Various Policy Instruments For Various Ends

Agricultural production affects the environment in myriad ways, and so begets multiple policy instruments to mitigate those effects. This section provides an overview of policy instrument types, highlighting generic properties and illustrating those properties with actual policies, where applicable.

The wide variety of specific policy tools available to policy decisionmakers can be categorized broadly as (1) information dissemination tools, (2) economic incentive tools, and (3) regulatory requirements. One important difference among the three groups is the degree to which producer participation would be voluntary (table 1). Fully voluntary approaches include technical assistance and government cost sharing. Instruments become increasingly prescriptive as economic incentives are tied to performance, ending with regulatory requirements as under the Clean Water Act.

A second major difference among policy tools is the role of government. Public personnel may simply assist farmers by collecting and disseminating information (e.g., educational and technical assistance programs). They might also, in a more direct role, define recommended procedures for achieving certain goals—a set of recommended best-management practices or requirements for third-party organic produce certification. Finally and most directly, public agencies could pay farmers who change their behavior (or levy taxes on those who do not) or simply require that best-management practices be implemented.

The third principal difference among policy tools is the nature of the land management decision targeted. A policy can be designed to influence/change farmers' choices about *how much* (and *which*) land to farm (land retirement). Or it can target decisions about *how cropland* is *used*, which crops are produced and under which practices and inputs (management and conservation practices).

Each policy tool has advantages and disadvantages; their differences will manifest as different impacts on farmers' profits, taxpayer costs, consumer prices, and environmental gains. The actual economic and environmental effectiveness will depend on a range of detailed design issues discussed later in the report ("Analysis of Alternative Program Designs," p. 36).

Here, we briefly describe each type of policy tool and its advantages and disadvantages.

Education and Technical Assistance

Education and technical assistance provide information to farmers to facilitate the adoption or use of more environmentally benign practices. Assistance can range from providing data, for example on soil quality, or disseminating information about new technologies or practices—including which are best under a given set of circumstances or how to operate them to achieve the greatest gain—to helping farmers prepare conservation plans.

Participation decision: Voluntary.

Government role: Provide information.

Land management target: Traditionally applied to management and conservation practices.

Advantages: Public information gathering and distribution may increase the use of conservation practices by farmers unaware of their effectiveness or unsure about how to adopt them. Private benefits to producers may include lowering production costs, preserving soil productivity, or reducing damage to their own resources such as ground water.

Disadvantages: These programs are completely voluntary, with effectiveness largely dependent on whether a given practice creates benefits for farmers that offset the costs of adoption (Ribaudo, 1997).

Application: U.S. agri-environmental policy has long relied on education and technical assistance. The oldest, and largest, education and technical assistance program is the Conservation Technical Assistance program (CTA), founded in 1936. Real expenditures (in constant dollar terms) for technical assistance followed a slight upward trend to about 1970, and then leveled off (or declined slightly) (Heimlich et al., 2000b). In terms of Federal program expenditures, the importance of technical assistance relative to land retirement has declined precipitously since 1986 (fig. 1).

Government Labeling Standards for Private Goods

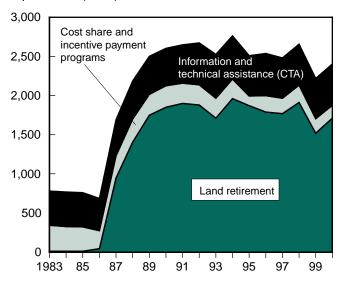
Government labeling standards for private goods help create efficient private markets for goods produced with environmentally sound practices. National certifiTable 1—A survey of public policy tools for addressing environmental effects of agriculture

