March 2006

United States Department of Agriculture
Economic Research Service

ECONOMIC BRIEF NUMBER 3

Conservation Program Design

Participant Bidding Enhances Cost Effectiveness

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Much of USDA conservation policy relies on voluntary, incentive-payment programs. These programs are designed to encourage farmers to undertake conservation efforts that address resource concerns on their farms. However, to spend program dollars cost-effectively, program managers must motivate farmers to offer to participate, then select those applicants who offer the greatest environmental gain per dollar spent.

Bidding is one way to do that. Conservation program managers solicit contract offers (bids) from farmers, and interested farmers compete for enrollment by submitting bids. Bids can convey critical information that program managers would not otherwise have, including who is willing to participate, what land and practices they will offer, what resource concerns they are offering to address, and the dollar amount they will accept to participate. When the cost to enroll all interested farmers exceeds available funding, bidding allows program managers to select the best applicants by comparing contract offers—projected conservation benefits versus costs as submitted. This ensures that final program participants are those who will maximize taxpayers' investment in conservation effort.

Voluntary conservation payment programs need to specify who is eligible to receive payments, how much can be received, for what actions, and the means by which applicants are selected. The achievement of program goals in a cost-effective manner hinges on the choices policymakers and program managers make when answering these questions. **This Economic Brief is one in a set of five** exploring specific design options these decisionmakers face:

(1) income support versus environmental objectives,

(2) alternative ways to target programs,

(3) the use of bidding in determining payment levels,

(4) land retirement and conservation on working lands, and

(5) payments for conservation practices versus the level of environmental performance.

Available at www.ers.usda.gov/publications/eb1, . . ./eb2, . . ./eb3, . . ./eb4, and . . ./eb5

Bidding Provides Information on Conservation Costs and Benefits

The bidding process is analogous to a homeowner who solicits construction bids. Different contractors will likely propose offers that differ in terms of cost, expedience, quality, amenities, and durability. Based on various financial constraints, zoning requirements, and architectural preferences, the homeowner will weigh these offers and select the best fit. Similarly, a program manager might have a good idea of how much a conservation practice might cost on average, but the likely environmental benefits provided and which farmers will submit a bid for enrollment at a particular incentive rate are generally not known until after program implementation.

In this situation, payments could be set at a fixed rate and contracts could be accepted until program funds were exhausted ("first come, first served"). Or program managers could harness competition with a signup that asks farmers to submit bids. Depending on the program, bids may specify what conservation practices a farmer will install, on what land, at what price, and over what period. Different programs have different rules about how bids are specified and weighted, but each bid generally includes information about costs and benefits.

Costs –Farmers could "bid for cost," or agree to accept a lower incentive payment for a given practice(s) in hopes of being enrolled. However, accurate cost estimates for certain practices are elusive and time consuming for both program managers and farmers.

Benefits –Farmers could "bid for benefits," offering the practice(s) and field(s) that provide the greatest (perceived) environmental benefit. When actual benefits are unknown, a proxy value (like the Environmental Benefits Index (EBI)) can be used by program managers.

In a competitive program (one where the budget is not sufficient to enroll all interested participants), the program manager could rank the bids according to costs, benefits, or both. To stretch the available budget and to maximize environmental gain, the manager would favor contracts with the highest benefits relative to costs.

Bidding is Used in CRP and EQIP

Two prominent U.S. conservation programs have used flexible bidding rules to enroll the most cost-effective contracts. These are the Conservation Reserve Program (CRP, with a 2004 budget of $1.9 billion) and the Environmental Quality Incentives Program (EQIP, with a 2004 budget of $0.9 billion).

