The Conservation Crossroads in Agriculture:

Insight from Leading Economists

Top Ten Design Elements to Achieve **More Efficient Conservation Programs**

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Contents

Executive Summary 1

An Overview of Conservation Programs 3

Evaluating PES Programs 4

Design Element 1:
Performance-Based vs. Practice-Based PES Programs 5

Design Elements 2-3:
Targeting of U.S. Conservation Programs 6

Design Elements 4-9:
Other Challenges in Program Design and Implementation 7

Design Element 10:
Distributional Considerations 10

Conclusions 10

References 11

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Executive Summary

Conservation programs for agriculture are often discussed in qualitative terms of soil quality, clean streams, best land use, secured wildlife habitat or cleaner air. But often lost in these types of discussions is the fact that agricultural Conservation programs are economic products that can be analyzed and designed to be efficient instruments that can provide the greatest benefits for the lowest cost.

Too often the discussion about Conservation programs is focused on the budget dollar amount or program size instead of their design or how they can be improved. Applying an economic lens to conservation programs can create more efficiently designed programs, which is crucial as we face tough choices ahead to balance fiscal discipline, environmental impact and social needs.

This report highlights 10 design elements synthesized from economic studies that should be considered when developing policy to implement more efficient conservation programs, including incorporating advanced technology and information, new social values, and better understanding of geography.

Conservation programs were created because markets do not currently reward farmers financially for environmental conservation activities. Governments have stepped in to fill this market gap to secure environmental benefits to society that would otherwise go unrealized—reduced soil erosion, reduced farm runoff, carbon sequestration, and habitat protection. This intervention has paid farmers for environmental stewardship efforts through such programs as the Conservation Reserve Program (CRP) and the Conservation Stewardship Program (CSP), as opposed to regulation, which is the predominant approach in other sectors such as manufacturing and energy.

While Conservation programs have evolved over time to be more effective and efficient—as exemplified by the CRP's transition from maximum acreage to land picked through a cost-benefit analysis—significant steps can still be taken to achieve the greatest possible environmental benefits and services at the lowest possible cost to U.S. taxpayers.

Overall, this report finds that the outcome of conservation programs could be substantially improved by incorporating these practices:

- Basing programs on the goal of improving the actual performance of conservation systems rather than on a menu of practices because similar practices will not accomplish the same environmental outcome for all applications;
- Incorporating differences in biophysical and socioeconomic conditions across regions, and human capital differences across producers;
- Building in flexibility for adaptation to changing market and environmental conditions; and,
- Using the information, measurement tools or technology needed to track performance and improve benefits.

SYNOPSIS:

Conservation programs for agriculture provide significant social and environmental benefits. However, given budget constraints and pressures to increase production, Conservation programs must further evolve to maximize effectiveness at the lowest possible cost to the American taxpayer. This paper provides a "Top 10" list of improvements that could be made to Conservation programs in order to get the biggest bang for the buck, both for taxpayers and the environment.

Cutting conservation budgets or combining programs in the Farm Bill may save government spending, but the benefits of lower-funded conservation programs can actually increase if the remaining programs are designed for the best outcome.

But the careful design of more efficient conservation programs must take factors such as these into account:

- How to value and weigh multiple environmental benefits that could be obtained;
- Whether smaller plots of land in different places have the same benefits as the same acreage that is together in one place;
- Whether slippage occurs whereby bringing new land into production diminishes the effect of taking land out of production to meet environmental or economic goals;
- Whether the programs are paying for actions that would have been taken even in the absence of the programs' benefits;
- How the programs' benefits are distributed across different kinds of people, farms, and regions; and,
- How the programs are enforced to assure that benefits really are being generated.

Looking Ahead: The 2012 Farm Bill

While this paper does not go into details about the current 2012 Farm Bill, the implications of its findings are readily apparent. Policies that do not take advantage of these possible design improvements are likely to prove inefficient and waste money, offsetting cuts in spending policymakers choose to make to the program.

For instance, the *Agricultural Reform, Food, and Jobs Act*, the farm bill passed by the Senate in June 2012, eliminates funding for the Conservation Measurement Tool, which is used to monitor or verify that the Conservation Stewardship Program is working at its optimal level. As shown in this report, excluding new information or ways to verify the program sets up a situation ripe for wasting good federal dollars.

The Senate bill recognizes that if funding to conservation is going to be cut by about $6 billion over 10 years, then the land included in the CRP must adhere to criteria that maximize the environmental impact of the funding. A well-designed mechanism for establishing eligibility requirements could improve the outcome of the conservation program given that its funding is likely to be cut.