Policy tool	Participation	Government Role	Selected U.S. Programs	
			Program title	Acronym
Educational/ Technical assistance	Voluntary	Provide farmers with information and training to plan and implement practices	Conservation Technical Assistance	СТА
Government labeling standards for private goods	Voluntary, but standard must be met for certification	Government sets standards, which must be met for certification typically involving voluntary "eco-labeling" guidelines	Organic certification	None
Incentive policies: Land retirement payments	Voluntary	Annual payments for retiring land from crop production for contract duration; contracts generally long term (10 years - permanent)	Conservation Reserve Program Wetland Reserve Program and Emergency Wetland Reserve Program	CRP WRP
Incentive policies: Land use payments	Voluntary	Payments to offset the cost of adopting specified best manage-	Agricultural Conservation Program ¹	ACP
		ment practices; contracts intermediate run (5-10 years)	Water Quality Improvement Program ¹ Environmental Quality Incentives Program	WQIP EQIP
			Wildlife Habitat Incentives Program	WHIP
Incentive policies: Environmental taxes	Involuntary, but payment amount depends on behavior	Per-unit charges for failure to meet environmental goals	None at the Federal level	None
Compliance mechanisms	Involuntary, after opt-in to Farm Program	Sets standards for environmental performance and determines whether requirements are met before releasing payments	Conservation Compliance Sodbuster Swampbuster	None None None
Regulatory requirements	Involuntary	Producers subject to regulations if voluntary measures do not achieve environmental goals	Coastal Zone Management Act Reauthorization Amendments	CZARA
		Operations may be subject to effluent discharge permits	Clean Water Act	CWA
		Use restrictions and bans on certain pesticides	Federal Insecticide, Fungicide and Rodenticide Act	FIFRA
		Farmers may not "take" a member of a listed species; Agencies must protect and restore species and their habitats	Endangered Species Act	ESA

¹ Programs are no longer in effect; they were replaced in 1996 by EQIP.

Figure 1 Conservation expenditures, 1983-2000

Expenditures (\$ mil.)



cation standards increase the informational value associated with specialized labels.

Participation decision: Voluntary.

Government role: Identify approved practices or guidelines for certification, enforcement.

Land management target: Traditionally applied to management practices.

Advantages: Certification standards assure consumers of the meaning and value of specialized labels, and make it easier for producers to capture price premiums for products produced under environmentally friendly practices. National certification standards can eliminate confusion created by standards that vary by State, facilitating interstate commerce in such products.

Disadvantages: Certification standards will generally be effective only where private gains from participation can be captured in a market setting. In some cases, it will be difficult to link program participation to measurable environmental benefits.

Application: USDA recently set uniform national standards defining the term "organic" for both bulk and processed products and at all stages of production and marketing in an effort to encourage wider adoption of low-input, organic crop production. To the extent that organic farming increases production costs per unit of output, relative to commercial farming,

farmers will be more likely to adopt such practices if they can capture price premiums. Without clear standards for organic production practices, the line between organic farming and traditional commercial farming could blur and farmers adopting practices best for the environment might be less competitive than others. Standards can protect such farmers by requiring that everyone marketing their output as organic adopt at least a minimum set of required practices.

Economic Incentive-Based Policies

Economic incentive-based policies can provide positive incentives (payments to farmers) designed to encourage environmentally beneficial activities, or negative incentives (taxes farmers pay) designed to discourage environmentally harmful activities. In practice, only positive incentives have been implemented at the Federal level in regard to agriculture.

Economic-incentive instruments allow producers greater flexibility of response than do regulatory approaches (discussed below). Producers are free to weigh the incentive (subsidy or tax) against the costs they will encounter in making land use, management, or conservation practice changes that could increase a total subsidy payment or decrease a tax bill. Some producers may find it advantageous to forgo subsidies or pay a tax because the cost of making changes is high. Other producers may make large changes in response to the incentive. In this way, incentives can direct agri-environmental activity toward producers who can makes changes (achieve gains) at the lowest cost. Hence, economists frequently hail incentivebased policies as efficient tools for environmental goals. Whether they are, in fact, efficient will depend on the agri-environmental setting and the details of the program design.⁴

Taxes and subsidies differ, of course, in their effect on net farm income and on taxpayer burdens (both farm income and taxpayer burden rise with subsidies and fall with taxes). They also differ in the incentive they create for expanding or contracting crop production. Subsidies can encourage producers to expand crop production while taxes can encourage producers to contract production. A more detailed description of three economic incentive options follows.

⁴ Later is this report, we show that the efficiency of a subsidy incentive depends signficantly on the details of program design.

