Agri-Environmental Payments: Rewarding Farmers for Environmental Performance

Environmental issues are increasingly prominent in farm policy debates. There is growing interest in developing a program of agri-environmental payments to producers based on use of environmentally sound practices or achievement of a high level of environmental performance on land in agricultural production. Such a program could help to maintain past agri-environmental gains, to address emerging environmental problems (e.g., nutrient runoff), and perhaps to support farm income.

A program to offer environmental payments to farmers is not a new idea. For more than 60 years, the Federal government has offered cost sharing for adoption of conservation practices that have beneficial effects on the environment. (For more on farmers' adoption of conservation practices, see article on page 32). Periodically, the government has paid for retiring land from crop production—e.g., the Conservation Reserve Program.

But unlike current programs, agri-environmental payments could reward producers who already have reached a high level of environmental performance—so-called "good actors." Payments could be set to exceed producer costs for installing or adopting conservation management systems or technical practices, and could add directly to farm income. Senator Tom Harkin (D-IA) has introduced legislation—the Conservation Security Act (CSA)—that proposes a type of agri-environmental payment program.

This article addresses the role of explicit objectives in assuring success of an agri-environmental payment program, the potential for unintended consequences in a subsidy program, and the value of coordination among all types of agricultural programs. While no specific legislative proposal is analyzed, the discussion applies broadly to agri-environmental program design. A number of insights are gleaned from past programs as well as from analysis of three hypothetical agri-environmental payment program scenarios: 1) pay farmers who reach a high level of environmental performance but impose a penalty for bringing highly erodible land (HEL) into production; 2) same as #1 but no penalty for adding HEL to planted area; and 3) pay farmers for improving environmental performance.

Designing an Effective Program

An agri-environmental payment program could entail a wide range of environmental and farm income objectives. Once objectives are established, program design and implementation will largely determine how the program performs in terms of environmental gains, costs of achieving the gains, and distribution of costs (or benefits) among farmers, taxpayers, and consumers. More specifically, performance depends largely on how much is paid to whom and for taking what action.

Guidelines for designing an effective agri-environmental payments program include the following:

- explicitly address each program objective in eligibility criteria;
- minimize incentives for cropland expansion;
- coordinate agri-environmental payments with other farm programs; and
- coordinate land retirement with payments to reward good environmental performance on land in agricultural production.

Explicitly address each program objective in eligibility criteria. Suppose that the explicit program objective is to reduce erosion and the expectation is that payments from an erosion reduction program will support farm income. Unless producer eligibility is determined according to criteria related to both objectives—i.e., making both objectives explicit—program performance with respect to the implicit objective (supporting farm income) may not be fully satisfactory. Focusing on one objective alone might exclude either farms that could contribute to the environmental goal or farms that are in need of farm income support. While eligibility does not guarantee that farmers will participate in an agri-environmental payment program, excluding farms that could contribute virtually ensures that both program objectives cannot be fully achieved.

For example, consider conservation compliance requirements that are part of existing farm policy. Producers must apply government-approved conservation systems on highly erodible cropland to be

ERS Cross-Analysis of Farm Characteristics & Environmental Indicators

Agriculture affects a wide range of environmental resources (e.g., water quality), which provide many environmental amenities (e.g., water-based recreation). Data on environmental indicators are from a county-level geographic information system that assigns an indicator value to each farm included in USDA's Agricultural Resource Management Study (ARMS). The ARMS conducted annually by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS) collects data on characteristics of U.S. farms. The ARMS is designed to capture the physical, financial, demographic, and managerial attributes of farm businesses and people engaged in farming. Information from the ARMS is used to classify farms into categories of the ERS farm typology.

Many indicators of potential environmental damage could be used to determine eligibility of land for agri-environmental payments. Three indicators used for illustrative purposes are:

- *Rainfall erosion acreage*—non-highly erodible cropland with rainfall erosion rates greater than the soil loss tolerance—i.e., the rate of erosion a soil can withstand without long-term productivity damage;
- *Wind erosion acreage*—non-highly erodible cropland with wind erosion rates greater than the soil loss tolerance;
- *Nitrogen runoff acreage*—cropland acreage where nitrogen runoff to surface water is estimated to exceed 1,000 kg/km2/year (classified as "high" by U.S. Geological Survey (USGS) researchers).

