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

Roger Claassen, LeRoy Hansen, Mark Peters, Vince Breneman,
Marca Weinberg, Andrea Cattaneo, Peter Feather, Dwight Gadsby, Daniel Hellerstein,
Jeff Hopkins, Paul Johnston, Mitch Morehart, and Mark Smith

Introduction

Agricultural production can both enhance the environment and degrade it. Agriculture provides rural landscape amenities and wildlife habitat, but has also resulted in soil erosion, nutrient and pesticide runoff, and the loss of wetlands (see box "Environmental Impacts of Agriculture"). Agricultural producers have limited market incentives to maintain beneficial practices or reduce environmental damages. Environmental outcomes typically follow from production on many farms over a large area. Benefits and damages often occur at some distance (i.e., downstream or downwind) from the farms that create them and may be realized only after a period of months or even years. The contributions of an individual farmer to environmental benefits and damages are neither directly observable nor easily monitored.

Agri-environmental programs seek to increase environmental benefits and decrease environmental damages associated with agricultural production. For example, soil conservation can reduce sediment in water, enhancing water-based recreations such as boating. Land retirement or wetland restoration can provide habitat that increases wildlife populations, enhancing wildlife viewing, fishing, and hunting. Agri-environmental programs may also support farm income. For example, a subsidy program might pay farmers who use environmentally sound production practices such as conservation tillage or nutrient management. These payments, even if designed to improve environmental quality, could provide another source of farm income.

Agri-environmental policy generally refers to a group of programs that encourage farmers to adopt environmentally sound production practices. Policy instruments or "tools" range from involuntary approaches, such as regulation or environmental taxes, to voluntary approaches such as technical assistance and subsidy programs. Some programs—like land retirement—discourage the use of environmentally sensitive land in crop production. Other programs focus on crop production practices (which tillage systems or chemicals are used) or on livestock waste management. Education and technical assistance help producers improve environmental performance, with or without financial incentives.

Producer participation in agri-environmental programs has mostly been voluntary; participants receive cost-share or incentive payments. To be eligible for these and other farm program payments, however, producers must meet minimum standards of soil conservation on highly erodible land and refrain from converting wetlands for crop production.

How well an agri-environmental policy instrument performs (e.g., the extent of environmental gains, cost of achieving gains, and distribution of these costs) depends largely on program design and implementation. In other words, the "devil is in the detail." Performance can vary widely depending on *how* a policy tool is used as well as *which* policy tool is used. Program features that can improve the effectiveness of an agri-environmental policy instrument, recognizing changes in the policy environment, are the subject of this report.

Agri-Environmental Policy At a Crossroads

Changes in the slate of agri-environmental problems and changes in agricultural and trade policy have transformed the agri-environmental policy landscape over the last two decades. A number of factors may point toward a rethinking and restructuring of agri-environmental policy.

First, the number of widely recognized agri-environmental problems is expanding. Before 1990, agri-environmental policy focused largely on conserving soil to

Environmental Impacts of Agriculture

Seventy-one percent of all U.S. cropland (nearly 300 million acres) is located in watersheds where the concentration of either dissolved nitrate, phosphorus, fecal coliform bacteria, or suspended sediment exceeds criteria for supporting water-based recreation (Smith et al., 1994).

National water quality assessments strongly suggest that agriculture is a leading source of remaining water quality problems (Ribaudo and Smith, 2000). Sediment is the largest contaminant of surface water by weight and volume (Koltun et al., 1997), and is identified by States as the leading pollution problem in rivers and streams (U.S. EPA, 1998). High concentrations of nitrogen in agricultural streams were correlated with nitrogen inputs from fertilizers and manure used for crops and from livestock wastes (USGS, 1999).

The level of agricultural nitrogen use, as with nitrogen concentrations in surface waters, rose sharply during the 1970's, peaked in 1981, and then stabilized (Smith et al., 1993; Smith et al., 1987).

Eutrophication and hypoxia in the northern Gulf of Mexico are due to nitrogen loadings from the Mississippi River (Rabalais et al., 1997). Agricultural sources (fertilizer, soil inorganic nitrogen pool, and manure) are estimated to contribute about 65 percent of the nitrogen loads entering the gulf from the Mississippi Basin (Goolsby et al., 1999). As much as 15 percent of the nitrogen fertilizer and up to 3 percent of pesticides applied to cropland in the Mississippi River Basin make their way to the Gulf of Mexico (Goolsby and Battaglin, 1993).

