

Chapter 2

Designing Voluntary Incentive Payments for Working Land Conservation

Water quality, air quality, abundant wildlife, and open space are among the issues addressed by agri-environmental policy. Agri-environmental programs may also have secondary goals like helping farmers comply with environmental regulation, supporting farm incomes, and ensuring an equitable distribution of payments across regions. To design a cost-effective WLPP (see box, “What Is Environmental Cost-Effectiveness?”), it is necessary to (1) identify those producers, land, and practices that are most likely to secure program objectives at least cost; and (2) devise eligibility criteria, incentives, and enrollment screening criteria that will attract those producers, land, and practices.

Benefits from WLPPs Contingent on Design

Agri-environmental incentives, when offered to farmers, trigger a sequence of events that includes producer bids, program enrollment, the application of conservation practices, the disbursement of payments, and ultimately environmental and economic outcomes. Once enrollment decisions are made—well before any of the contracted practices have been adopted or installed—most of what can be done to ensure that program objectives are achieved will already have been done. Thus, designing a cost-effective

What Is Environmental Cost-Effectiveness?

Environmental cost-effectiveness is achieved when an environmental goal or objective is attained at the lowest possible cost to society as a whole. Note that “cost” is not necessarily equal to government expenditure. Costs include the full (private and public) cost of adopting or installing and maintaining beneficial conservation practices, including federally provided technical assistance, and transaction costs. If government payments and technical support exceed producer conservation costs, the amount exceeding cost is a transfer payment to the producer. Because the transfer payment is simultaneously a cost to taxpayers and a benefit to the producer, these costs and benefits cancel one another for society as a whole. When program expenditure is limited by a budget (e.g., EQIP) or acreage allocation (e.g., CRP), an alternate formulation of the cost-effectiveness criterion can be used: maximize environmental gain given the available budget. The budget-constrained cost-effectiveness criterion is not a precise mirror image of the standard cost-effectiveness criterion. To maximize environmental gain subject to a budget constraint, both the economic cost of environmental gains (just as in the standard cost-effectiveness criterion) and transfer payments must be minimized. In contrast to the standard cost-effectiveness criterion where transfer payments are a wash, transfer payments are an issue in the budget-constrained case because they use up budget resources that could be devoted to further reducing environmental damage. As a result, budget-constrained cost-effectiveness is more difficult to achieve than standard cost-effectiveness.

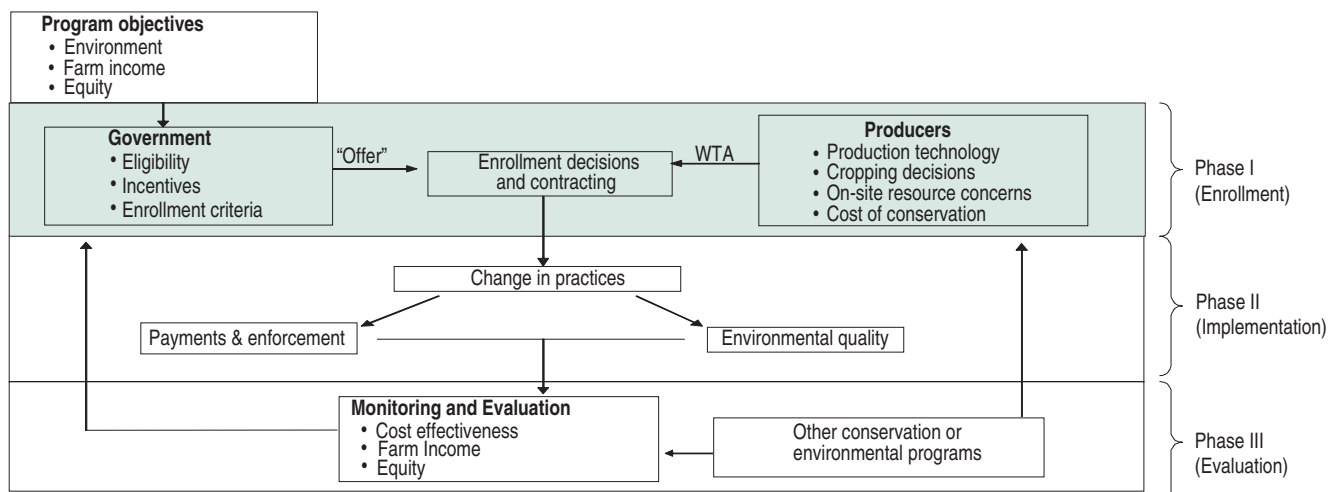
program—regardless of objectives—places a premium on the ability of program decisionmakers to anticipate program outcomes.

To anticipate outcomes, it is necessary to anticipate how producers will react to the offer of payments and how their changed practices would affect the environment. The way government structures an agri-environmental program—effectively its “offer” to producers—will largely determine what information can be gleaned from the application process and how it can be used to determine program enrollment (Phase I, fig. 2.1). Broadly speaking, all existing U.S. agri-environmental payment programs use one of two basic structures:

- **Request for proposal.** In most agri-environmental programs, the government’s offer is, in fact, a request for proposals from producers. The government’s offer generally indicates who can submit proposals (i.e., who is eligible), minimum requirements in terms of conservation action, how much producers can expect to be paid (or, for some programs, the maximum bid that could be acceptable), and the criteria by which proposals will be assessed. Participants are then selected on the basis of the specific environmental benefits they offer and costs they incur, or another set of criteria that reflect policymaker objectives. A producer’s offer typically specifies the land to be enrolled, what resource concerns will be addressed, what practices will be adopted or installed, and, in some programs, the level of payment the producer is willing to accept for taking the specified actions.
- **Payment offer.** In some programs (e.g., continuous signup for CRP), the government offers producers a given payment (usually based on conservation cost or land rents) for taking a given action and allows them to choose to participate without further assessment by the government. If necessary, budget or other limits can be enforced by withdrawing the offer when the limit is reached (i.e., first-come, first served). In the special case of an entitlement program—where eligible, willing producers cannot be denied enrollment, regardless of budgetary consequences—spending would be determined by the extent of participation (e.g., how much land, which practices).

Figure 2.1

Framework for a voluntary working-land payment program



The difference between these two approaches is in the extent of final review by the government. This process, which we call enrollment screening, allows program decisionmakers to gather farm- or field-specific data (e.g., location, soil types, topography, proposed practice changes) that can be very helpful in assessing potential environmental benefits. This information can be used to better weigh the potential environmental benefits against contract costs for specific proposals.