Cost-Share/Incentive Payment Policies

Cost-share/incentive payment policies pay farmers for adopting or using environmentally desirable practices. Cost-share policies typically pay 50 to 75 percent of farmers' adoption costs, while incentive payments more broadly defined could include payments exceeding farmers' costs.

Participation decision: Voluntary.

Government role: Determine targeted practices, provide direct payments.

Land management target: Traditionally applied to management practices.

Advantages: Cost-share and incentive payment programs increase the likelihood that farmers will adopt environmentally desirable practices by reducing the net cost of doing so. The larger the payment, the greater the range of practices likely to be adopted and the higher the number of likely participants. Payments that exceed the cost of adoption can provide income support to farmers who adopt or use environmental practices, compensating them for providing public amenities such as clean water or wildlife habitat (although landowners who are not farmers may capture some of the value of these payments (see box, "Supporting Farm Incomes and Protecting the Environment: The Case Where Farmers Are Not Landowners"). Also, if farmers are required to improve their environmental performance as a result of a separate regulatory requirement, public subsidies for adopting required practices would reduce (or eliminate) the impact of that requirement on farm income. Finally, incentive payment policies are conducive to voluntary contracts spanning a number of years, ensuring continuity of practices over time.

Disadvantages: Participation in such programs is voluntary. Policies providing for less than 100 percent of adoption costs will be effective only to the extent that targeted practices provide private economic benefits (in addition to the environmental benefits). Because participation will increase as payment rates rise (also increasing total program expenditures), it may be expensive for taxpayers to fund and exact substantial environmental change. In addition, without specific controls, payments for targeted practices can induce producers to expand crop acreage and thus exacerbate environmental damages, even if average damages per

acre fall. These unintended consequences are addressed at length later in this report.

Application: A number of incentive payment programs have dealt largely with how land is farmed, including the Agricultural Conservation Program (ACP) and its successor the Environmental Quality Incentives Program (EQIP), and the Wildlife Habitat Incentives Program (WHIP) (see appendix 1, "Major Conservation Programs"). Traditionally, these programs focused on soil erosion but have expanded to incorporate other environmental attributes. While they have long been a mainstay of agri-environmental policy, total expenditures on these programs are small relative to expenditures on land retirement (fig. 1).

EOIP was enacted in 1996 to combine and refocus a number of longstanding conservation cost share/incentive payment programs (Ribaudo, 1997). Unlike the programs it replaced (the ACP, Great Plains Conservation Program, Colorado River Salinity Program, and Water Quality Incentives Program) 50 percent of EOIP funds are earmarked for practices or systems relating to livestock production. Moreover, EQIP funds are to be targeted to achieve the greatest possible environmental benefit per dollar of program expenditure. The programs preceding EQIP were generally available to producers on a first-come, firstserved basis, and funds were divided more or less evenly among political jurisdictions.

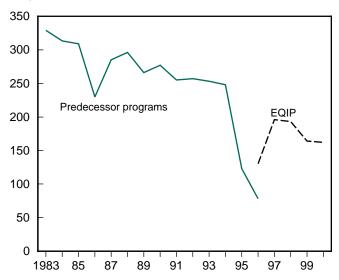
EQIP has, in fact, focused a substantial share of program resources (58 percent of EQIP funds) on livestock operations (see box, "Environmental Quality Incentives Program"), especially management of livestock waste nutrients.⁵ Under EQIP, 20 percent of program funds are allocated to livestock waste management, 6 a 50-percent increase in total funding for livestock waste management relative to ACP allocations in 1995. This increase is doubly significant since funding for cost-share and income incentive programs like EQIP has declined (in real dollars) over the past 15 years (fig. 2).

⁵ Local USDA-NRCS staff determine whether an activity is "livestock-related." While there is no specific definition of a livestock-related activity, the term encompasses more than animal waste management.

⁶ Source: ERS analysis of EQIP program data.

Figure 2
Funding for EQIP and predecessor programs

Program expenditures (\$ mil.)