Conservation Reserve Program

The CRP initially focused on retiring highly erodible cropland. Farmers often enrolled less productive land and received annual payments above market rental rates for that land. Beginning in the early 1990s, the USDA began selecting land for CRP enrollment based on the Environmental Benefits Index (USDA-Farm Service Agency, 2004). The EBI accounts for offsite damages of soil erosion and recognizes other environmental benefits, particularly wildlife habitat. EBI points are now assigned based on several environmental categories and a cost factor. The majority of the EBI score is due to site-specific characteristics (e.g., slope of the field, leaching potential of the soil, location in a wildlife priority area). Farmers could therefore offer those fields for enrollment that have the highest site-specific scores (i.e., *bidding for benefits*). Moreover, farmers could increase the attractiveness of their bids by agreeing to establish better wildlife habitat, such as planting native grasses rather than domestic varieties. Farmers could also increase the attractiveness of their bids by lowering the rental rate for their fields, known as "offering a discount" (i.e., *bidding for costs*).

Program managers use both benefit and cost information to enroll the bids with the highest EBI score. Between 1997 and 2003, farmers offering discounts had, on average, lower site-specific EBI scores than those not offering discounts, suggesting that bidding for costs improved farmers chances of being enrolled (table 1). However, the proportion of farmers offering a discount has declined over time, even though the amount of the discount offered has generally increased.

Why are fewer farmers offering discounts over time, when competition is increasing? It may be that offering fields for enrollment that are inherently more attractive to program managers (i.e., bidding for benefits) is becoming a more successful strategy. Fields enrolled from 1997 to 2003 had much higher site-specific scores than fields that were not enrolled, regardless of whether a discount was offered (table 1). Also, fewer farmers may be offering discounts because program rental rates under CRP have been largely constant since 1997, while market rental rates have increased, reducing landowners' willingness to offer a further discount.

Environmental Quality Incentives Program (EQIP)

Before 2002, EQIP applicants were able to both lower their request for program payments (bid for costs) and offer a suite of conservation practices on selected fields (bid for benefits). During 1997-2001, broad eligibility and modest funding ($200 million/year) resulted in a very competitive program. In 1997 and 1998, roughly 70 percent of EQIP applicants were rejected. Bids for cost-share rates (the reimbursement rate requested by farmers for implementing conservation practices) were low relative to maximum allowable rates. For structural practices (e.g., animal waste handling systems or grassed waterways), farmers could request up to 75 percent of the cost, but the mean accepted cost-share rate was only 35 percent. For management practices (e.g., nutrient management, conservation tillage), producers could request up to 100 percent of the (county) maximum incentive payment rate for the practice, but the mean accepted cost-share rate was only 43 percent (table 2).

Some farmers requested lower cost-share rates because many structural/management practices funded by EQIP produced private benefits. As such, even at the lower cost-share rates, farmers still broke even or offset production costs that they would have borne anyway. For example, waste storage facilities may be part of a livestock feeder's plan for complying with local or State waste handling requirements. Sprinkler irrigation systems that conserve water also reduce pumping costs. Pasture planting can improve grass cover and reduce erosion, but will also increase grazing productivity. Similarly, conservation tillage, irrigation water management, prescribed grazing, and nutrient management may reduce production costs through careful management of production inputs.

Table 1—Contract acres for CRP enrollment (1997–2003)

Year	Signup	Acres (mil.)	Share of acres offered	Acres offered with discount	Mean discount	Site-specific EBI	
						With discount	W/o discount
Acres enrolled in CRP[1]:							
1997	15	16.17	71%	57%	2.99	197	200
1997	16	5.92	65%	53%	6.68	198	209
1998	18	4.99	73%	36%	4.89	184	194
2000	20	2.46	73%	38%	5.80	183	194
2003	26	2.00	49%	31%	7.16	231	230
Acres offered, but not enrolled in CRP:							
1997	15	6.49	29%	70%	5.01	153	155
1997	16	3.19	35%	48%	6.38	167	171
1998	18	1.81	27%	42%	5.67	153	161
2000	20	0.89	27%	41%	6.31	149	159
2003	26	2.06	51%	27%	6.49	181	181

Source: Economic Research Service analysis of CRP data.

[1]The site-specific EBI score measures the base environmental attributes of a candidate field and does not account for proposed discounts or environmental enhancements.