Meanwhile, a producer's attitude toward a given program can be summarized in a single question: "Am I willing to take the specified actions in exchange for the payment offered?" What producers are willing to accept (WTA) will depend on factors like their cost of adopting conservation practices, attitudes about and awareness of conservation problems, wealth, and level of aversion to the risk of trying new practices (see box, "Producers' Willingness To Accept Payments"). By definition, producers are willing to participate so long as the incentive offered meets or exceeds their WTA. For example, if a producer is willing to adopt conservation tillage for a payment of \$5 per acre, he will be willing to participate in any program where he is offered \$5 or more per acre for conservation tillage adoption. While producers' WTAs are generally unknown, a program implementation process that includes competitive bids for financial assistance may induce producers to reveal their WTAs—which can lower program costs *if* program decisionmakers use this information in determining which producer applications to accept.

Decisions about eligibility, participation incentives, and enrollment screening must be made simultaneously, particularly when the program budget is limited. For example, broad eligibility and large participation incentives will yield a large pool of program applicants, which can then be narrowed using an enrollment screen. A broad pool of applicants may be environmentally cost-effective because it is more likely to include those producers who can make the most profound contributions to achieving program goals. The risk in this approach is that many applications will be reviewed only to be rejected, possibly straining administrative resources and/or discouraging producers from again applying for agri-environmental programs.

In an entitlement program, enrollment screening is moot—those producers who meet eligibility requirements and are willing to accept the payment offered must be enrolled. As a consequence, achieving cost-effectiveness requires that eligibility requirements and incentives be designed to attract producers best suited to making a cost-effective contribution to program objectives. This goal can be accomplished, but only at a cost (in terms of program expenditure) that is higher than may be necessary if an enrollment screen was used.

The need to make program provisions work together is not limited to decisions about a single program. WLPPs are likely to interact with other agricultural and environmental programs. Accounting for that interaction in program design can help avoid conflict or duplication between programs (see chapter 4 for more details).

Producers' Willingness To Accept Payments (WTA)

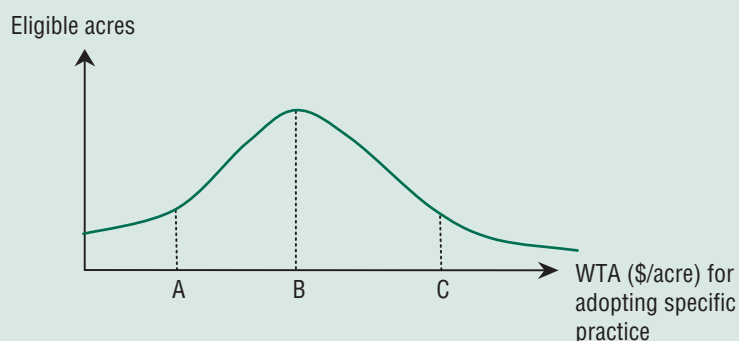
Producers may consider a variety of issues in deciding whether to apply for any voluntary agri-environmental program. These factors can be summarized in a single question, "Am I willing to take the specified actions in exchange for the payment offered?" Because many agri-environmental programs allow producers to propose which portion(s) of the farm would be enrolled and which practice(s) would be adopted or installed, the question may also be formulated as, "What am I willing to offer, given the level of payment that is potentially available?"

In either case, the level of payment the producer is willing to accept (WTA) for undertaking any conservation practice or activity reflects a variety of costs and benefits to the producer. Most obvious (and most easily measured) are the out-of-pocket costs to adopt or install conservation practices. These include earthworks to build terraces or waterways and machinery upgrades needed to practice reduced- or no-till farming. Other obvious (but less easily measured) costs are from adoption or installation of management practices. For example, producers adopting nutrient management may save on fertilizer but could also risk reductions in yield.

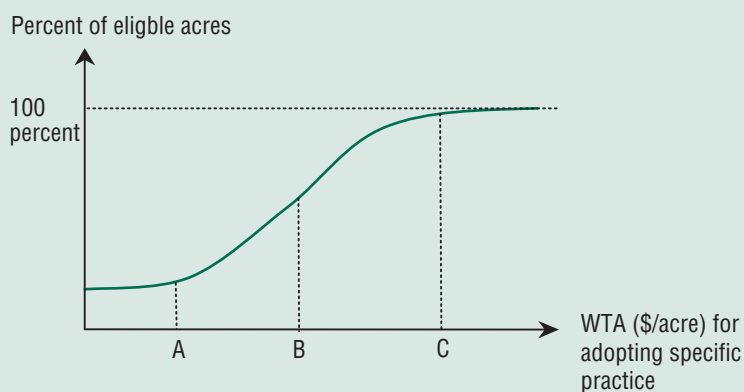
For some producers, the transaction costs associated with program signup can be considerable. These costs can include time and travel required to meet with USDA staff

and develop conservation plans in conjunction with technical experts (provided by USDA). Likewise, risk aversion may increase WTA as risk-averse producers require greater payment for making changes perceived as risky. Finally, WTA may also reflect other factors like wealth, education and attitudes about environmental quality, and participation in government programs.

Because the factors that underlie WTA can vary widely among producers, WTA can also vary widely among different producers who install or adopt the same practice or address the same resource concern. Understanding the likely distribution of WTA among producers is important because it can help policymakers assess the proportion of producers to adopt certain practices or address certain resource concerns for a given level of payment. This variation in WTA can be depicted by a bell-shaped or normal curve. To depict the bell-shaped curve in a way that is directly relevant to agri-environmental program participation, we graph the proportion of acres controlled by producers with WTA of a specific level or less. This type of curve is known as a probability density function or PDF. The more (less) variation in WTA for adoption of any given practice, the smaller (larger) the "peak" in the bell curve and the less (more) pronounced the "S" shape of the cumulative distribution function (CDF).



A bell-shaped PDF, or "normal" curve, is used to represent the distribution of WTA. Average WTA is represented by point B. Relatively few acres are owned/farmed by producers who have WTA significantly less than the average level (point A) or significantly higher than average (point C). Some acreage has a zero WTA because the practice has already been adopted.



This s-shaped CDF formulation shows the proportion of acres with WTA at or less than a given level. On only a handful of acres (where the practice is not already adopted), WTA is less than or equal to A. In contrast, WTA is less than or equal to C on almost all acres. A payment of \$A would result in enrollment of only a handful of producers, while a payment of \$C would send enrollment to nearly 100 percent.

After the enrollment phase, contracts are signed, technical assistance is provided, conservation practices are adopted, and incentive payments are disbursed (Phase II, fig. 2.1). However, compliance is not assured. Given the wide range of practices typically available in a WLPP, checking that practices are actually adopted as specified in the contracts is difficult—more so for management practices than for structural practices (Johansson, 2002). For example, the existence of terraces or grassed waterways—as well as the appropriateness of their design and the extent to which they have been maintained—can be observed directly. But it is very difficult to confirm that nutrient management plans are being fully implemented in the field.

Finally, although monitoring of agri-environmental outcomes (Phase III, fig. 2.1) has been used only sparingly in agri-environmental programs, information gained from monitoring could be used to adjust program design to better meet policy objectives. This type of ex-post evaluation could help improve cost-effectiveness by honing environmental indices and other “tools” used in program implementation.