Land Retirement Programs

Land retirement programs provide annual payments to farmers for retiring land from crop production. Payments compensate farmers for forgone net revenues (net benefits they would have received had they produced crops on that land).

Participation decision: Voluntary.

Government role: Provide direct payments, select lands to be retired.

Land management target: Land retirement.

Advantages: Land retirement programs are particularly well suited for securing environmental benefits that increase with the length of time land is removed from crop production. For example, many wetland services and other wildlife habitat arise only when the ecosystem is fully established, a process that might take years. Retirement programs are also useful for protecting lands that cannot be sustainably farmed, such as those with very steep slopes. As such, land retirement programs tend to run longer than other policies. By removing land from crop production, land retirement also controls commodity supply, whether intentionally or as a byproduct. Finally, land retired can be easily confirmed and, therefore, easily enforced.

Disadvantages: Land retirement policies cannot address environmental damages from the vast majority

of cropland that remains in production. Also, because program payments must cover the full value of the land in crop production (rather than a cost for modifying practices on land remaining in production), land retirement programs may be more expensive, per acre, than other policies discussed.

Application: Land retirement was used sporadically, most notably under the ACP in the 1930's and in the Soil Bank program of the 1950's, until the Conservation Reserve Program (CRP) began in 1985. Since the mid-1980's, land retirement has dominated Federal spending on agri-environmental programs (fig. 1). The CRP initially continued a tradition of land retirement for soil conservation and commodity supply management. Unlike previous programs, however, CRP eligibility was restricted to highly erodible land to enhance environmental performance. More than 36 million acres—about 10 percent of U.S. cropland—were eventually enrolled in CRP (Osborn et al., 1995). (See appendix 1, "Major Conservation Programs," for a program description.)

In 1990, the resource concerns of agri-environmental policy were broadened, largely to address many offsite problems (Zinn, 1991). An Environmental Benefits Index (EBI) was adopted to target land for retirement in the CRP based on environmental benefits and government costs. Wetland restoration on agricultural land also accelerated after 1990 with enactment of the Wetland Reserve Program (WRP), which purchases long-term, often permanent, easements.

Using the EBI, CRP contracts are allocated among bids based on generic environmental objectives like water quality or wildlife habitat. In recent years, policymakers have created the Conservation Reserve Enhancement Program (CREP) to focus a portion of CRP resources on local environmental problems. In Maryland, for example, the CREP is targeted to protect water quality in the Chesapeake Bay. In New York, specific watersheds are targeted to protect the drinking water supply for New York City. In Washington and Oregon, CREP programs focus on endangered species habitat (Smith, 2000).

Environmental Taxes

Environmental taxes are per-unit charges for actions contributing to environmental degradation. Charges may be associated with emissions (such as a fixed dollar value per pound of soil lost) or with input use (such as a fertilizer). They can be assessed on all units, or just on the

Supporting Farm Incomes and Protecting the Environment: The Case Where Farmers Are Not Landowners

It may be difficult to support farm incomes—through agrienvironmental payments or otherwise—when farmers are not landowners. About 40 percent of agricultural land is rented from retired farmers, family members of deceased farmers, or somebody else. Payments intended to support farm income may instead be used to increase bids in the competition for rental land. In recent years, cropland rental rates have not declined, despite historically low commodity prices, indicating that some portion of large Federal farm income support payments (more than \$20 billion in 2000) has supported land rental rates instead.

Whether payments can, in fact, support the incomes of tenant farmers depends on the nature of land rental agreements and the type of management or conservation practices being subsidized. Two types of tenure agreements predominate in agriculture: cash rental agreements (about 30 percent of cropland) and share rental agreements (10 percent of cropland). Moreover, the level of tenant and landowner responsibility and cost may depend significantly on the type of management or conservation practice involved. Environmentally motivated changes in management or conservation practices may involve (1) changes in crop production practices or (2) permanent improvements on land itself, e.g., terraces, waterways, manure handling facilities, etc. Permanent improvements imply a higher level of landowner responsibility and cost.