Cutting conservation budgets or combining programs in the Farm Bill may save government spending, but the benefits of lower-funded conservation programs can actually increase if the remaining programs are designed for the best outcome.

An Overview of Conservation Programs

Conservation programs that pay farmers for environmentally-related activities are an example of a general economic concept known as "payment for environmental services (PES)" (Bulte et al. 2008, Engel et al. 2008, Wunder et al. 2008, Polasky and Segerson 2009).[1] A PES is a contract that provides incentives for the provision of environmental services. This contract is used to transfer resources from the government[2] to an individual or firm in exchange for undertaking actions designed to improve environmental quality. These programs can take a variety of forms. For example, some are diversion programs that pay farmers to divert land from production of crops to activities that generate other environmental amenities (planting trees, preventing soil erosion, or protecting wetlands). Others are working-land programs that pay farmers to modify their farming practices (e.g., changing pest control strategies or modifying waste management practices).

The PES programs are part of a broad suite of voluntary approaches designed to address the underprovision of environmental amenities that occurs when market forces do not fully compensate firms or individuals who provide those amenities (Salzman, Thompson and Daily 2001).[3] Voluntary approaches are viewed as alternatives to other environmental policy approaches, such as the introduction of clear and enforceable property rights (Coase 1960), direct regulations (e.g., discharge permits), taxes and fees (e.g., emission fees), and cap and trade programs (Baumol and Oates 1988).[4] While there is no logical economic distinction between activities that increase benefits and those that decrease costs, in practice PES programs have generally been viewed as a means of rewarding activities that generate public benefits, such as protecting native plants and wetlands, improving water quality, planting trees, or modifying soil practices to sequester greenhouse gases. In contrast, regulatory and fee-based approaches have typically been viewed as a means of discouraging production of public "bads," e.g., by reducing chemical residues or point-source discharges of pollutants.

In contrast to environmental policies for industrial pollution, which have historically been based primarily on regulations, agro-environmental policies in the United States have relied primarily on paying farmers for conservation. Farm-conservation programs in the United States originated in the 1930s in response to the Great Depression and the Dust Bowl. Historically, payments have been related to farm economic situations, with payments increasing during periods of low farm prices. The early emphasis was on land-diversion programs that targeted soil-conservation efforts.[5] *The Food Security Act* of 1985 was the start of a new era of conservation programs. It introduced the Conservation Reserve Program (CRP), a land-diversion program that targeted multiple environmental amenities and initially aimed to maximize acreage among lands that met eligibility criteria. However, CRP design evolved to emphasize performance-based enrollment of lands, thereby paying for activities that enhanced wildlife, improved water and air quality, and controlled soil erosion.

While the CRP is based on land diversion, other PES programs apply to working lands. The significance of and the number of working-land programs have increased over time. Cross-compliance requirements, which made eligibility for income support programs dependent on engagement in

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1 The acronym PES is also used for "payment for ecosystem services." Ecosystem services are a category of environmental services provided specifically by ecosystems.

2 Contracts can also be with private parties, such as NGOs and firms, but this paper will focus on contracts with governments.

3 In technical terms, there are policies designed to address problems of negative externalities and underprovision of public good. For an overview of voluntary approaches, see, for example, Alberini and Segerson 2002, Croci 2005, and Morgenstern and Pizer 2007.

4 Related to PES is the establishment of markets for eco-system services, e.g. greenhouse gas (GHG) mitigation or water management (Salzman 2005).

5 The *Agricultural Act* of 1954, for example, enacted the Soil Bank Program with a conservation branch that targeted erodible soil.

Evaluating a PES program requires an understanding of how farmers will likely respond to certain incentives. It is important that PES programs be designed to provide incentives for efficient decisions.

both land-diversion activities and working-land efforts, were introduced in 1985 (Claassen, Cattaneo, Johansson 2008). Subsequently, the Environmental Quality Incentive Program (EQIP) was introduced in 1996. It aims to subsidize investments to meet environmental objectives with significant emphasis on animal-waste management. Similarly, the Conservation Security Program, now known as the Conservation Stewardship Program (CSP), introduced in 2002, offers farmers alternative conservation contracts based on crop-management activities.[6]