Recent research found that 44 estuaries (40 percent of major U.S. estuaries) exhibited highly eutrophic conditions, caused by nutrient enrichment (Bricker et al., 1999). These conditions occurred in estuaries along all coasts, but are most prevalent in estuaries along the Gulf of Mexico and Middle Atlantic coasts.

The most frequently detected herbicides in surface waters include several triazines (atrazine, cyanazine, and simazine), acetanilides (metolachlor and alachlor), and 2,4-D. These are among the most commonly used agricultural herbicides (USGS, 1999).

At least one of seven important herbicides (atrazine, cyanazine, simazine, alachlor, metolachlor, prometon, and acetochlor) was found in 37 percent of the groundwater sites examined by USGS but all at low concentrations (Barbash et al., 1999).

From its 1988-90 survey of drinking water wells, the EPA found nitrate in more than half of the 94,600 community water system wells and in almost 60 percent of the 10.5 million rural domestic wells. Levels exceeded minimum recommendations in 1.2 percent and 2.4 percent of the community and rural wells (U.S. EPA, 1992).

Groundwater levels are declining anywhere from 6 inches to 5 feet annually beneath more than 14 million acres of irrigated land (Sloggett and Dickason, 1986). Groundwater overdrafts tend to permanently increase pumping costs; can lead to land subsidence, which compacts the aquifer's structure; and can induce saltwater intrusion (USDA/ERS, 1997a).

Soil particulate, farm chemicals, and odor from livestock are carried in the air we breathe.

Habitat loss associated with modern farming methods on over 400 million acres of cropland brought about dramatic reductions in many wildlife species in North America, including cottontail rabbits and ringneck pheasants (Wildlife Management Institute, 1995; Risley et al., 1995).

Agriculture has been a factor in the decline of 380 of the 663 species federally listed as threatened or endangered in the United States (USDA/ERS, 1997a).

Agricultural wetland conversions averaged 31,000 acres per year between 1982 and 1992 (Heimlich et al., 1998). Wetland losses often reduce biodiversity because many organisms depend on wetlands and riparian zones for feeding, breeding, and shelter (NRC, 1995).

Success of Agri-Environmental Protection, 1985-2000

Agriculture-induced erosion fell from 3.08 to 1.89 billion tons/year from 1982 to 1997.[1]

Nonmarket benefits of erosion reduction due to compliance are estimated to exceed $1.4 billion/year (Hyberg, 1997).

Nonmarket benefits of erosion reduction due to the CRP land-use changes are estimated to exceed $692 million/year (see table 3).

Wetland losses fell from 593,000 acres/year in 1954-74 (Frayer et al., 1983) to 31,000 acres/year in 1982-92 (Heimlich and Melanson, 1995) as conversions became less cost-effective and Federal regulations became more constraining.

Swampbuster now discourages conversion of 1.5 to 3.3 million (estimated range) wetland acres (Claassen et al., 2000).

[1]Estimates of changes in erosion from 1982 to 1997 are from ERS analysis of National Resources Inventory (NRI) data of the USDA/NRCS.

The WRP and EWRP have restored over 990,000 acres of wetlands (Heimlich et al., 1998; USDA, NRCS, 2000c).

The permanent cover of the CRP and WRP has improved wildlife habitat. The nonmarket benefits from the habitat provided by the CRP are estimated at over $704 million/year (see table 3).

Conservation tillage, which reduces soil erosion, was used on over 37 percent of all acres planted in 1998, up from 26 percent in 1989 (Magleby et al., 2000).