Under cash rental, tenants pay a fixed fee for use of the land, pay all costs of production, retain the commodities produced, and generally are paid all commodity program benefits. When land rental markets are competitive, commodity program benefits generally accrue to landowners

in the form of high rental rates. Likewise, if agri-environmental subsidies paid to farmers exceed the costs of practice adoption, a portion of this income support payment may also accrue to landowners.

Even if landowners have no stake in annual production, they may receive a share of—or even all of—an agrienvironmental payment. Under the Environmental Quality Incentives Program (EQIP, see box), for example, landowners are ultimately responsible for completion of contract terms. USDA allows EQIP contracts to specify any mutually agreed distribution of payments. Many contracts, particularly those involving structures such as manure management facilities for confined animals, reportedly go entirely to the landlord.

Under share rental agreements, tenants and landowners typically share in crop revenues, costs of production, and farm income support benefits. Agri-environmental subsidy payments, as well as any change in revenues or costs resulting from changes in management or conservation practices, would be split according to the general terms of the rental agreement. Because tenants generally provide machinery, they may receive a larger share of payments for changes involving machinery investment, such as conservation tillage. On the other hand, landowners are generally responsible for improvements to the land and may receive a relatively large share when changes involve land-related investment (e.g., terraces). To the extent that landowners are able to negotiate a relatively favorable division of the agri-environmental payment, they can capture some of the payment intended for farm income support.

number of units emitted or used above a given threshold. Total tax payments would depend on the farmer's behavior; the further from the environmental goal, the higher the payment. Farmers who meet those goals might incur no additional costs from a tax program.

Participation decision: Involuntary.

Government role: Monitoring, enforcement, and collection of tax.

Land management target: Primarily management practices, but could be designed to address land retirement.

Advantages: Environmental tax policies are consistent with the "polluter pays" principle, and they do not promote expansion of environmentally damaging activities.

Disadvantages: Taxes have a negative impact on farm income.

Application: Environmental taxes have not been used as an agri-environmental policy mechanism at the Federal level, though a few State tax programs do exist. For example, both Minnesota and Iowa tax agricultural pesticides and fertilizer (Morris, 1994). However, tax rates are too low to have a significant effect on the use of pesticides or fertilizer. Tax revenues fund research

on environmentally sustainable agriculture (Iowa) and cleanup of agricultural chemical spills (Minnesota).

Compliance Mechanisms

Compliance mechanisms require a basic level of environmental compliance as a condition of eligibility for other programs. This tool shares characteristics with both government standards for private goods/actions and economic incentives. It is similar to the former in that the government establishes a set of approved practices, except that here compliance is linked to a direct economic payment. Because existing programs are used for leverage, compliance mechanisms require no budget outlay for producer payments, although considerable technical assistance is needed to develop conservation compliance plans.

Participation decision: Involuntary.⁷

Government role: Establish and determine whether compliance standards are met.

Land management target: Land use, management, and conservation practices.

Advantages: Compliance mechanisms are well suited to certain agri-environmental problems that may be more difficult to address with voluntary subsidy programs. For example, draining a wetland can trigger the loss of Federal program benefits. In contrast, to protect wetlands with a voluntary subsidy program, policy-makers might find themselves having to pay for maintenance of all wetlands—a potentially expensive proposition—or needing to decide which wetlands have sufficient agricultural conversion potential to warrant protection—a potentially difficult and divisive task (Heimlich and Claassen, 1998b).

Disadvantages: The distribution of agri-environmental incentives depends on the distribution of Federal farm program payments. Many agri-environmental issues, particularly emerging issues such as livestock waste management, do not occur on farms that are the traditional clients of these programs. Also, if farm program payments are countercyclical, program payments will

be low when prices, and therefore incentives for plowing highly erodible land (HEL) or draining wetland, are high (Heimlich et al., 1989).

Application: In 1985, the Food Security Act ushered in a new era of agri-environmental policy. Perhaps the most fundamental change in policy was the adoption of compliance mechanisms to protect highly erodible soils and wetlands. These mechanisms require certain resource conservation activities in return for benefits from selected Federal agricultural programs, most notably price support loans and income support payments.