Attracting the Right Participants: Program Design Alternatives

Policymakers have a number of tools that can be used to influence WLPP participation. In particular, eligibility criteria, payment incentives, and enrollment screens can be used to direct resources toward producers, land, and practices that are most likely to achieve program objectives. Cost-effectiveness depends largely on how these tools are used and how they are combined into an overall program design.

Before these tools can be applied, however, it is important to be clear about what the program is expected to achieve, environmentally and otherwise (see box, “Defining Program Objectives”). Broad directives, aimed at general resource concerns, such as “improve water quality” or “increase wildlife habitat” are not specific enough for effective program design. To establish a practical agri-environmental program, environmental indicators that measure the need for action and progress toward addressing resource concerns are also important. The selection of indicators is effectively the selection of a more specific set of program objectives. When programs seek to address multiple objectives, moreover, some method of weighing objectives (indicators) against each other is needed when, inevitably, conflicts arise. Once these decisions are made, program decisionmakers can proceed effectively with all other aspects of program design: eligibility criteria, payment incentives, and enrollment screens.

Eligibility is often used as a broad “first cut” in defining participation because it determines who can apply for enrollment and what practices they can use. EQIP, for example, sponsors a wide range of practices on many different land types—virtually any type of farm, any type of agricultural land, and any practice found in the NRCS *National Conservation Practice Handbook* can be funded. Because eligibility has been so broad, program decisionmakers have used other means (e.g., enrollment screening) to select participants on the basis of environmental benefits and costs.

Defining Program Objectives

Practical agri-environmental objectives can be formulated in a number of ways. One way is to meet a specific, definable standard for a specific resource. For example, a water quality objective may be defined as meeting a specific maximum concentration of nutrients or other pollutants in a lake or along a stream. Many nonagricultural environmental programs use this method for defining goals. Under the Clean Water Act, for example, the Total Maximum Daily Load provisions require States to identify impaired water bodies where controls on municipal and industrial discharges will not achieve water quality standards. The State must define the maximum load of the problem pollutant that the water body can absorb and still achieve water quality standards. Load allocations are then assigned to both point- and nonpoint-source dischargers in the watershed so that the maximum load is not exceeded.

However, most agri-environmental payment programs have multiple environmental objectives. To weigh the environmental objectives against one another, multi-objective programs often use environmental indices. Both CRP and EQIP use indices to rank producer-proposed contracts by their potential to generate environmental benefits. In budget- or acreage-limited programs, environmental indices, used together with information on contract cost, can help program decisionmakers determine which contracts to accept.

When an environmental index is used, the proportion of total points allocated to various resource concerns defines objectives, implicitly. In the CRP, for example, addressing water quality concerns on a parcel of land is allotted a maximum of 100 points, while a maximum of 35 points can be assigned for addressing air quality concerns. The difference reflects program decisionmaker perceptions as to environmental value or urgency. Decisionmakers may use location, soils, practices to be adopted, and other information to determine how many points to assign for each resource concern. Variation reflects diversity of environmental problems faced by producers and variation in their ability to address them.

Nonenvironmental objectives, such as income support, may be an explicit or implicit consideration in the formulation of agri-environmental programs. Equity is often an issue. While any definition of equity is subjective, objective economic analysis can help policymakers understand the effect of program design decisions on different groups within the farm sector and society at large. For example, policymakers may be concerned with the distribution of payments among farms and their effect on farm income. In the 2002 farm bill, regional equity emerged as an issue in the distribution of agri-environmental payments. Special preferences may also be given to limited-resource farmers or beginning farmers. Equity concerns have been raised on behalf of “good actors”—producers who have already reached a high level of environmental performance.

Eligibility, however, need not be broad. In CRP’s continuous signup, only a narrow group of “buffer practices”—shown to significantly reduce sediment and nutrient losses to surface water (Dosskey, 2001)—is eligible for enrollment. The pool of potential applicants is narrowed in CSP by requiring producers to demonstrate past stewardship before they are eligible for program enrollment. Only those producers who have already addressed soil quality and water quality concerns on at least a part of their farm are eligible, and only those portions of the farm where these resource concerns have been addressed can be enrolled.

Table 2.1—Agri-environmental program design options

Program feature	Options		Potential effects
Budget	Continuously variable; allocations may reflect concern about regional equity		As budget increases, so does program scope; may significantly affect decisions on screening, eligibility, and incentives.
Eligibility	Can be based on wide range of factors: farm type, land type, practices, past stewardship, geographic area, etc.		Can be used to focus program implementation on producers, land, and practices most likely to cost-effectively produce environmental benefits.
Enrollment screens	Performance-based		Selection of participants based on ability to meet program objectives. If based on environmental benefits and cost, can promote environmental cost-effectiveness.
	Allocative		Budget can be allocated in ways considered to be fair, e.g., equal allocation among producers; first-come, first-served. Ensures spending stays within budget.
Participation incentives	New conservation incentive	Performance-based	Producers are paid according to the (estimated) value of their conservation actions. Can encourage environmental cost-effectiveness by directing greatest participation incentive to high-benefit, low-WTA (willingness to accept) producers. However, these incentives can also be costly in terms of budget.
		Fixed, cost-based	Payments are proportional to actual cost (as in cost-sharing for structural practices) or an estimate of cost (as in incentive payments for management practices). Environmental cost-effectiveness can be improved by using performance-based screen.
		Bid-based	Payments are based on bids that, ideally, reveal the minimum payment producers are willing to accept for taking conservation actions. Maximum acceptable rates are often specified. When used in conjunction with a performance-based enrollment screen, an environmentally cost-effective outcome is possible.
	Stewardship		Likely to ensure continued maintenance of existing practices, but direct environmental gain will be small. Indirectly, may reduce producer hesitation to adopt conservation practices without program support because they will not be frozen out of opportunity for future payments
	Payment limits can be applied annually, to overall contracts, etc.		May restrict participation of large farms; ensure that participation is more widespread. Effect on cost-effectiveness is unclear.
Implementation	Information costs		Good planning and technical assistance can improve cost-effectiveness, but it can be expensive. Information can also improve cost-effectiveness by leading to more accurate and detailed payment schedules or enrollment screens. But how much information and analysis can be justified on a benefit-cost basis?
	Enforcement		Greater monitoring effort increases likelihood that violation will be detected; greater penalties increase the potential loss if violation is detected; both increase incentives to comply.
Program coordination	Not a specific program provision, but may affect specification of other provisions		Can improve environmental cost-effectiveness by reducing conflict and/or duplication with other programs.