Evaluating PES Programs

The economic literature on environmental policies, including PES, identifies a number of criteria that can be used to evaluate alternative policies. Ideally, policy interventions would lead to efficient resource allocation, defined to be an outcome where the net social benefit[7] of each activity (including environmental amenities) is maximized. However, in many cases, the benefits from environmental amenities may be difficult to assess. In such cases, cost-effectiveness is an alternative economic criterion for policy evaluation. Cost-effectiveness, defined as achieving a given environmental objective at the lowest possible cost, serves as a practical criterion for evaluating PES programs when measures of the benefits of attaining a given environmental target are lacking or expensive to obtain (Alberini and Segerson 2002, Segerson 2010). Cost-effective policies are efficient in the sense of minimizing costs and, therefore, getting the most "bang for the buck," although they do not necessarily ensure that net benefits are maximized since no guarantee exists that the environmental target being met balances benefits and costs (Baumol and Oates 1988). It might instead reflect the government's available budget or other criteria for setting goals (e.g., designated uses for water bodies).

In general, evaluating a PES program based on either overall efficiency (maximizing net benefits) or cost effectiveness requires an understanding of how farmers will likely respond to certain incentives, which will in turn affect the private and social costs of providing environmental services (Polasky and Segerson 2009). Since the design of the program will determine the incentives farmers receive, it is important that PES programs be designed to provide incentives for efficient decisions.

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[6] For a list of conservation programs in the 2002 Farm Security and Rural Investment Act, see Cattaneo et al. 2005.

[7] Net social benefit, taking into account benefits to consumers, producers, the environment, government expenditures, etc. associated.

Design Element 1: Performance-Based vs. Practice-Based PES Programs

When evaluating alternative designs, it is important to distinguish between programs that pay for performance measured by environmental outcomes (for example, reductions in greenhouse gas emissions or nutrients in water bodies) versus programs that pay for practices or activities that are believed to generate positive environmental benefits (for example, planting certain trees or engaging in soil management practices). Ideally, farmers should be paid based on environmental performance, i.e., the value of the environmental amenities they provide (e.g., Ferraro and Simpson 2002). When all else is equal, performance-based standards are superior to practice-based standards because they allow flexibility in meeting environmental goals and promote innovation and technology adoption (Fuglie and Kascak 2001, Sunding and Zilberman 2001). The flexibility of performance-based standards gives them an advantage over mandating "best management practices."

Frequently, however, the direct measurement of environmental performance (for example, nitrate runoff from a field) is difficult. In some cases, it might be possible to estimate performance based on practices are often more readily observable than performance. For example, crop selection can be determined from remote sensing data. Practices can be used to estimate performance when the relationship between the practice (soil tillage) and the environmental outcome (carbon sequestration in the soil) is known with certainty.

However, when reliable quantitative data on linkages between practice and performance are not available, provisions of environmental services may need to be paid based solely on practices. As noted above, all else being equal, practice-based programs will generally be less cost effective than performance-based programs. For example, Antle et al. (2003) illustrate that in the case of carbon sequestration in cropland soils, contracts based on adoption of specific soil tillage practices are as much as five times more costly than efficient performance contracts based on payment per unit of carbon sequestered. Claassen, Cattaneo and Johansson (2008) argue that this is generally true for conservation programs in the U.S. Indeed, Cattaneo et al. found that for a simulated $1 billion conservation program, a performance-based program with bidding provisions achieves improvements at an average cost of $6 per unit of environmental performance. Without the bidding provision, the average cost of enhancing environmental performance by one unit increases to $8. The average cost under a practice-based program without stewardship provisions more than doubles to $17 per point and increases to $73 per unit when producers are eligible for stewardship payments based on past conservation efforts.

However, overall conclusions about the relative efficiency of **performance-based vs. practice-based** programs must also factor in the difficulty of measuring performance. Since measuring performance (directly or indirectly) may be more expensive than observing some types of practices, the total cost of achieving an environmental objective with a performance-based standard might be greater than the total cost under a practice-based standard. In this case, the practice-based program would actually be more efficient, given the measurement challenges of a performance-based program (Weinberg and Claassen 2006). Periodically, it would be beneficial to estimate the aggregate performance implied by practices that were supported by a PES and compare them with actual performance. This would allow for an assessment of the cost-effectiveness of the practice-based program, which could, in turn, guide efforts to improve payment schemes.

Design Elements 2-3: Targeting of U.S. Conservation Programs

Several factors make the design of PES schemes especially challenging. A critical factor is **heterogeneity**, i.e., differences in biophysical and socioeconomic conditions across regions, and human capital differences across producers. Thus, the same activity may have different implications at different locations (Antle et al. 2003).