Soil erosion indicators are based on non-highly erodible cropland because it is not currently subject to the conservation compliance requirements that apply to highly erodible land. The erosion indicators are calculated from National Resources Inventory data, and the nitrogen runoff indicator is calculated from USGS estimates.

eligible for payments under price and income support programs. Although conservation compliance has leveraged better conservation on the share of highly erodible cropland controlled by participating producers, not all producers participate in USDA programs so not all highly erodible cropland is covered. As a result, conservation compliance cannot fully address erosion on highly erodible land.

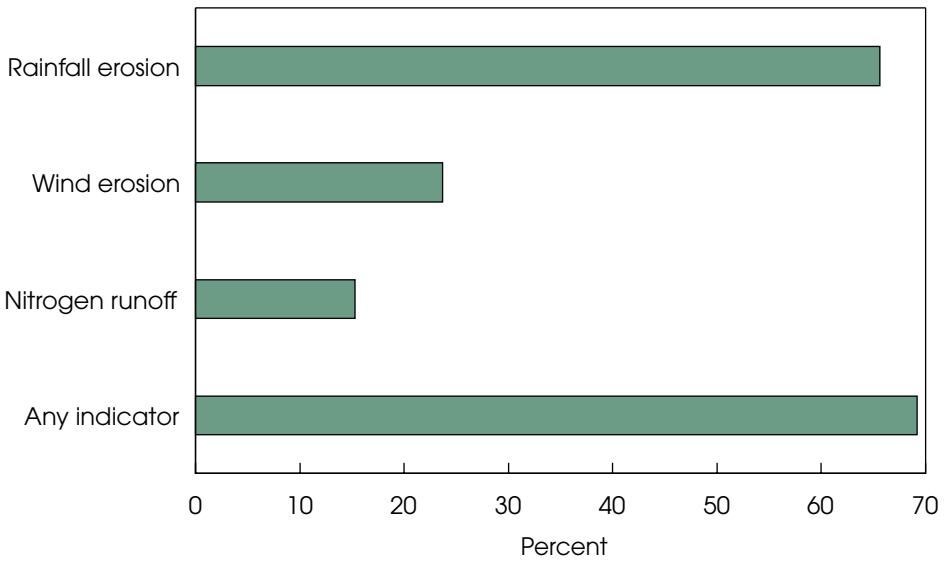
To explore these issues more generally, farm-level data from USDA's Agricultural Resource Management Study (ARMS) were linked with a number of environmental indicators. The farms were then grouped according to the farm typology developed by USDA's Economic Research Service (ERS) (*AO* November 1999). Analysis shows that focusing a conservation program on a specific farm type (e.g., large family farms) is not likely to solve a particular agri-environmental problem. No single group of farms delineated in the ERS typology accounts for more than 25 percent of the acres identified by rainfall erosion, wind erosion, or nitrogen runoff indicators.

Likewise, focusing an agri-environmental program on a particular environmental issue is not likely to solve farm income problems, particularly if policymakers want to direct support to specific groups. For example, nearly 70 percent of small family farms (annual gross sales under $250,000) would qualify for payments by the rainfall erosion indicator, but only about 22 percent would be eligible for payments under the wind erosion indicator.

Minimize incentives for cropland expansion. If subsidy rates are high enough for specific levels of environmental performance (e.g., soil conservation) or use of environmentally sound practices (such as conservation tillage), producers might be encouraged to plant land not previously used as cropland. For example, cropland acreage may expand if:

- payments are made for relatively good performance but do not require improvement;
- payments exceed the cost of required conservation systems; and

Share of Small Farms with Land Identified by Environmental Indicators*



Small farms are those with annual gross sales under $250,000.
*Indicators of potential for environmental damage.