- Under the sodbuster provision, producers who bring HEL into crop production must apply strict soil conservation systems(USDA/NRCS, 1996).
- ♦ Conservation compliance requires conservation systems on previously cropped HEL, albeit less stringent systems than required by sodbuster.
- Under **swampbuster**, producers who convert wetland for agricultural production can lose Federal farm program payments.

The adoption of compliance mechanisms was a significant step toward coordination in agricultural and agrienvironmental policy. The sodbuster and conservation compliance provisions were enacted in conjunction with the Conservation Reserve Program as part of an overall strategy to reduce soil erosion. Producers who choose not to meet conservation compliance requirements (because of cost, for example) could enroll land in the CRP. Compliance mechanisms also redressed a longstanding inconsistency between farm price and income support programs—which encouraged farmers to expand production, sometimes on environmentally sensitive land—and conservation programs that sought to mitigate the adverse effects of agricultural production (Miranowski and Reichelderfer, 1985).

Regulatory Requirements

Regulatory requirements lie at the far end of the policy spectrum in terms of the degree to which participation is voluntary. Rather than attempting to facilitate or encourage improved environmental performance, policymakers can simply require it. In the name of public health and safety, a number of practices are banned and safe application methods are required. The ban on the production and application of the chemical DDT is one such example.

Participation decision: Involuntary.

Participation is technically voluntary. However, payments in these programs are widely viewed as entitlements by producers, are largely capitalized into the value of land (Barnard et al., 1997; Duffy et al., 1994), and are generally built into producers' financial calculations. Consequently, we categorize this policy instrument as an involuntary one, albeit with a qualification.

Government role: Establishing standards, monitoring, and enforcement.

Land management target: Management practices and land retirement.

Advantages: Regulatory requirements can be the most effective of all policy tools in effecting changes to improve environmental quality, assuming that regulations are adequately enforced. Unlike policy choices in which farmer participation is uncertain, regulations simply require that all farmers participate. This feature is particularly important if the consequences of not changing are drastic or irreversible.

Disadvantages: Regulatory requirements can be the least flexible of all policy instruments, requiring that producers reach a specific environmental goal or adopt specific practices. Producers are not free to determine their own level of participation, based on their costs. Unless regulators know farm-specific costs and can use this information to establish farm-specific regulations, agri-environmental effort is not necessarily directed toward producers who can make changes (achieve gains) at the lowest cost. Consequently, regulation can be less flexible and less efficient that economic incentives.

Application: Regulatory requirements are rare within traditional agri-environmental policy. However, farmers operate within an increasingly complex regulatory environment. Federal laws most likely to impact farm operations include the Coastal Zone Act Reauthorization Amendments (CZARA), which targets agricultural nonpoint-source runoff affecting coastal waters; the Clean Water Act (CWA), which regulates the deposit of dredge and fill materials in wetlands; the Federal

Insecticide, Fungicide, and Rodenticide Act (FIFRA), which regulates the use of farm chemicals; and the Endangered Species Act (ESA), which aims to protect species in danger of going extinct (see appendix 1, "Major Conservation Programs"). The Environmental Protection Agency (EPA) is currently developing regulations regarding the management of animal waste from large confined animal operations under authority provided by the CWA.

In sum, a wide variety of tools are available to policy decisionmakers. Tools range from direct to indirect and voluntary to involuntary, from information provision and technical assistance to policies that dictate farmers' practices or performance levels. Some tools provide a direct economic incentive to encourage participation. Some policies are better suited for influencing decisions regarding cropping and management practices on land in production; others are better suited for addressing environmental implications of decisions on whether to retire land.