Land in retirement programs is increasing the amount of carbon sequestered in the soil, mitigating greenhouse gas buildup. A CRP acre in the Great Plains is estimated to sink approximately 0.85 metric ton of carbon each year (Lewandrowski et al., 2000).

preserve agricultural productivity. The 1990 farm bill expanded agri-environmental objectives to include water quality, air quality (dust), and wildlife habitat. More recently, nutrient runoff from agricultural sources has been identified as a key source of remaining U.S. surface water quality problems (USEPA and USDA, 1998). Nutrient runoff from commercial fertilizer, animal waste, and non-farm sources is polluting estuaries throughout the United States (Bricker et al., 1999). Nutrient inflows into the Gulf of Mexico are the suspected cause of a large zone of hypoxic (oxygen-depleted) waters (Goolsby, 1999), creating a “dead zone” largely devoid of marine life. Nutrient runoff from livestock farms may be responsible for outbreaks of waterborne pathogens, including *pfiesteria piscicida* (Mlot, 1997), *Cryptosporidium* (USDA, NRCS, 2000a), and deadly strains of *E. coli* (USDA, NRCS, 2000b). Other emerging or ongoing issues include the use of genetically engineered organisms in agricultural production, carbon emissions and the potential for sequestration in agriculture, and food safety concerns ranging from pesticide residues to new strains of antibiotic-resistant bacteria.

Second, environmental issues are increasingly important in agricultural policy. While farm income support has always been an implicit objective of agri-environmental programs (Luzar, 1988; Reichelderfer, 1991; Batie, 1984), environmental performance is now explicitly recognized as a policy objective in farm income support programs. Coordination between income support and agri-environmental policy was increased significantly in the 1985 and 1990 farm bills, helping to create significant agri-environmental gains. Since 1985, eligibility for farm income support programs has been tied to soil conservation on highly erodible land and preservation of wetlands. Between 1982 and 1997, soil erosion was reduced by nearly 40 percent on U.S. cropland.[1] The rate of wetland conversion for crop production in 1982-92 was a fraction of that in the 1950’s and 1960’s (Heimlich and Melanson, 1995; Frayer et al., 1983). Policy coordination may have played an important role in slowing wetland con-

[1] Source is 1997 National Resources Inventory, U.S. Department of Agriculture, Natural Resources Conservation Service: www.nhq.nrcs.usda.gov/NRI/1997/.

version for agricultural production (Heimlich et al., 1998). Land retirement and other traditional agri-environmental policies, which focused largely on soil conservation before 1990, have been broadened to include water quality, air quality, and wildlife habitat.

Third, recent developments indicate that the future of farm price and income support policy is uncertain (Browne et al., 1997; Orden et al., 1996). In some respects, the 1996 FAIR Act was designed to reduce the role of the Federal Government in agriculture. Some farm income support was decoupled from market prices and production decisions. Annual acreage reduction programs, designed to reduce commodity production in times of excess supply, were ended (Young and Westcott, 1996). On the other hand, loan deficiency payments (LDP's), which have accounted for a significant share of income support in recent years, are closely tied to production and market prices. Moreover, in 1998 and 1999, policymakers approved emergency farm legislation to partially offset low market prices and other disasters and up total direct producer payments to $14.4 billion in 1999 and $20.8 billion in 2000.[2] This strongly affirms Congress' commitment to farm income support, but the cost and ad hoc nature of emergency legislation also raises questions about the underlying rationale for farm support and the sustainability of current farm programs.

Moreover, global trade agreements have further complicated the farm policy debate, possibly restricting farm program options. Under the Uruguay Round Agreement on Agriculture, countries agreed to reduce domestic commodity price support and export subsidies. The United States met its commitment to limit farm commodity support to no more than $23.1 billion in 1995, and is to meet a ceiling of $19.1 billion[3] in 2000 (USDA, ERS, 1997b). Many U.S. programs—including "decoupled" payments, the Conservation Reserve Program (CRP), and the Environmental Quality Incentives Program (EQIP)—appear to qualify as "green box" programs that do not count against support ceilings. (USDA/ERS, 1998a and 1998b). However, countercyclical payment mechanisms (such as loan deficiency payments under the 1996 Act and deficiency payments under past farm bills) would count against support payment ceilings.

These changes hint at new roles for agri-environmental programs in the tableau of U.S. agricultural policy. Some have suggested that the limits imposed by trade agreements will give greater prominence to "green box" agri-environmental programs as vehicles for farm income support. Others see a need to replace conservation compliance—the quid pro quo arrangement under which commodity and commodity loan payment recipients must provide minimum land stewardship—with programs that independently encourage good practices (or discourage bad ones). Questionable environmental implications of subsidized crop insurance—an increasingly popular farm program mechanism suspected of inducing farmers to overplant—are leading some to look for new agri-environmental program resolutions to the ever-present problem of program consistency across agricultural objectives. And producers who face the prospect of increasing regulation, particularly of animal waste management for water quality, seek a lower-cost, voluntary alternative through new or expanded agri-environmental program opportunities.