Table 2—EQIP best management/structural practices (1997–2001)

Selected management practices	Mean cost share rate (%)	Selected structural practices	Mean cost share rate (%)
Conservation crop rotation	60	Waste storage facility	40
No-till/ Strip till	53	Fence	35
Mulch till	58	Sprinkler irrigation systems	42
Cover crop	27	Pasture/hay planting	45
Residue management	26	Pipeline (livestock water)	18
Irrigation water management	39	Irrigation water pipeline	42
Prescribed grazing	46	Brush management	29
Nutrient management	48	Grade stabilization structure	39
Pest management	45	Pond	38
All management practices	43	All structural practices	35

Source: Economic Research Service analysis of EQIP data.

Strong competition among applicants may also have encouraged farmers to offer multiple practices on their bid, thereby enhancing their environmental score. Subsequently, many proposed practices were never implemented (which does not carry a penalty but does lessen the payment received). Between 1997 and 2001, 17 percent of EQIP contracts had one or more practice withdrawn (Cattaneo, 2003). Such behavior reduces environmental gain from expected levels and may lower program cost effectiveness.

Evidence from CRP and EQIP suggests that bidding for costs can help increase the cost effectiveness of conservation programs.

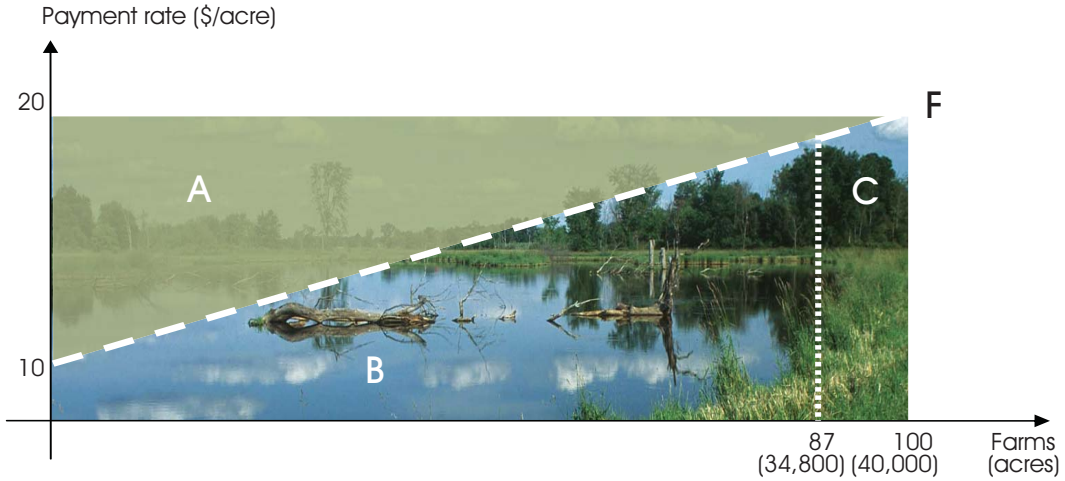
Modeling Bidding and Cost Effectiveness

Evidence from CRP and EQIP suggests that bidding for costs can help increase the cost effectiveness of conservation programs—i.e., lowering the amount of financial assistance going toward farmers' efforts to install and manage conservation practices. Similarly, evidence from CRP illustrates how bidding for benefits can increase cost effectiveness by enrolling fields that provide greater environmental benefits. By collecting cost and benefit information from farmers prior to enrollment, program managers can maximize environmental benefits for a given conservation budget. Because there is little information available to compare gains in cost-effectiveness via bidding versus nonbidding designs, two hypothetical conservation programs (at different scales) help illustrate how program managers can use bidding to distribute conservation funds effectively.

