecological forests", nonincome generating tree cover, the period is eight years. Cover crop planting can be a non-trivial task, with many farm households unable to provide the labor or the expertise to do it effectively. Moreover, villages are often required to plant unused, or barren, land to trees and other cover in return for their participation in the program, bringing additional costs to participation. In the initial years of the program, tree survival rates were very low in some regions. Xu and Cao (2003) report that initial survival rates were only between 20-50 percent for the seven counties in their study, with most areas requiring a second round of planting.

The problem of establishing and maintaining cover crops, which are primarily tree crops in the SLCP, affects program implementation in a variety of ways. As mentioned above, villages are often expected to cover more than just the cropland taken out of production, but such "unused" land is likely very poor quality and establishing tree cover can be difficult. The SLCP funds include funds for local officials to provide technical assistance to villages in the program, but qualified technical experts may not be available in the local forestry offices and need to be hired from local academies or other agencies, which adds costs to the program. Perhaps the most difficult problem is what to do when the tree cover crops fail. The SLCP stipulates that farmers and villages only receive compensation after passing an inspection by the local SLCP officials, but many villages may fail these inspections despite putting substantial resources into establishing cover crops. Local officials are then confronted with whether they should withhold compensation and risk alienating farmers from the program, or pay compensation in the hope that the cover crops will survive in the next go-round. If local officials choose the latter course, they are then confronted with how to pay for replanting the trees that do not grow.

Evaluation and Data issues

Similar to CRP, the primary data issue for understanding the effects and effectiveness of the SLCP is the level of enumeration. Enumerating farm households, as is most common, will miss important components of the decision making process to enroll land into the program, including even the overall incentives to participate. In addition, household enumeration is not ideal for evaluating the effectiveness of the program in that the converted parcels generally contain land outside the household's holdings and many parcels comprise several households holding and their contribution to preventing erosion should be taken together. Finally, determining the appropriate level of enumeration for participation and implementation decisions can be difficult because of wide variation in the way policies are carried out at the local level, with some areas making decisions behind closed doors.

Unlike the ARMS data in the United States, there are few nationally representative, publicly available data sources that can be used for economic analysis at the farm household level in China.¹¹ This fact, however, may serve as a blessing rather than an impediment to understanding how the SLCP works in such early stages of its implementation. Because of the lack of access to data, researchers looking into SLCP

¹¹ There are a couple household-level panel data sets, once collected by China's National Bureau of Statistics, and one collected by the Ministry of Agriculture's Research Center for Rural Economy. But neither of these is publicly available and neither provides detailed data on the SLCP.

policies have conducted their own fieldwork to obtain data.¹² This allowed them to collect data not only from households, but also from individual plots managed by the household and from village leaders. In doing so, they were better positioned to understand the participation decisions in China than if they had relied on household-level data alone, although these decisions are far more complex and, to some extent, involved decisions made at levels above the village.

The ambiguity over land tenure rights in China is reflected in research findings. While the voluntary nature of the program suggests that farm households make the decision to enroll individual parcels to which they have use rights, it appears that highercollective levels sometimes make, or at least influence, enrollment decisions. Using a survey 360 households in Sichuan, Shaanxi and Gansu Provinces in 2003, 74 percent of which were participating in the SLCP by 2002, Xu et al (2006) find that only half of the participating households surveyed responded that their participation was voluntary. Furthermore, only 35 percent responded that they could choose which areas to retire, 30 percent responded they could choose the specific plots to retire, and 36 percent responded that they could choose the cover crop to be planted on their enrolled land.

Studies addressing the cost effectiveness of the program also rely on independently collected data. For work looking into targeting and cost effectiveness, Uchida et al (2005) uses a survey of 144 participating households in 16 villages in two provinces, (Gansu and Ningxia) in 2000. This data not only contains information at the household level, but also at the village level and of individual plots enrolled in the program. The authors find that a sizeable portion of land selected does not meet the slope criteria, and that stated rental payments are far higher than the net income on the land prior to conversion. These findings indicate that the program could more effectively target beneficial land, and likely pay less for it as well.

Studies that look into how the SCRP affects household income and labor allocation also use household surveys conducted by the authors. Using the same survey data described above and used by Xu et al (2006), Uchida et al (2004) find that participating households tend to do increase their livestock activities but little evidence that they increase off-farm employment more than non-participating households. However, with a follow-up survey of these households conducted in 2005, the authors take advantage of the panel data and use a difference-in-differences technique to show that SLCP participants show a slightly higher increase in off-farm participation than nonparticipants over the period. They also show that household with fewer liquid assets show a higher off-farm labor participation response upon enrolling in the SLCP than households with more liquid assets to begin with, thus concluding that the SLCP payments provide households with assets that allow them to search for non-farm employment. Groom et al. (2006) also uses data collected from participating and nonparticipating households to show that the duration of off-farm labor for participating households increased more than for non-participating households.