The original CRP emphasized maximization of enrolled acreage. This was recognized as inefficient because it did not maximize environmental benefits given the available budget (Reichelderfer and Boggess 1988). This early approach targeted the cheapest lands that were providing environmental amenities without regard for the magnitude of the associated benefits. The opposite approach is to pay rent on lands that have the "best" amenities without much regard for the cost per acre. However, targeting land that is either most affordable (cost targeting) or has the highest levels of environmental benefits (benefit targeting) is inefficient and does not maximize the environmental benefits the government is able to obtain per dollar spent.[8] Instead, an efficient policy will quantify environmental benefits provided by parcels of land, as well as the cost required to divert them, and target the land with the highest benefit-cost ratio (benefit-cost targeting). Compared to benefit or cost targeting, using this method can either significantly increase the environmental benefits possible for a given budget or significantly decrease the amount of resources needed to achieve the same level of aggregate benefits.

The implementation of benefit-cost targeting is challenging because it requires good quantification of environmental benefits. One reason for the historical use of cost targeting is that it required minimal quantification of environmental impacts, and, indeed, it can be optimal under certain conditions. For example, if less productive lands provide the most environmental amenities per acre, then cost targeting is optimal. However, if there is little or no correlation between profitability and environmental amenities, or if more productive land provides more environmental amenities (as in the case of some riparian land), then benefit-cost targeting is more efficient.

Benefit-cost targeting has been implemented in the contemporary CRP through performance-based payments centered on observed practices. It has been used primarily to support activities that generate mostly fixed environmental benefits per acre, but the benefits per acre documented in the National Resources Inventory (NRI) are distributed unevenly. Frequently, environmental amenities are concentrated in certain areas, and a relatively small fraction of the land, say 20 percent, may provide 80 percent of the amenities. Economic benefits vary less significantly than environmental benefits, and, thus, the ability to recruit lands in the highest benefit locations is crucial for efficient use of resources (Babcock et al. 1996). Several studies, documented by Claassen, Cattaneo, and Johansson (2008), have demonstrated that the benefits from switching from cost targeting to benefit-cost targeting in the CRP were substantial enough to dwarf the extra costs of implementation.[9]

The significant gains from recognizing heterogeneity in benefits have been demonstrated in other contexts in addition to U.S. conservation programs. For example, De Janvry and Sadoulet (2008) documented the efficiency gains for targeted Mexican PES programs aimed at preventing deforestation. Similarly, in the context of adoption of irrigation technologies, Xabadia, Goetz and Zilberman (2008) demonstrated that the gains from introducing differentiated valuation of environmental amenities, as is done with benefit-cost targeting, increase with the heterogeneity across locations.

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8 See, in particular, Wu and Babcock (2001); Babcock, Lakshminarayan, Wu, and Zilberman (1996); Babcock Lakshminarayan, Wu, and Zilberman (1997); Wu, Zilberman, and Babcock (2001); and Hansen and Hellerstein (2006).

9 For example, Feather et al. (1999) estimate that the shift to benefit-cost targeting in the CRP almost doubled the realized environmental benefits. The measured gains were equal to 25 percent of the program's cost.

These transition from cost targeting to benefit-cost targeting presents a movement towards performance-based PES for the CRP, a land-diversion program. The more recently introduced working-land program, CSP, has a strong element of performance pay by design. This program has various levels of payments based on the selection of practices—and it is likely to enhance efficiency to the extent that the incremental change in payments reflects the incremental improvement in the provision of amenities. The other working-land program, EQIP, introduced payments for conservation efforts to address water quality and other environmental concerns at the local level. Tailoring the program to local (heterogeneous) conditions is a source of improved efficiency (Claassen, Cattaneo, and Johansson 2008, Cattaneo et al. 2005). Similarly, the efficiency of crop compliance programs is enhanced when the implicit pay is adjusted to reflect the benefits provided.

There are additional gains that can be realized when payments are allowed to be **flexible** and vary over time in response to changes in economic and other conditions (Xabadia, Goetz and Zilberman 2008). The economic cost of PES programs (like the CRP) can vary because of cycles and volatility in agricultural markets and related energy markets. For example, from 2000 to 2012, the price of corn has fluctuated from $2.50 to $8.00 per bushel; thus, the cost of diverting lands from corn production has varied substantially. This suggests that efficiency could be improved by allowing the amount of resources diverted from agricultural production to adjust in response to changes in food prices and the food situation (Bulte et al. 2008). Similarly, changes in climatic and economic conditions are random and can affect the value of environmental services provided by payments to farmers. Thus, fluctuations in both costs and benefits indicate that adjustments in PES payments might be warranted, suggesting that there is a value from keeping the scale of the program flexible. However, for some environmental amenities, benefits depend on taking land out of production for a long period of time. Thus, PES program design needs to balance the benefits of longer contracts against the gain that flexibility to adjust to changing conditions over time provides.