Incentives and Enrollment Screens Can Work Together

In most programs, where eligibility criteria are broad, most of the work in selecting participants is done through a combination of payment incentives and enrollment screening. In general, higher payment rates will lead to broader program application, but exactly how many producers will apply and what actions they will offer to take depends largely on how the incentives are designed. It can be very difficult (or very expensive) to design payment incentives so that the pool of applicants contains only those producers, land, and practices that can (1) most cost-effectively meet program objectives and (2) be funded within the program budget. Consequently, many programs use enrollment screens to help select participants and make sure that budget limits are not breached (see box, “Enrollment Screening and Budgets”).¹

Existing enrollment screens are generally **performance-based**. The term “performance” refers to *estimated* physical effects of adopting conservation practices (e.g., reduced erosion and sediment delivery to water) and the potential benefits that society derives from them (e.g., lower water treatment costs, enhanced water-based recreation). One of the best-known examples of a performance-based screen is the Environmental Benefits Index (EBI) used to select CRP participants. Producers offer specific tracts of land (with specific environmental characteristics), identify what type of cover they will establish (e.g., grass or trees), and what level of cost-sharing and annual payment they are willing to accept. Program managers can also obtain tract-specific information from existing databases (e.g., soil survey information), and so score proposed contracts by benefit-cost criteria using the EBI. Contracts with EBI scores above a cutoff level are accepted.²

But enrollment screening need not be performance-based. Any method of allocating a limited budget can be used as an enrollment screen. For example, producers may be enrolled on a first-come, first-served basis until the program budget (or other limit) is exhausted. CRP’s continuous signup for high-priority practices follows this method. On eligible land, buffer practices such as filter strips or grassed waterways are eligible without the competitive review process that accompanies regular signup. Because eligibility is limited to a few practices with profound environmental benefits, a competitive process is waived.

Of course, the extent to which screening is needed depends considerably on the level and type of payments available to producers. Payments for the adoption/installation of new practices can generally be grouped into three categories: fixed-rate payments, performance-based payments, and bid-based payments. Payments can also be based on stewardship, i.e., ongoing conservation effort.

New Practices: Fixed-Rate Payments. Fixed rate refers to a fixed incentive payment (dollars per acre or per practice) or, in the case of cost sharing, a fixed cost-share rate, e.g., 75 percent. Cost sharing reimburses farmers for part of the cost of installing structural (or vegetative) practices such as terraces and grassed waterways. The actual cost of installation can be deter-

¹Appendix 1 contains a graphical analysis exploring these tradeoffs in more depth.

²Producers are unlikely to be aware of the level of environmental benefit they can produce, given that many benefits will accrue offsite (e.g., downstream).

Enrollment Screening and Budgets

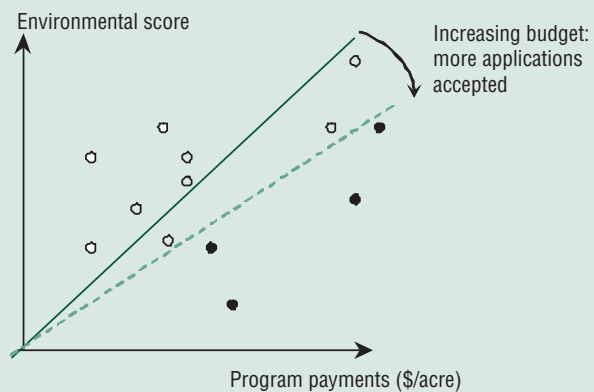
Evaluation of applications hinges on the criteria adopted to rank eligible applicants. Here, several possibilities are presented using 13 hypothetical applicants plotted according to their environmental score and per-acre cost to the government. Black points represent applications that would not be accepted; white points represent applications that would.

This first approach (A), which coincides with how EQIP functioned until 2002, enrolls applications based on their benefit/cost ratio. The evaluation process can be portrayed by rotating clockwise a "cutoff" line: applications above the line are accepted, those below are rejected. How far the line is rotated depends on the available budget. The advantage of this approach is that the largest number of acres will be accepted into the program (short of evaluating applications based exclusively on cost). The disadvantage is that some acres may be accepted simply because the conservation measures to be adopted are very cheap, and as a result, provide only minimal environmental benefits.

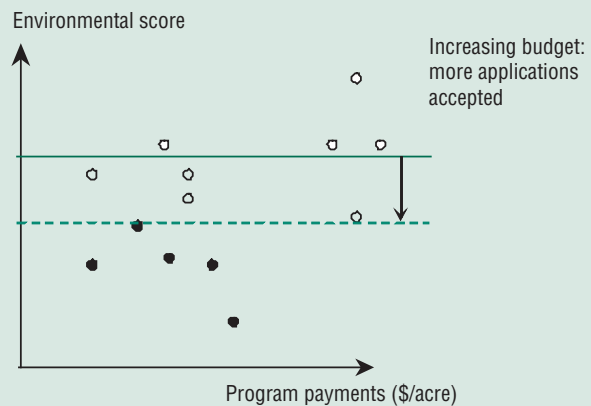
Another approach (B) is to accept applications with the highest environmental scores until the funds are exhausted. This approach excludes all cost considerations from the evaluation procedure. The drawback is that it could reject an application with an environmental score that is just below cutoff but would be less costly to fund than some that are accepted. When cost is excluded, some applications that are rejected may be more environmentally cost-effective than the applications that are accepted. Many States adopted this method in 2002 when the U.S. Congress passed EQIP legislation that discourages cost considerations in the evaluation procedure.

An intermediate approach (C) assigns additional points to applications for cost-effectiveness. This can be portrayed as a sloped cutoff line. The more cost-effectiveness is emphasized, the steeper the slope of the line. States following this approach are Colorado, Kansas, Massachusetts, Minnesota, Nebraska, North Dakota, South Carolina, South Dakota, Utah, and Wyoming.

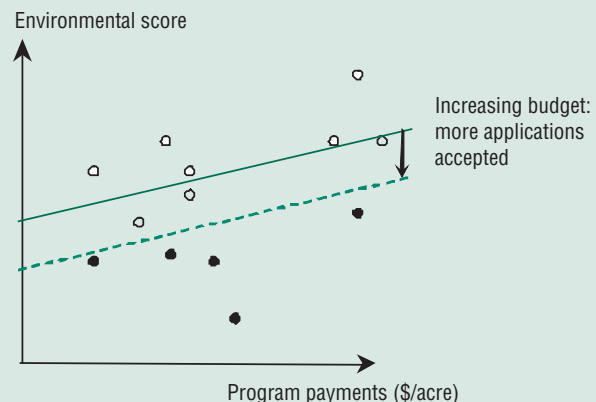
A. Maximize environmental score per dollar of program expenditure



B. Maximize environmental score



C. Maximize environmental score considering cost-effectiveness



mined from receipts for earthwork, seed, and other necessary inputs and services. Incentive payments encourage adoption of management changes where cost is not easily defined. For example, conservation tillage may save on labor and fuel but increase herbicide costs. In EQIP, for example, incentive payments are made to encourage the adoption of management practices, but are not tied to the producer's cost of adopting these practices.