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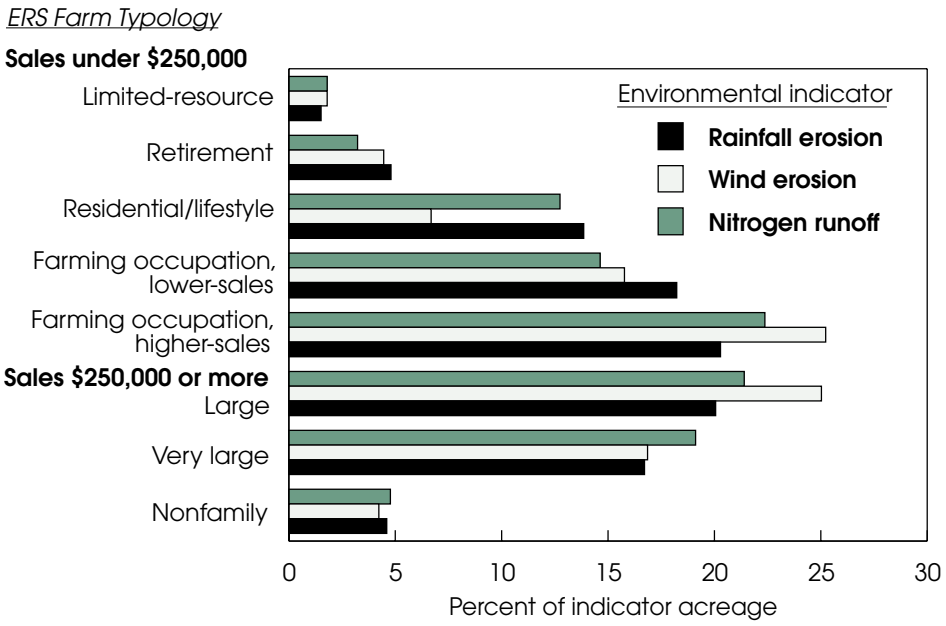
Land Identified by Three Environmental Indicators*: Acreage Shares by Farm Type



*Indicators of potential for environmental damage.

Economic Research Service, USDA

- payment eligibility is extended to previously uncropped land.

When improvement in environmental performance is not required to receive agri-environmental payments, overall environmental performance may worsen because of additions to cropland. Increased environmental damage on land not previously in crop production will offset, at least partially, environmental gains on other cropland. Even if producers use good environmental and conservation practices, converting land from grass or trees to crop production will almost surely increase soil erosion, nutrient runoff, or other environmental damage.

Despite the potential for unintended consequences, implementation of a program with this latitude is not unrealistic. Payment for good performance can reward "good actors" for past environmental improvements—often achieved without subsidies—and can help maintain both privately and publicly funded conservation investments. Moreover, measuring environmental improvement may not be possible. Unless the field-by-field practices and environmental conditions existing before the program are known to the government, environmental improvement cannot be measured. For example, if the timing and rate of the existing nutrient application are unknown to the government, improvement from implementation of a new nutrient management plan is impossible to assess. In many cases, potential environmental benefits to society may be larger than the cost of conservation systems to farmers, providing a rationale for payments that exceed costs. Payments must be larger than farmers' costs if the program is to provide direct farm income support.

When payments exceed producer costs and environmental improvement is not required, the status of previously uncropped land is critical. Consider two alternative program design scenarios. In both, producers are paid on the basis of "good performance," and payments can exceed producers' costs for achieving that level of performance. However, in one good performance program scenario, producers are severely penalized by loss of USDA farm program benefits for expanding cropland acres by planting on previously uncropped highly erodible land. In this scenario, erosion reduction ranges from 20 million tons to 40 million tons

ERS Farm Typology Groups

Small Family Farms (sales less than $250,000)

Limited-resource. Any small farm with gross sales less than $100,000, total farm assets less than $150,000, and total operator household income less than $20,000. Limited-resource farmers may report farming, a nonfarm occupation, or retirement as their major occupation.