Consider a conservation program designed to encourage farmers to use no-till residue management (no-till) on cropland in a multicounty region. No-till leaves a large percentage of harvested crop residue on a field in order to reduce the amount of sediment and fertilizer runoff, enhancing nearby water quality. Suppose this program either offers participants a flat rate for adopting no-till, or solicits bids on the level of financial assistance farmers would be willing to accept (WTA) to implement no-till. In

Figure 1

Acres of no-till management



At a national level, farmers can improve the environmental performance of their cropland (in response to incentive payments) using a broad slate of conservation practices.

this example, suppose there are 100 farmers willing to adopt no-till on their 400-acre farms at an incentive rate of $10 to $20 per acre, depending on individual farm conditions ($10 ≤ WTA ≤ $20). Line (F) in fig. 1 represents the hypothetical distribution of farms and their WTA to adopt no-till. (In a real world situation, it is likely that farms would not be distributed in such a uniform fashion along a straight line; there would likely be many small farms and fewer large farms with different WTA.)

If the program manager offered a flat payment of $20 per acre to any farmer willing to adopt no-till, the noncompetitive program would be able to enroll all interested farmers. (Area A+B+C would represent the total cost of such a program: $20 per acre × 40,000 acres = $800,000.) Yet, we know that many farmers would have been willing to adopt no-till for less than $20 per acre. In this example, area (A) represents the amount of payments in excess of farmers' WTA for adopting no-till. These excess payments essentially support farm incomes (see Economic Brief No. 1).

Suppose now that the program manager has a limited budget of $500,000. Given a flat payment rate of $20 per acre to any producer willing to adopt no-till on their fields, enrollment on a first-come, first-served entitlement basis would result in 63 farms and 25,000 acres being enrolled. As one alternative, the program manager could offer the same $20 per acre and collect all the bids from farmers. Selecting those who bid for the most *benefits*, the program manager could enroll those farms that would likely result in the greatest environmental benefit for enrollment (e.g., farms on highly sloped lands or near water resources). The program manager would still enroll 25,000 acres on 63 farms, but not necessarily the same farms as before.

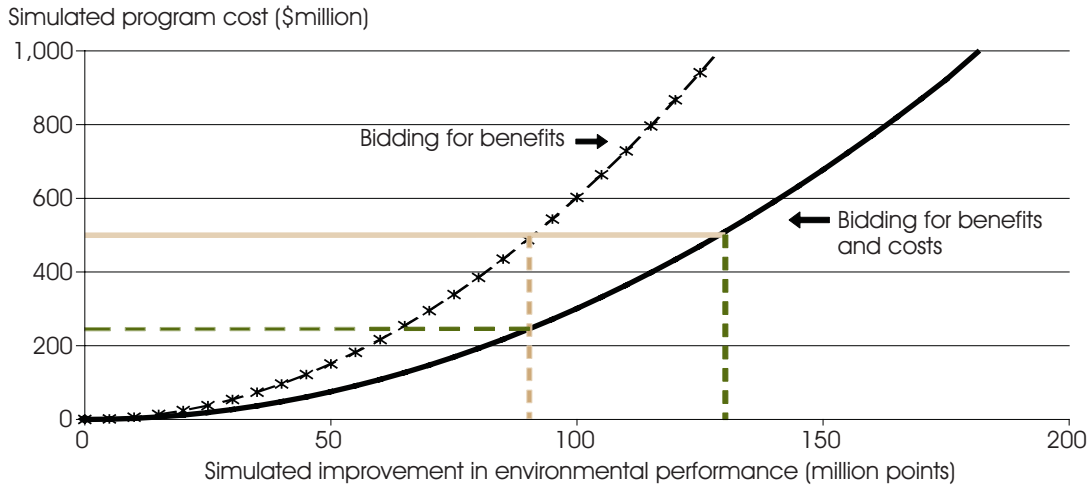
Instead, suppose the program manager solicits bids from these same farmers, but asks them to indicate how much they would be willing to accept to adopt no-till. The program manager could then select those who bid for the lowest *cost* (with a cutoff of $10 per acre) and enroll up to 87 farms and 34,800 acres with no-till for the same $500,000 budget (area B in figure 1). However, these acres might not necessarily generate the same aggregate benefits as before.