There is no guarantee that producers who apply for payments will be able to make environmental contributions that are more cost-effective than those who choose not to apply. If environmental benefits are typically high when producer WTA is low (i.e., benefits and WTA are negatively correlated), fixed-rate payment arrangements can produce a relatively cost-effective outcome. In other words, producers willing to participate with low payments are also those with relatively high benefits to offer. This is not very likely (see box, "Correlating Costs, Benefits, and Rental Rates"). With performance-based screening, however, program decisionmakers can select producers who can produce relatively large environmental benefits relative to costs. Using a screen in conjunction with fixed payments can significantly improve cost-effectiveness.

Of course, fixed-rate payments need not be based on the cost (real or estimated) of adopting, installing, or maintaining conservation practices. For example, policymakers seeking to direct income support through these programs may want to reimburse producers above conservation costs. However, funds intended as income support may direct participation away from producers who can deliver high environmental benefits at a low cost, because the income support-related payment is not necessarily positively correlated with environmental benefits or negatively correlated with conservation costs. In a budget-limited program, moreover, these additional payments would divert funds from leveraging additional environmental gains.

New Practices: Performance-Based Payments. Performance-based payments compensate farmers based on actual or estimated environmental benefits from their actions. For example, the Soil Condition Index, developed by NRCS, helps determine the CSP payment rate for practices designed to improve soil quality, with measurements both before and after the approved practice is adopted.

When payments are based on (estimated) performance, producers will apply if their WTA is less than or equal to the (estimated) value of their actions.³ Those whose estimated performance is high, but who can adopt practices designed to achieve that performance at low cost, are most motivated to and most likely to apply. Consequently, the pool of applicants is likely to include largely the same producers who would have been selected using a performance-based enrollment screen, assuming the same performance measures are used in both cases.

However, providing the payment incentives that make this self-selection process work can be costly. When a producer's payment exceeds his WTA, that producer receives some surplus over the minimum amount he or she would have been willing to accept, and money is diverted from other conservation efforts. Without proper safeguards, moreover, these additional

³Producers may not know the environmental potential of their actions. Providing this information can improve the cost-effectiveness of the program because it equips producers to respond effectively to the offer of incentive payments. In short, performance-based programs are most effective when producers are fully aware of the environmental impact of their actions.

Correlating Costs, Benefits, and Rental Rates

The table below shows the correlation coefficient between environmental benefits, conservation costs, and land rental rates for seven combinations of resource concern and land type. The correlation coefficient is a measure of linear association that can have values between -1 and 1. When the correlation coefficient is -1, variables are perfectly negatively correlated. In other words, when one variable is high, the other is low. Likewise, a correlation coefficient of 1 indicates perfect positive correlation, while a coefficient equal to zero indicates no correlation.

Benefit	Land type	Average benefits	Correlation coefficient	
		\$/acre	Conservation cost	Rental rate
Water quality	Nonirrigated cropland	20.4	0.14	-0.07
Air quality	Nonirrigated cropland	3.02	0.07	-0.064
Soil productivity— water erosion	Nonirrigated cropland	3.74	0.08	0.31
Soil productivity— wind erosion	Nonirrigated cropland	3.53	-0.14	0.58
Wildlife habitat	Nonirrigated cropland	18.41	0.36	0.37
Wildlife habitat	Grazing land	7.86	0.16	0.2

Note: County CRP rates are used for cropland, Grassland Reserve Program (GRP) rates for grazing land.

Sources: ERS analysis of NRCS and FSA data. See Web Appendix C (www.ers.usda.gov/publications/err5) for a detailed discussion.

Only one resource concern/land type combination—soil productivity damage due to wind erosion—shows negative correlation between potential benefits (damage reduction) and cost and positive correlation between potential benefits and land rental rates. The correlation between benefits and costs is low. Moreover, the potential soil productivity benefit of reducing wind erosion is modest. In all other cases, benefits are positively correlated with costs. Benefits are negatively correlated with rental rates in some cases and positively correlated in others. For water quality, where potential benefits are particularly high, benefits are positively correlated with costs and negatively correlated with rental rates. These results indicate that benefit-cost targeting could likely improve the environmental cost effectiveness of a program, using cost-based or rental rate-based payments.

For a more extensive, technical discussion of these issues see Babcock et al. (1997) and Wu et al. (2001). These authors focus on land retirement but find that targeting on the basis of cost is equivalent to benefit-cost targeting only when costs and benefits are negatively and highly correlated.

funds may encourage producers to bid up the value of eligible land or make changes in land use that could undercut program goals (see chapter 4). Furthermore, any program in which (1) conservation payments exceed conservation costs and (2) payments are tied to agricultural land could inflate land values and ultimately intensify land use, depending on the size of the payments and whether they are viewed as long term.

New Practices: Bid-Based Payments. Program decisionmakers can encourage producers to reveal their specific WTA through competitive bidding on cost-share or incentive payment rates. Generally, a maximum bid is established (e.g., 75 percent cost-share in pre-2002 EQIP), but producers are otherwise free to bid as they wish. Bids would encompass a statement of which parcels of land will be enrolled, what practices will be adopted or installed on that land, and the level of financial assistance the producer would accept for taking the specified actions.

As with fixed-rate payments, bid-based payments will not automatically attract producers able to make environmental contributions that are relatively cost-effective. When paired with a performance-based enrollment screen, however, bid-based payments can produce a cost-effective outcome.⁴ If bidding is competitive, incentive payments will approximate producers' WTAs and government payments will be minimized (see box, "Bidding and Budgets," p. 17, and Appendix 1). Thus, the risk of unintended consequences is quite low. Bidding may also facilitate participation of producers with relatively high WTA but who could, nonetheless, produce benefits large enough to make a cost-effective contribution. Of course, bid-based payments provide little, if any, boost to farm income. If bidding is competitive, and producers do bid their WTA, there will be no surplus left over to supplement farm income.

Stewardship Payments. Finally, unlike most agri-environmental programs that extend payments based only on practices that were to be adopted, stewardship payments are based on past conservation efforts. For example, under CSP, producers may qualify for payments based on practices that were adopted or installed before enrollment. In other words, so-called "good actors"—those producers who have already adopted or installed environmentally beneficial practices—can be rewarded with program payments.