Retirement. Small farms whose operators report they are retired (excludes limited-resource farms operated by retired farmers).

Residential/lifestyle. Small farms whose operators report a major occupation other than farming (excludes limited-resource farms with operators reporting a nonfarm major occupation).

Farming occupation, lower-sales. Small farms with sales less than $100,000 whose operators report farming as their major occupation (excludes limited-resource farms whose operators report farming as their major occupation).

Farming occupation, higher-sales. Small farms with sales between $100,000 and $249,999 whose operators report farming as their major occupation.

Other Farms

Large family farms. Farms with sales between $250,000 and $499,999.

Very large family farms. Farms with sales of $500,000 or more.

Nonfamily farms. Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers.

Agri-Environmental Payment Programs: Simulation Analysis

To illustrate the effects of program design on program performance, ERS simulated the environmental and economic effects of three agri-environmental payment program scenarios.

Scenario I: Good performance. A producer receives a payment if the estimated rate of soil erosion on the farm is below a benchmark rate for similar soils in the same region. This benchmark is the estimated erosion rate using predominant crop rotations (e.g., corn-soybeans in the Corn Belt) and conventional tillage systems. Producers are paid only if erosion rates are below the benchmark rate. Although erosion rates are often low on pasture and woodland, non-cropland is excluded because of the large acreage and potentially prohibitive expense. Previously uncropped land can be eligible for payments. However, producers are penalized if additional highly erodible land is brought into crop production. Magnitude of the penalty is approximately the amount of farm price and income support benefits and similar to the potential penalty for violation of conservation compliance.

Scenario II: Good performance, no penalty for adding highly erodible cropland. Same as good performance scenario but no penalty is assessed for bringing additional highly erodible land into crop production.

Scenario III: Improved performance. Producers receive payment for taking any action that reduces soil erosion from a pre-program baseline, no matter how good or bad the pre-program performance.

The objective of each scenario is to increase water quality by reducing sediment loads from cropland. The scenarios are hypothetical and illustrative only. They do not represent analysis of any specific policy proposal, although insights gained are relevant. Payments depend on a producer's soil conservation performance. The payment rate ranges roughly from $1 to $16 per ton of soil conserved and varies regionally depending on potential water quality benefits. These benefit estimates are likely to be a lower bound to actual benefits because some water quality benefits have not been measured.

Economic and environmental effects of alternative agri-environmental payment program scenarios were analyzed using the U.S. Regional Agricultural Sector Model (USMP) developed by USDA's Economic Research Service. With its linkage to the Erosion/Productivity Impact Calculator (EPIC), USMP can estimate how changes in environmental or other policies affect U.S. production, demand, trade, input use, environmental indicators, and commodity prices. USMP includes 44 agricultural commodities and processed products as well as 23 inputs, and the model is disaggregated into 45 geographic regions within the U.S.

per year as total payments to producers range from $1 billion to $3 billion.

In the second good performance program scenario, producers are not penalized for expanding crop production onto previously uncropped highly erodible land. Producers can receive an agri-environmental payment on this land if they use a conservation system that achieves a good performance, even if overall soil erosion for all the farm's cropland increases from previous levels. In this program scenario, the increase in soil erosion caused by production on previously uncropped land more than offsets erosion reduction from improved conservation practices on existing cropland.