A new farm bill will be debated in 2001 and 2002 (which also ends the period of payments under the 1996 FAIR Act). This presents a grand opportunity to rethink the focus of agri-environmental policy and its relationship to overall farm policy. In looking ahead, only one thing is certain. Agricultural policymakers in the legislative and executive branches, and their constituents in agricultural and environmental interest arenas, will witness adoption of some portfolio of policies that will influence (if not induce) particular levels of agri-environmental protection and farm and farm household income. Exactly what those levels are, and how they relate to one another, is a direct function of the specific features—bells, whistles, and more pedestrian details—of the agri-environmental programs in place at the time. Because the features of agri-environmental programs end up resonating in the political arena, a prospective examination of how outcomes appear to be linked with program characteristics is clearly a useful exercise. And because history informs the future, some retrospective reflection can be equally useful.

This report seeks to arm those considering the future of agri-environmental programs with lessons gleaned from the past and conceptual insights about future

[2] Program payments include: Production Flexibility Contracts, Loan Deficiency Payments, Market Loss Assistance Payments, Noninsured Assistance Payments, Disaster Assistance, Cotton User Market Payments, Supplementary Income Assistance Payments, Farm Storage Facility Loans, and other direct payments. Dollar figures are based on data from Office of Budget and Program Analysis, USDA.

[3] Not all of the direct payments to farmers mentioned above are subject to limitations, so the support ceiling is unlikely to be violated.

farm and agri-environmental policy interactions. We begin with a review of the general types of policy "tools" available and utilized to gain agri-environmental benefits. We then catalog the environmental gains achieved and limitations encountered under the policies and programs in place between 1985 and 2000. From this, we extract a series of lessons about the design of cost-effective conservation and agri-environmental policies.

Finally, we turn to analysis of a specific agri-environmental policy option: an agri-environmental payments program. Agri-environmental payments are based on actions taken to improve environmental performance. As we use the term, agri-environmental payments are extended to producers primarily for changes in farming practices and are designed to address issues that may not be effectively addressed with more traditional cost-share or land retirement programs. For example, changes in crop rotations, input use, and tillage systems could be subsidized under an agri-environmental payments program. Although not principally a land retirement program, producers could retire land in response to an agri-environmental payments program as a method of reducing input use, soil erosion, etc.

The term "green payment" refers to a subset of agri-environmental payment programs that have both environmental and farm income objectives.

Green payments are frequently discussed as an alternative for, or supplement to, current farm income and environmental programs (Lynch, 1994; Lynch and Smith, 1994; Batie, 1999; Horan, 1999; Claassen and Horan, 2000). For example, the Conservation Security Program (CSP), proposed as part of the Clinton Administration's FY 2001 budget proposal, would provide payments to support farm income but only to farmers who implement or maintain certain conservation practices such as conservation tillage or nutrient management (Glickman, 2000).

We address a number of questions that policymakers will face in designing any agri-environmental payments program:

- How will producers be prioritized for the receipt of payments? On the basis of potential environmental gain, need of farm income support, or both?
- Will payments be based on a measure or estimate of environmental performance or on the use of practices deemed to be environmentally sound?
- Will "good actors"—producers who have already adopted good conservation practices and/or achieved good environmental performance—receive payments on the basis of past actions?
- Will payments exceed the cost of making changes required for program participation? In other words, will producers derive significant benefits—over and above their costs—from participation in an agri-environmental program?

These program design details will largely determine the environmental and farm income effects of an agri-environmental payment program. To illustrate this, we define some hypothetical program scenarios. Using a computer simulation model designed to predict producer response to policy incentives, we analyze these scenarios to illustrate some of the more important tradeoffs policymakers will face in designing an agri-environmental payment program.

In analyzing program options, we pay special attention to the prospects for unintended consequences that may arise from extensive use of a subsidy mechanism.