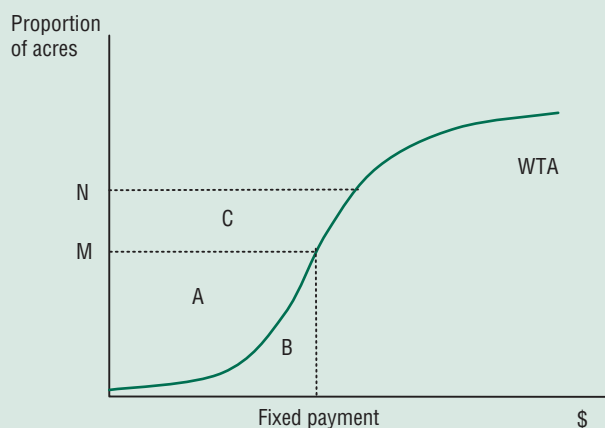
Proponents argue that stewardship payments address a fundamental inequity in current programs—that good stewards will no longer be excluded from agri-environmental payment programs just because they have taken the initiative in addressing resource concerns on their farms. They criticize traditional U.S. agri-environmental payment programs for rewarding those who have done little to maintain or enhance environmental quality while good stewards have done so without payment. Some are concerned that producers will be reluctant to address resource concerns outside the context of a payment program for fear of being frozen out of current or future programs. There is also some concern that good stewards could find themselves at a competitive disadvantage and may subsequently abandon conservation practices or fail to maintain them in the absence of ongoing payments.

⁴Evidence suggests that policymakers have been successful in designing cost-effective programs using environmental indices and bid-based payments. In the CRP, policymakers have done both. The 1990 farm bill mandated a change in CRP enrollment procedures, from what was effectively a fixed payment without performance-based enrollment screening to a system with bid-based payments and performance-based screening (the Environmental Benefits Index). A 1999 study of the CRP (Feather et al.) found that use of EBI and bidding significantly improved the cost-effectiveness of that program. The study also noted that additional gains were possible through further refinement of the EBI.

Bidding and Budgets

Competitive bidding on conservation payments can help stretch a limited budget to achieve more agri-environmental gain than is possible using a fixed payment. In the figure, the “S”-shaped curve represents the distribution of the minimum payment producers would be willing to accept (WTA) in exchange for installing a practice or taking some other conservation-related action. The higher the payment rate (on the horizontal axis), the larger the proportion of land producers are willing to enroll in the program (see “Producer Willingness To Accept Payments,” p. 8, for more details on WTA). When the payment rate is fixed across producers, the proportion of acres enrolled is represented by point M and program expenditure is represented by area A + area B. When producers bid for payments, a lower bid increases the likelihood of being enrolled in the program. If bidding is competitive and producers are unsure about the level of bid that will be accepted, they have an incentive to submit bids that equal their WTA. If so, the cost of funding conservation action on the proportion of acres represented by point M is reduced from A+B to A. The change frees some of the budget to fund additional acres up to point N. Area C, the cost of funding additional producers, is equal to area B, the savings from instituting a bidding system.

Savings due to bidding can be large. In the Environmental Quality Incentives Program (EQIP), where competition for enrollment has been very strong, cost-sharing and incentive payment rates were much lower than maximum



rates when bidding was allowed (1996-2002). The average bid on cost-sharing for structural practices was 35 percent of cost, compared with a maximum of 75 percent. For management practices, bids averaged 43 percent of the maximum rate (generally established by practice and by county).

Finally, note that bidding alone does not make a program cost effective. Bidding generates a range of payment rates for practices. However, to create an environmentally cost-effective program, bidding can be used in conjunction with a performance-based enrollment screen to ensure that producers who do receive higher payments can also produce a higher level of environmental gain.

However, stewardship payments may do little to encourage new environmental gains. Opponents of stewardship payments argue that they divert funds from practice installation or adoption in budget-limited programs. Moreover, unless stewardship payments are positively correlated with potential for achieving environmental benefits and negatively correlated with producer WTA for taking the necessary action, they do little to encourage participation among producers who could (in addition to a history of good stewardship) take additional actions to improve environmental quality. As presently configured in the CSP, stewardship payments are based on land rental rates, which are unrelated to either environmental benefits or conservation costs (see box, “Correlating Costs, Benefits, and Rental Rates”).

Payment Limitations. Regardless of payment mechanism, program payments can be limited on an annual basis or over a period of years. In terms of equity, payment limitations can ensure broader access to an agri-environmental program. However, farms large enough to be constrained by the payment limit may scale back their own participation or avoid the programs altogether. For example, large farms may register only a portion of their total operation or elect to install less expensive practices, even when other practices would be more environmentally effective.

Costs of Conservation Programs Include Administration and Monitoring

Environmental cost-effectiveness is not determined exclusively by the costs and benefits of establishing conservation practices on the ground. In the program implementation process, applicants fill out forms, administrators process them, and program managers monitor sites. *Transaction costs* include the government's cost of formulating the program (e.g., establishing payment rates), the producer's cost of submitting an application, the government's cost of assessing producer applications, and the government's cost of monitoring and enforcement.

Increased emphasis on working land conservation may increase the overall flexibility of U.S. agri-environmental policy as more producers have access to more programs. In theory, producers who seek to address resource concerns can select the lowest cost approach from a number of environmentally effective alternatives. However, environmental benefits and the cost of implementing a given conservation practice can vary widely by climate, soils, location (e.g., proximity to water), cropping patterns, and management skills. If program decisionmakers are to improve their ability to weigh contract offers using benefits and costs, additional research and/or data may be needed. The cost of information gathering increases as program managers seek to adjust program parameters to better differentiate applicants. The gains in cost-effectiveness need to be weighed against increasing transaction costs.

Environmental benefits are achieved only when producers comply with contract requirements, which require monitoring. Many irregularities are inadvertent and can be corrected with the cooperation of the producer. In some cases, however, penalties may be required. For some, the incentive to fulfill all contract requirements will partially depend on the likelihood that a contract will be selected for inspection, the likelihood that a penalty will be assessed once a violation is detected, and the potential size of the penalty.

Program managers may choose to monitor intensively, visiting many enrolled farms and thereby maximizing adherence. But this is costly: monitoring efforts will entail onfarm visits by qualified personnel who could otherwise be engaged in conservation planning or technical assistance. On the other hand, program managers may choose to minimize monitoring, visiting only a few farms or when there is reason to suspect irregularities. To a certain degree, it is possible to compensate for a minimal monitoring effort by increasing both the size and certainty of penalties. Even if detection is unlikely, the prospect of stiff sanctions may encourage careful compliance with contract requirements. Of course, stiff penalties may be unpopular with producers and inadvertent errors are more likely to go uncorrected with less monitoring.

In either case, it is important to consider the difficulty of monitoring in determining practice eligibility, practice-specific payment rates, and the role of specific practices in contract acceptance criteria. The extent to which practice implementation and maintenance can be observed varies widely. Consider the potential tradeoff between nutrient management and conservation buffers in

reducing nutrient runoff from cropland. Many nutrient management practices, including reduced application rates and better application timing, are difficult or impossible to monitor (Johansson, 2002). But nutrient runoff can also be intercepted before it leaves the field or enters a stream through filter strips, grassed waterways, or riparian buffers. The existence, adequacy of design, and maintenance of these buffer practices can be observed more easily than compliance with nutrient management plans. In both cases, the benefits of specific practices need to be weighed against their full costs.