As with the CRP, evaluating the environmental benefits of the SLCP is difficult due largely to the difficulty of finding data that enumerates environmental outcomes at a level and frequency sufficient to attribute changes to the program. Thus, the few studies that try to assess this rely on a proxy variable, such as the slope of the land enrolled in the

¹² Due to literacy, the mail system and other issues, farm household data collection in China is primarily fieldwork rather than mail surveys.

program compared to non-enrolled land in the selected villages. For example, using the data reported in Xu and Cao (2002), Uchida et al. (2005) show that the percentage of land with more that a 15 degree slope was higher for cropland enrolled in the SLCP than for cropland not enrolled in the program in 2000, the first year of implementation. Thus, they conclude that the program will have environmental benefits. However, there was still a high percentage of cropland not enrolled in the program that was steeply sloped, and some land in the program was not steeply sloped, therefore the overall environmental benefits of the program could be increased with better targeting.

IV. Comparison and Discussion

The two programs described in this paper have several similarities and differences. The goals of both programs are very similar: to convert environmentallysensitive cropland into forest or grassland, and both started out specifically targeting highly-erodible land. However, the CRP, which has a history 15 years longer than the SLCP, has evolved over the years to include a wider definition of environmental benefits that the program intends to achieve. Moreover, the two programs have different secondary goals. The CRP initially sought to retire farmland to achieve supply control goals, but the supply control goal has become secondary to the environmental benefits over the years. The SLCP, on the other hand, never sought to reduce supply, in fact a major debate in China after its establishment was the role it plays in reducing grain production (Xu, et al, 2006). The primary secondary goal of China's SLCP is to facilitate structural transformation of the rural economy in poor areas, that is, to shift income earning activities away from production of staple grains and into more livestock production and non-farm activities.

The selection, compensation and implementation measures for the two programs differ significantly. In the United States, CRP offers are selected from among a range of independent offers farm operators or non-operating landowners make to retire their land for a level of compensation they are willing to accept. In China the offer is fixed, although there are still concerns whether the full offer is paid out to the participating households (Xu and Cao, 2004). Selection in China is also more complex: targets for individual jurisdictions are passed down through the levels of the bureaucracy until they reach the village. Once a village target is established, village leaders may or may not solicit households when identifying specific parcels to be enrolled. While households may have no say in the participation decision, compensation is lucrative enough that most households are satisfied with being enrolled whether it was their decision or not (Xu and Cao, 2004). Both programs involved local agents to monitor progress of the cover crop and other features of program implementation.

Differences in participation processes, however, result in similar data issues regarding the level of enumeration. In both countries, the farmers that are cultivating any given parcel are not always the party with the right to make enrollment decisions. Because of this, data collected at the household or farm operator level will not always capture information on the individual making the decision to enroll or not to enroll. In the United States, non-operating land owners can enroll land into the CRP but are not included in the ARMS or other data enumerated at the farm operator or household level. In China, the situation is more complex in that some farm households hold more secure rights to their land and these may be invited to offer their land into the program, whereas in other areas, alienation rights are still primarily held at collective entities above the farm households and these entities are the primary enrolment decision makers.

The two programs also share difficulties in measuring environmental outcomes, and this is a common problem with any program intended to provide environmental benefits (Smith and Weinberg, 2004). The primary difficulty is, again, the appropriate level of aggregation. Household or operator data generally does not have specific information on the individual plots enrolled or not enrolled in the program, and an assessment of the plots enrolled versus those not enrolled is useful in understanding the extent to which the environmental benefits are effectively targeted. More importantly, the ultimate environmental benefits may occur in areas far away form the actual land enrolled in the program. For example, the benefits of reduced soil erosion may occur far downstream from the individual plot. Relating changes in downstream sediment loads to upstream land retirement is also very difficult. Both countries also have other changes occurring on the land that can affect sedimentation, such as the extension of conservation practices on land still in production in the United States, and the increasing popularity of low-till agriculture in China. All these changes would have to be incorporated into an empirical model in order to isolate the change occurring due to any specific policy, and data that includes all this information in a comprehensive way is very rare.

V. Conclusion

Policies to retire environmentally-sensitive farmland seek to compensate farmers to take selected parcels of land out of production and convert them to cover crops that more effectively achieve the goals of the program. Many farm households, however, have only use rights and rights to residual income (*usufruct* rights) to at least some of their land, and do not have sufficient right of alienation (*abusus* rights) to enroll such land into these programs. Agricultural data collection, however, commonly targets the farm household or operator as the unit of enumeration. Doing so may miss important features of the decision to participate in the program, the sustainability of the compensation scheme and the programs effectiveness at achieving its economic goals. Moreover, detailed information on parcels selected and not selected into the program is useful for evaluating the program's effectiveness at achieving its environmental goals, but such information is also commonly left out of household or farm operator surveys.

In this paper, we examine and compare the goals, implementation and outcomes of two similar programs established in very different circumstances: The Conservation Reserve Program in the United States, and the Sloped Land Conversion Program in China. While both programs seek to convert environmentally-sensitive cultivated land into more sustainable, environmentally beneficial uses, they differ in their specific goals, implementation policies, and outcomes. Much of the differences in the implementation results from different property rights regimes in the two countries. Despite these differences, there are interesting similarities in comparing the drawbacks to using solely household or operator level data for understanding participation and other socialeconomic decisions and how these affect the rural economy.





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