Design Elements 4-9: Other Challenges in Program Design and Implementation

In addition to heterogeneity, other factors challenge the design and implementation of effective agricultural PES programs. A key challenge is **imperfect information**. Basic processes linking practices and their consequences are sometimes not well understood, and the estimated relationships between farm practices and environmental outcomes are shrouded by uncertainty and measurement

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With improvements in modeling and measurement, PES programs might be able to rely more on payments for performance, which are more cost-effective than payments for practices. Thus, the design of PES programs should be an adaptive process based on lessons of the past and taking advantage of accumulated knowledge and new technical capabilities.

errors that can be quite significant. However, with technological change and ongoing research, the state of knowledge and the basic information for PES program design and implementation are improving. The introduction of Geographic Information Systems (GIS) and the reduced cost of computing expand monitoring possibilities and may lead to changes in environmental policy design and implementation (Millock, Xabadia and Zilberman, forthcoming). With improvements in modeling and measurement, PES programs might be able to rely more on payments for performance, which are more cost-effective than payments for practices. Thus, the design of PES programs should be an adaptive process based on lessons of the past and taking advantage of accumulated knowledge and new technical capabilities.

Another challenge of designing efficient PES programs is the **weighting and aggregation of multiple benefits** (Wunder, Engel and Pagiola 2006). Much of the early literature on assessing PES in agriculture treated different environmental amenities separately. However, a given parcel of land often provides more than one benefit, and conservation programs in the United States, in particular the CRP, pay farmers to engage in practices that generate a multitude of environmental benefits. Thus, various types of benefits have to be weighted and aggregated to generate an index used for benefit assessments. Indeed, in assessing each CRP request, each type of benefit (enhanced wildlife habitat, improved water quality, and reduced erosion) is scored, and these scores are given weights.[10] The sum of the weighted benefits is then used to generate the "Environmental Benefit Index" for comparative evaluation.

The efficiency of the CRP program depends on the extent to which the weights given to different environmental amenities represent the social values of these amenities. For example, some amenities (such as air quality improvements from reduced wind erosion) are more valuable when generated in locations close to population centers than in remote areas. Similarly, water quality benefits are higher in locations where the potential damage to water bodies is greater. While the CRP scores for different amenities are adjusted to locational differences, the weights given to different objectives are determined administratively and reflect national rather than locational differences in the relative importance of these objectives.[11]

For example, the CRP seems to have a strong bias in favor of reducing soil erosion and maintaining soil productivity (Claassen, Cattaneo, and Johansson 2008). Eligibility requirements also place a heavy weight on a high erosion index and past enrollment in the CRP. This emphasis can lead to channeling payments to certain regions

[10] USDA. "Conservation Reserve Program." Last modified May 30, 2012. Accessed July 5, 2012. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp

[11] The challenge of having effective indicators to enhance the efficiency of performance-based PES programs has been recognized outside of the U.S. as well. See, for example, Hajokciz (2009) and Polasky and Segerson (2009).

that meet these criteria while other regions that can provide other amenities, such as air quality, may be underweighted. Ribaudo et al. (2001) suggested that the existing indicators reflect a shift of social preferences from soil conservation to other environmental amenities. However, it is not clear if this change has progressed sufficiently far to reflect the true social benefits associated with agricultural conservation efforts. The design and performance of various environmental benefit indices warrant further study.

A third challenge in designing PES programs is the consideration of **scale effects**. While much of the literature on the targeting of land-diversion programs considers payments that are determined on a per acre basis, scale considerations can be important in evaluating individual PES projects for two reasons. First, in some cases (such as water quality), the reduction in aggregate regional pollution needs to exceed a certain threshold to have a meaningful impact (Wu and Boggess 1999). Second, there may be an agglomeration effect, as, for example, when the health or even survival of a wildlife population depends on having sufficient habitat for roaming (Drechsler et al. 2010). In this case, the benefits from diverting a large contiguous parcel of land may be higher than the benefit obtained from the same number of acres spread across various locations. The agglomeration effect suggests that PES contracts should be done at various scales and that government agencies sometimes may consider location and interaction with neighboring land in determining PES levels. The exact strategy depends on the specific amenities and locations.