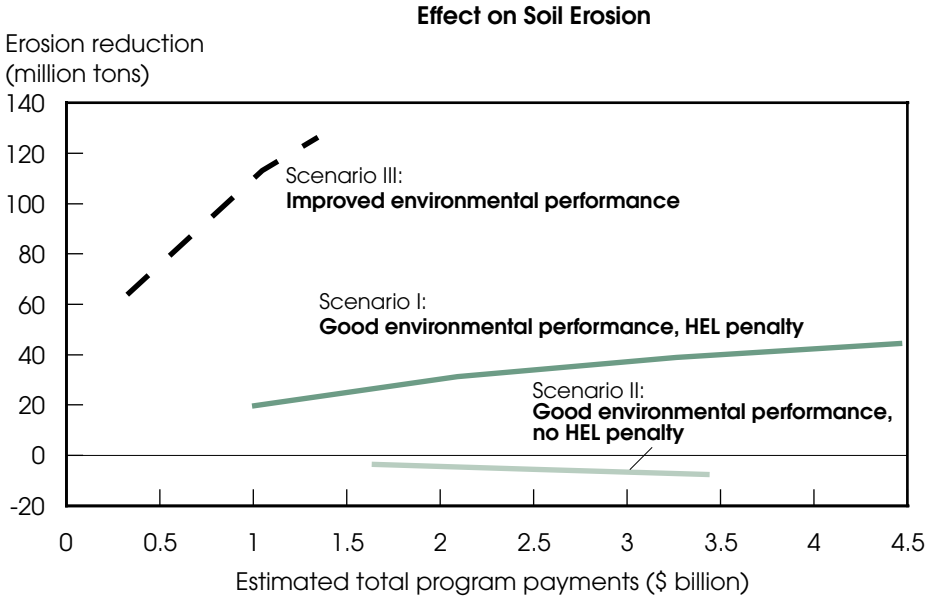
Coordinate agri-environmental payments with other farm programs. Coordination of environmental programs with other farm programs can help to achieve all agricultural policy objectives at minimum cost to society or, conversely, the greatest possible environmental or farm income gain within a given cost constraint, such as Federal budget limitations. One objective of coordination is to avoid conflicts that reduce the effectiveness of individual programs. For example, the swampbuster provision of farm legislation, in order to eliminate program incentives to expand crop production onto wetland, penalized farmers who did so. Producers who drain wetlands for crop production become ineligible for farm program payments.

Coordinate land retirement with payments to reward good environmental performance on working land. In pursuing agri-environmental objectives, it may be best to coordinate land retirement programs for environmentally sensitive land with programs to encourage improved conservation/environmental practices on less sensitive land. To illustrate this point, ERS estimated the effects of making agri-environmental payments for improved environmental performance only (e.g., reducing soil erosion from previous levels). While this scenario is not particularly realistic because of the difficulty of measuring improvement, a retirement/improvement program is a good standard of comparison because it focuses resources on erosion reduction and subsidizes the widest possible range of strategies for soil erosion reduction, helping to identify strategies for environmental improvement that are not encouraged by other approaches.

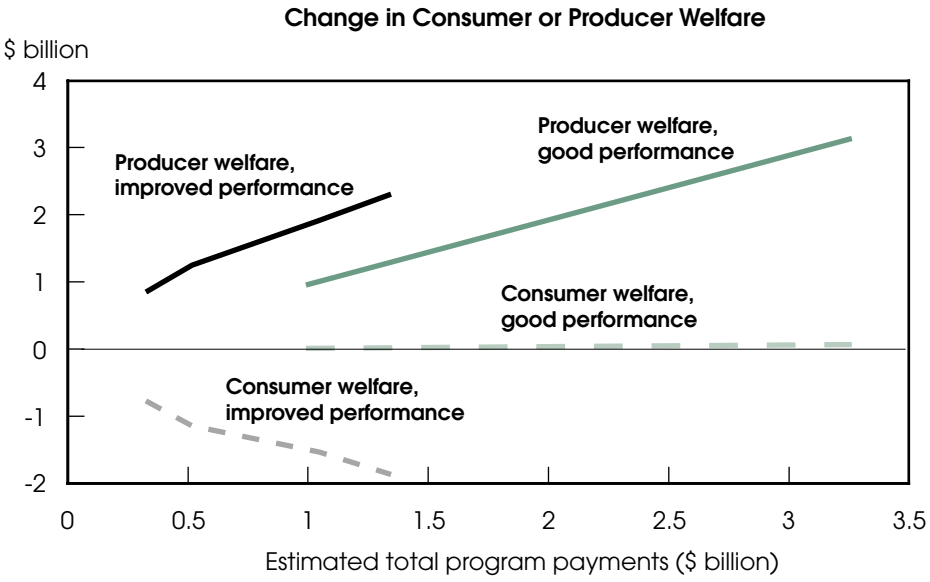
Net erosion reduction per dollar of producer payment is much larger in the improved performance scenario than in the good performance scenarios. One reason for this difference is that a significant share of payments in the good performance scenario is devoted to rewarding producers who have already achieved a high level of environmental performance. Thus, only a portion of payments funds further erosion reduction.