In this example, a farmer's probability of being accepted into a conservation program is heightened by agreeing to accept lower payments to implement a conservation practice or by agreeing to enroll fields likely to generate the greatest benefits from no-till residue management. In either case, the information gathered by soliciting bids results in cost savings over a "first-come, first-served" approach.

Bidding for costs and benefits can also increase the cost effectiveness of a conservation program when multiple regions and practices are involved. At a national level, farmers can improve the environmental performance of their cropland (in response to incentive payments) using a broad slate of conservation practices—nutrient management, no-till residue management, conservation rotations, etc. Using an empirical model of U.S. agriculture and its environmental impacts, farmer responses to two types of program designs (funded at $500 million) are simulated: one that allows bidding for benefits only (using a fixed-rate incentive payment) and one that allows bidding for both benefits and costs. Improvements in environmental performance on farms are measured in a number of ways (reduced soil erosion, increased soil productivity, etc.) and are represented in aggregate using environmental points, similar to the EBI. The simulations suggest that farmers could enhance environmental performance on cropland by

Figure 2

Program budget and environmental performance



Source: Cattaneo et al., 2005

approximately 91 million points (or by 8.5 percent) if they were offered $5.50 per point and allowed to bid for benefits (fig. 2). On the other hand, if farmers were asked to submit bids for both benefits and costs, the program could generate the same environmental benefits at half the cost (about $250 million)—at an average cost of $2.75 per point. At a funding level of $500 million, bidding for benefits and costs could generate nearly 130 million benefit points (an average cost of $3.90 per point)—an increase in cost effectiveness of about 30 percent when "bidding down" costs are allowed.

Practical Considerations

Many program design decisions will influence a program's performance. For example, larger farms may have lower average costs of installing practices than smaller farms, raising equity issues in selecting program participants. Or certain farms may have greater potential to enhance wildlife habitat, whereas others may be more suited to addressing water quality issues. Selecting bids for enrollment is difficult when a program pursues multiple objectives (environmental or otherwise) that are not easily compared. However, these considerations are generally important for voluntary conservation programs, with or without bidding for costs and benefits.

In addition, the more flexible a program is regarding farmers' choice of structural or management practices to bid for costs (lowering the amount of payment they require) and benefits (increasing the number of practices eligible to generate environmental benefits), the more cost effective the program generally will be. However, by allowing more flexibility, program managers will expend more time and effort in developing estimates of the resulting environmental benefits and in providing technical assistance to interested farmers. Farmers will also have to spend more time estimating how much various practices will cost to implement and which combination of practices on which fields will provide them the best chances for enrollment. If these transaction costs are high, farmers may be reluctant to participate and/or program managers may not have sufficient resources to select cost-effective contracts.

Bidding In Sum

For a program with limited funds, bidding provides program managers benefit and cost information to select cost effective contracts, enables interested farmers to compete for enrollment, and can enhance cost effectiveness. To maximize the advantages of bidding in conservation programs (i.e., to reduce program costs and increase environmental benefits), both bidding for costs and bidding for benefits would need to be included. In many cases, bidding for benefits is already in place. Farmers and program managers have a good idea of which fields and which practices will generate the most benefits. Bidding for benefits is already evident in State-level ranking procedures for EQIP contracts. Bidding for costs in EQIP was discontinued in 2002 amid concerns about the ability of producers with limited financial resources to compete effectively for EQIP enrollment. Aside from distributional concerns, however, bidding has significant potential to increase the environmental cost effectiveness of conservation programs.

So it is bidding for costs, allowing farmers to submit the payment levels they would require under their contract, that holds the most untapped potential for enhancing conservation program cost effectiveness. If farmers compete for limited funds through such bidding, the cost effectiveness of the enrolled contracts would be higher. Furthermore, the cost to program managers of determining the appropriate payment levels for eligible practices on participating farms would be much lower. The end result would be more environmental gains for each conservation dollar spent.

This brief is drawn from . . .

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