A fourth challenge is **slippage**. Taking land out of production reduces supply and increases prices. This acreage loss may induce marginal land that was not in production to be utilized again, thereby offsetting some of the environmental gains from land diversion. Wu (2000) found that for the period 1982 to 1992, about 10 percent of the benefits of CRP wind and soil erosion programs were offset due to this phenomenon, an estimate later challenged by Roberts and Bucholtz (2005). The magnitude of slippage warrants further study. In cases where slippage is likely to occur, the design of programs should also provide some incentives to keep marginal land out of production, a concept admittedly difficult to implement.

A related challenge is to enhance PES program **additionality**, which means to ensure that payments induce conservation activities that would not have been done otherwise. There are various estimates on the amount of CRP land that would have been diverted away from farming even without the program. Lubowski, Plantinga, and Stavins (2008) argue that the CRP did enhance land conservation activities since they estimate that 91 percent of CRP land would not have been enrolled in the program otherwise. On the other hand, when EQIP subsidizes compliance to local or federal water quality regulations, the degree of additionality of this program is likely to be smaller since regulatory compliance would occur in the absence of conservation subsidies. The additionality of various conservation programs has important implications for the efficiency of resource allocation.

A final challenge in implementing PES programs is **enforcement**. Enforcement may be especially difficult for working-land programs where practices cannot be easily observed by remote sensing or other relatively cheap methods. Giannakas and Kaplan (2005) suggest that non-compliance is likely to increase as the cost of conservation activities increases, the cost of monitoring increases, and the size of government payments decreases. Claassen, Cattaneo, and Johansson (2008) report that adherence to conservation cross-compliance requirements, as well as the monitoring of compliance, can be significantly improved, and the government frequently does not invest in enforcing completion of conservation plans that were part of EQIP. Since monitoring and enforcement are costly, government has limited capacity to engage in enforcement activities, and, therefore, the design of PES conservation programs has to take into account the capacity to enforce them. Technological improvement is likely to increase the feasibility and precision of monitoring performance while also reducing its costs, which may facilitate enforcement and thereby enable the development of more refined PES schemes.

Design Element 10: Distributional Considerations

In addition to efficiency, like any other government program, PES programs can also be evaluated based on how their benefits and costs are distributed across various groups in society. Conservation payments have been explicitly promoted in some developing countries as a means to support relatively poor members of society. Even in the United States, these programs can have at least an implicit distributional agenda. For example, Wu, Zilberman and Babcock (2001) suggest that one reason for cost-targeting was that it was more beneficial for farmers than other targeting schemes. Zilberman, Lipper, and McCarthy (2008), who conceptually analyzed the **distributional effect** of PES programs across farmers, consumers and farm labor, found that land-diversion programs may hurt consumers by reducing supply and increasing food prices. In addition, they may have negative employment effects by taking land out of production. Thus, there is a high likelihood that land-diversion programs have some negative distribution effects.

In contrast, working-land programs do not reduce supply in the way that land-diversion programs do. In addition, they can induce farmers to substitute labor for chemicals. As a result, these programs are more likely to have positive distributional effects from the perspective of food prices, consumers, and farm employment than land-diversion programs. While no empirical studies have been done in the context of the United States, these predictions seem to hold in developing countries (Pagiola, Arcenas, and Platais 2005).

Conclusions

U.S. conservation programs are going through a transitional process where their efficiency in providing environmental benefits is being enhanced. The transition to performance-based payments based on benefit-cost targeting in particular has increased the environmental amenities provided per dollar spent. Over time, the range of amenities has expanded beyond prevention of soil erosion to include improved water and air quality, as well as protection and enhancement of habitat. The mixture of working-land and land-diversion programs allows a diverse set of environmental objectives to be addressed. The introduction of multiple payment schemes responding to performance in the CSP is an important innovation that can improve efficiency.

Economic studies suggest that agricultural conservation programs provide significant benefits that are likely to increase as program design improves. But the design of agricultural PES programs is still a work in progress. It is complicated by a significant degree of uncertainty about human behavior, as well as the relationship between practices and environmental outcomes, and by heterogeneity and fluctuations in economic and biophysical conditions. Thus, continuous learning and reassessment should be important parts of conservation program activities, and new information and understanding should be incorporated as these programs are refined. In addition, program designs should address the challenges associated with imperfect information, the aggregation of multiple amenities, scale effects, slippage, additionality, and enforcement, as well as the distributional implications of alternative designs.

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