Working-Land Payment Programs in Practice: EQIP and CSP

The Environmental Quality Incentives Program (EQIP) and the Conservation Security Program (CSP) are, at present, the largest U.S. WLPPs. EQIP and CSP are designed to address similar environmental problems on working lands, but various program design decisions have largely distinguished CSP from EQIP, so that these programs now represent the broad diversity of program designs that can be encompassed within the definition of the WLPP (table 2.2).

On one hand, EQIP is similar to previous conservation programs in that eligibility is broad. Payment incentives (cost-sharing or incentive payments) are based on the installation or adoption of new conservation practices that meet existing NRCS standards (the “non-degradation” standard) (see box, “Environmental Quality Incentives Program”). Producers need not reach any specific level of conservation effort or stewardship before becoming eligible, and there is no incentive for whole-farm conservation effort. Enrollment screening is based on an index that incorporates environmental benefits and costs. EQIP is heavily focused on livestock-related resource concerns and, since 2002, is often used to help large livestock operations comply with new Clean Water Act regulations on waste discharge.

On the other hand, CSP has introduced a number of nontraditional concepts into the agri-environmental policy debate (see box, “Conservation Security Program”). Unlike EQIP, CSP eligibility requires a substantial level of stewardship, and participation incentives encourage whole-farm conservation effort. Soil quality and water quality must be addressed (to existing NRCS standards) before land can be enrolled in CSP. Stewardship payments are available based on past conservation efforts. CSP also provides significant payments for “enhancements,” which, to some extent, encourage producers to transcend existing conservation standards. Enrollment screening is also based largely on stewardship and the willingness to pursue conservation effort beyond minimum program requirements. While many livestock-related practices can be eligible for CSP, livestock waste management structures and handling equipment are specifically excluded. Finally, CSP is available nationally, but only in selected watersheds for any given signup. All 2,100 U.S. watersheds are to be eligible once over an 8-year period (2004-2012).

Table 2.2—EQIP and CSP designs

Program feature	EQIP	CSP
Budget	2004 contract obligations totaled \$903 million. A total of \$5.8 billion is authorized for 2002-2007.	2004 contract obligations totaled \$35.2 million. A total of \$6 billion is authorized for 2002-2011.
Conservation standard	Producers must address resource concerns to standards in existing NRCS handbook (referred to as “non-degradation”).	Standards in existing handbook (“non-degradation”) are minimum. Through enhancement payments, CSP can encourage producers to go beyond this standard.
Eligibility	• Both crop and livestock production (in 2003, 33% to crop-related practices; 67% to livestock practices). • Emphasis on assisting livestock operations to comply with new Clean Water Act regulation. • No previous conservation effort required. • Only newly installed practices can be funded. • Available nationally.	• All agricultural land (in 2004, 67% to cropland; 33% to range and pasture land). • Animal waste storage or treatment facilities are not eligible. • Soil and water quality concerns must be addressed before land can be enrolled in CSP. • Existing practices eligible for payments. • Available nationally, but only in selected watersheds for any given signup. All 2,100 U.S. watersheds to be eligible once during 8-year period.
Enrollment screen	Performance-based “offer index.”	“Category” system based on level of conservation effort above minimum requirement.
Participation incentives	Fixed payments: • Cost sharing (typically 50%) on structural and vegetative practices; • Incentive payments for management practices. No annual payment limitation. The sum of all EQIP payments to an individual or entity cannot exceed \$450,000.	Fixed payments: • Stewardship and existing practice payment based on land rental rates. • Cost-sharing for new practices. Performance-based payments: • Enhancements based, in part, on environmental performance Payments limited by tier: Tier 1 = \$20,000 max annual payment Tier 2 = \$35,000 max annual payment Tier 3 = \$40,000 max annual payment.

Environmental Quality Incentives Program (EQIP)

EQIP was established by the 1996 Federal Agricultural Improvement and Reform Act as an innovative voluntary conservation program to provide assistance to farmers who adopt conservation practices. Since its creation in 1996, EQIP has provided cost-share and incentive payments for conservation practices. EQIP contracts specify a conservation plan, which outlines what changes in farming practices are planned and how these changes address environmental concerns in the area.

Budget—The initial funding level of \$200 million annually was insufficient to meet demand early on, with 65 to 70 percent of applications turned down in the first 2 years. This rejection rate discouraged subsequent farmers from applying, as indicated by a steady reduction in the number of applicants from 1997 to 2001.

The Farm Security and Rural Investment (FSRI) Act of 2002 authorized funding at a total of \$5.8 billion from 2002 through 2007, nearly a five-fold increase in annual funding. The increased budget, combined with more inclusive eligibility criteria for practices and the allowance of contracts up to \$450,000, attracted a broader pool of applicants than previously. Applications doubled from 2001 to 2002, maintaining the competitiveness of the enrollment process.

Eligibility—Both crop and livestock producers are eligible for EQIP. Currently, 60 percent of EQIP funds are designated to address livestock-related resource concerns. Over 250 acceptable conservation practices are eligible for EQIP funding. Such flexibility enables a more efficient addressing of resource concerns. If the set of eligible practices is limited, practices appropriate to some situations or regions may be excluded, leading to an outcome that is less cost effective.

As of 2002, EQIP no longer limits eligibility for funding of waste treatment structures to smaller animal feeding operations (fewer than 1,000 animal units). Water quality may benefit by allowing larger animal facilities to compete for program funds. Many of these larger facilities face new Federal water quality regulations, and EQIP funds may be used to help producers comply. (One of the objectives set out for EQIP in both the 1996 and 2002 Farm Acts is to provide assistance to “help farmers and ranchers meet Federal, State, Tribal, and local environmental requirements.”)

Enrollment Screens—The enrollment screens used in EQIP have changed over the program's life. Initially (as stated in the 1996 FAIR Act), EQIP's principal objective was to achieve the greatest possible environmental benefits per dollar of program expenditure. Under the 1996 program, at least 65 percent of EQIP funds had to be allocated to specially targeted priority areas, with local workgroups determining priority resource concerns and allocating funds. Nearly 41 percent of all applicants within a priority area were accepted, versus 24 percent outside a priority area. Furthermore, an “offer index” was calculated by NRCS for each proposed conservation plan by considering the environmental benefits and the cost-share request for each practice. Applications were ranked according to this offer index. In 2002, Congress de-emphasized benefit-cost targeting by eliminating the requirement to “maximize net environmental benefits per dollar expended” and eliminated priority areas. The offer index was retained.

Participation Incentives—EQIP offers contracts ranging from 1 year (after the implementation of the last scheduled practices) to 10 years. These contracts provide fixed-rate payments (incentive payments and fixed cost-shares) to implement new conservation practices. By funding conservation practices yet to be introduced, all EQIP funds are meant to actively contribute to environmental improvement.