A second key reason for this difference is that land retirement is encouraged by the improved performance scenario but not by the good performance scenario. When program payments are $1 billion, producers in the improved performance scenario retire 8 million acres of highly erodible land from crop production. Even if land retirement achieves only a 10-ton-per-acre reduction in soil erosion, it would bring about 80 million tons in soil erosion

Payments to Farmers for Environmental Performance



HEL penalty = Loss of some or all USDA program benefits for bringing into production land designated as highly erodible. Negatives indicate net increase in soil erosion.



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reduction. In contrast, HEL cropland acreage is unchanged in the good performance scenario. Thus, if agri-environmental payments are extended for good performance on land in crop production, policymakers may want to coordinate these payments with a land retirement program to capture additional environmental gains.

Farm Income & Welfare Effects

The three policy scenarios simulated by ERS do not have a farm income objective, but they do have farm income effects. Because the environmental objective is narrow (reduce sediment damage to water quality), cross-analysis of farm characteristics with environmental indicators suggests that farm income gains may not be widely shared. Nonetheless, a number of insights can be derived by examining gains in farm income and consumer welfare relative to producer payments (a cost to taxpayers).

Because an agri-environmental payment program would be voluntary, producers would participate only if payments exceed their participation costs. Consequently, farm income would increase even if producers were prompted to retire land or to adopt practices that are less productive as well as less erosive. Crop producers can also benefit from higher crop prices that could result from a decline in overall production. While crop producers gain, however, livestock producers and consumers would experience a downside as feed and other crop products rise in price.

The good performance and improved performance scenarios all support farm income, but in different ways. In the good performance scenario with a penalty for expanding production on HEL, most payments reward producers who have already achieved good performance. Erosion reduction and associated costs are modest, so payments pass through to farm income almost on a dollar-for-dollar basis. Because there is little adjustment in the farm sector with the good performance scenario, commodity price effects are quite small and consumers are largely unaffected.

In contrast, the improved performance scenario results in much greater erosion reduction and larger commodity price effects as producers change production practices or retire land to reduce erosion. In aggregate, farm income rises due to receipt of payments and higher crop prices, even though livestock producers pay higher feed grain prices. Consumers bear some of the cost of higher farm income through steeper prices for products made with crop commodities, while taxpayers shoulder a smaller burden than in the good performance scenario for given level of benefits.

As noted above, however, because of lack of meaningful measurements it is not practical to base payments on improved performance. Moreover, development of such a measurement system would increase program delivery costs. If policy-

makers develop payments based on good performance coordinated with land retirement (a more realistic scenario), taxpayers will bear the cost both of compensation to producers who have already achieved a high level of environmental performance and of payments for land retirement.

Agri-environmental payments are a potentially important part of the agricultural policy toolbox. These payments may allow policymakers to zero in on agri-environmental issues while providing income support to agricultural producers. Program performance, however, depends largely on the details of program design and implementation. In devising a practical program, policymakers may want to consider each objective explicitly; exercise caution to avoid unintended consequences; coordinate with other agricultural programs; and consider whether environmental issues on a specific field are best addressed through land retirement or improved conservation/environmental practices.

These principles, together with efforts to target payments to producers who can achieve the greatest environmental gain per dollar of cost and to allow individual producers the flexibility to select least-cost alternatives for achieving environmental goals (*AO* June-July 2000), can help to ensure that environmental and other objectives are achieved at a minimum cost to society. AO

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Agri-Environmental Policy at the Crossroads: Guideposts on a Changing Landscape

Details on:
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