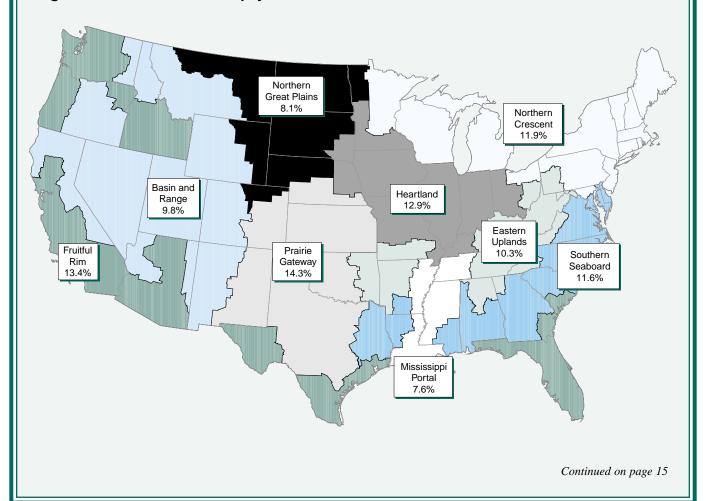
Despite this wide range of options, USDA agri-environmental policy in the past two decades has relied primarily on two tools: economic incentives for long-term land retirement and compliance mechanisms for soil conservation on land remaining in production and to discourage conservation of wetlands to crop production. Cost sharing and technical assistance programs exist as well, but are significantly smaller than land retirement in terms of total expenditures and than compliance mechanisms in terms of acreage affected. In the following section, we discuss the environmental gains that can be associated with past programs, and highlight policy design features that contributed to their relative successes and failures.

The Environmental Quality Incentives Program (EQIP)

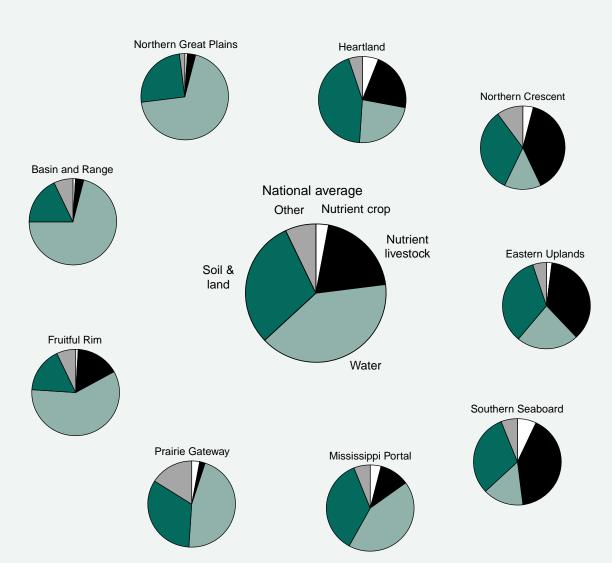
The Environmental Quality Incentives Program (EQIP) provides technical, financial, and educational assistance for a wide range of agri-environmental activities. Through 1999, \$466 million was obligated in 64,361 contracts covering 26.8 million acres of agricultural land, including nearly 7 million acres of cropland. Payments are proportional to the number of farms across resource regions, except in the Basin and Range where payments relative to the number of farms tend to be greater (see appendix 6, "ERS Farm Resource Regions").

Five categories of conservation practices are being funded: crop-related nutrient management, livestock-related nutrient management, soil erosion and land protection, water resources management, and other resource concerns. Thirty-nine percent of EQIP funds are being allocated toward water resources management practices, ranging from more efficient irrigation systems to livestock drinking troughs. Soil erosion and land protection practices account for 30 percent of all funding. While 58 percent of EQIP funds are devoted to livestock-related activities, 20 percent of funds have been designated specifically for livestock waste nutrient management.

Regional distribution of EQIP payments







EQIP's targeting, in environmental terms, varies significantly across the ERS Farm Regions. Practices associated with management of livestock waste obtain the lion's share of funds in the Northern Crescent, Eastern Uplands, and Southern Seaboard where there is, in fact, an overriding concern surrounding these issues. In the Western United States (e.g., Northern Great Plains, Basin and Range, Fruitful Rim, and Prairie Gateway regions), where water scarcity is high profile, the major-

Economic Research Service/USDA

ity of EQIP funds are allocated to improve water management practices. In the Heartland and the Prairie Gateway regions, which include 44 percent of the Nation's cropland, a large share of the funds are used to prevent soil erosion (the Heartland has the highest share of its expenditures allocated for soil erosion control). The Mississippi Portal is the one region where water resource and soil erosion practices are assigned approximately equal shares of the budget.