For structural and vegetative practices, farmers are reimbursed a share of their costs not to exceed 75 percent (90 percent for limited-resource and beginning farmers and ranchers). However, most practices will be cost-shared at 50 percent. Cost-shares between 50 and 75 percent require special approval by State conservationists, but can be provided on those practices deemed most effective at addressing local resource concerns.

For management practices, EQIP incentive payments may be provided for up to 3 years. These payments are set at the local or State level by considering the amount necessary to encourage producers to participate, given additional costs or risks incurred by the producer, including lost production.

The 2002 FSRI Act eliminated the “bid down” procedures, by which operators could improve the offer index of their applications by reducing the amount of payment they would accept. Between 1996 and 2002, when bidding procedures were in place, the overall national average cost share rate was 35 percent for structural practices and incentives payments were, on average, 43 percent of maximum rates. The elimination of bidding may increase the cost of individual EQIP contracts, reducing the level of conservation that can be funded with a given budget.

The FSRI Act also increased the flexibility of EQIP contract design. It increased the maximum payment to \$450,000 for all contracts held by a producer through 2007, and eliminated the limitation on annual payments. The 2002 FSRI Act also allows for contracts to expire 1 year after the date of the installation of the last practice, even though practices have to be maintained. And rules now allow for more than one contract per tract. These changes allow more environmental concerns to be addressed, appeal to large-scale producers who may have felt that previous payments were insufficient, and reduce the risk of long-term contractual obligations.

Implementation—The EQIP competitive bidding process before 2002 may have induced some farmers to enter into an untenable agreement due to overcompetitive bidding. The potential remorse was compounded by the limited enforcement capabilities of the conservation authority to ensure that the contract was carried out in its entirety. In fact, 17 percent of the contracts were not being implemented in full due to structural problems with the program incentives (Cattaneo, 2003). These contract withdrawals often resulted in the loss of funds allocated to these practices. (Funds for canceled practices are now recycled by the program, so the negative impact of cancellations is more limited.)

Conservation Security Program (CSP)

The Conservation Security Program (CSP) may be the first in a new generation of conservation policy. As structured by Congress, CSP could fill the traditional role of conservation programs—providing incentives for improving the environmental performance of farms—and some not-so-traditional roles—such as providing ongoing rewards for good environmental performance. CSP will also stress “enhancements.” Enhancements could be used for a number of purposes, including addressing local resource concerns. Unlike previous programs, however, some enhancement payments will encourage the adoption of practices or activities that go beyond minimum standards of addressing a specific resource concern (e.g., soil quality) as defined in the NRCS Field Office Technical Guide (USDA-NRCS, 2004a). To address a soil quality concern, for example, producers are required to reduce soil erosion to at least the soil loss tolerance (“T”) level. Through enhancements, however, CSP could encourage producers to reduce erosion to even lower levels or in other ways improve the quality of their soils.

Budget—CSP was originally enacted as an entitlement, meaning that all eligible producers who wished to participate would be enrolled. However, CSP funding was capped at \$41 million in fiscal year 2004, limiting implementation to 18 selected watersheds. In 2005, CSP funding is \$202 million and sign-up will encompass 220 watersheds. Unless and until the budget cap is lifted, CSP enrollment is effectively a competitive program—producers’ participation offers can be rejected.

Eligibility—CSP eligibility is broad in terms of producers and land types—cropland, pasture, and range—but is open only to producers who have already addressed soil quality and water quality concerns on at least part of their agricultural operations. Only those acres where these resource concerns have been addressed can be enrolled in CSP. For any given sign-up period, CSP eligibility is also limited to a set of selected watersheds. NRCS will enroll producers in 220 watersheds in 2005, with plans to make all 2,100 U.S. watersheds eligible for CSP enrollment once over the next 8 years. Both crop and livestock operations are eligible, but livestock waste management facilities are explicitly excluded from CSP.

Enrollment Screens—In CSP, applicants are ranked by categories based on stewardship and on their willingness to take on additional conservation effort during the contract. In 2004, producers were placed in the lowest category (least likely to be enrolled) if they met only the basic requirements of the program (i.e., have addressed soil and water quality concerns). In the highest category, producers agreed to implement multiple enhancement practices and activities. The category system may or may not be used in any given sign-up, depending on the number of applicants and the CSP budget.

Participation Incentives—In CSP, eligible producers can participate in one of three CSP “tiers,” based on the extent to which the entire farm and all associated resource concerns are addressed. Higher tiers require a greater minimum level of conservation effort but also offer higher payments. Minimum conservation requirements, by tier, include:

- In tier I, producers may enroll that portion of their farm on which soil and water quality concerns have been addressed at least to existing handbook standards. Tier I contracts are for 5 years and can be renewed only if the producer expands conservation efforts to a larger share of the farm or additional resource concerns.
- For tier II, producers must address soil and water quality concerns on their entire farm. Contracts are for 5-10 years and can be renewed without further action.
- In tier III, producers must address all resource concerns on all land in the farming operation. Tier III contracts are for 5-10 years and can be renewed without further action.

CSP offers several types of payment, some of which reward past stewardship and help producers maintain previously installed practices. “Stewardship” and “existing practice” payments are based, roughly, on a percentage of the county average rental rate for the specific type of land involved (rental rate data from several sources were combined by USDA, then adjusted to ensure consistency and equity at local and regional levels). For the 2005 CSP sign-up, stewardship payments are equal to 11.25 percent, 5.0 percent, and 1.25 percent of these rates for tier III, tier II, and tier I contracts, respectively. Where the CSP stewardship rate is \$75 per acre, for example, the annual stewardship payments—paid in each year of the contract—would be \$8.44, \$5.63, and \$0.94 per enrolled acre, for tiers III, II, and I. Existing practice payments, which are designed to ensure maintenance of previously installed practices, would be 25 percent of the stewardship payment.

New practices can be cost-shared through CSP at a rate of up to 50 percent. Limited resource farmers and beginning farmers may be eligible for higher cost-share rates. For example, producers may install or adopt new practices as part of a CSP contract in which they agree to move to a higher tier. These payments made up only a very small portion of overall CSP payments in 2004.

Finally, payments for environmental “enhancements” accounted for about two-thirds of all CSP payments in 2004. Enhancements address local resource concerns (e.g., resource concerns other than the nationally significant concerns of soil quality and water quality) and encourage practices or activities that improve or enhance resource quality beyond the minimum (non-degradation) standard. In a number of cases, enhancement payments are based not on cost but on environmental performance as measured by indices like the soil condition index. Payments are to be based on the improvement in index values, ensuring that payments reflect likely environmental gains.

Overall payments (stewardship, existing practice, and enhancements) are limited to \$20,000 per year per farm in tier I, \$35,000 in tier II, and \$45,000 in tier III. Stewardship payments are also limited to \$5,000 per year for farms in tier I, \$10,500 in tier II, and \$13,500 in tier III.