

Resources & Environment



The Change to Conservation: Moving Farmers Toward New Production Practices

How much do government conservation programs actually influence farmers' decisions to adopt production practices that conserve natural resources? USDA has a number of programs that encourage farmers to use environmentally beneficial production practices and technologies on their farms. Most of these programs are voluntary, involving offers of technical assistance, education, demonstrations, and cost sharing. But what really motivates farmers to operate in a manner that enhances conservation efforts?

The department's Economic Research Service (ERS) examined over the last decade why America's farmers choose to adopt—or not adopt—nutrient (e.g., nitrogen), pest, soil, and water management practices beneficial to the environment. In particular, the ERS-led study—called the Area Studies Project—assessed how government policies, resources, and education influence farmers to use such practices, and how differences in kinds of crops, types of technology, and particularly geographic regions can further affect those decisions. Specific characteristics of the local landscape and climate, for instance, may make certain practices impossible to

implement, and will ultimately determine an area's vulnerability to various kinds of agricultural pollution.

Variations in land and climate, by shaping farmers' decisions about the practices they can implement, also determine the ultimate efficacy of government conservation policies—just as changes in policies determine which practices farmers choose to implement and the environmental impacts stemming from those practices. Understanding these forces and how they interrelate is crucial to determining which production practices are likely to be attractive to farmers, and how effectively they will be employed.

New Ways of Doing Business

Like most people operating a business, farmers want to use production methods that maximize profits, given existing prices, policies, personal preferences, and available resources. If farmers choose not to adopt new conservation practices, it is generally because 1) adopting those practices is less, or no more, profitable than continuing with traditional practices, or 2) other considerations interfere—even if adopting the new practices would lead to

larger profits. Consequently, policies designed to encourage farmers to adopt certain practices must take into account these different orientations.

When a new conservation practice is introduced, it is natural for farmers to be uncertain about whether it will work in their area. In fact, the practice may have to be modified significantly before it can be successfully employed in a particular region or on a particular farm. As interested local farmers adopt and gain more experience with the new practice—and as their fellow farmers learn more about the practice from them, from the extension service, or from the media—the associated uncertainties and costs recede.

Nonetheless, some farmers may still choose not to adopt a practice for a variety of reasons. The practice may not suit environmental conditions on their farms, the size of their farms, or the types of operations they run; it may interfere with other practices they customarily employ; or skills levels needed for successful implementation may vary among farmers. To be fully effective, then, government policies designed to promote the adoption of conservation technologies and management strategies depend on a clear understanding of how and why farmers choose certain production practices. (For more on designing effective government conservation programs, see article on page 26.)

The Area Studies Project Survey

In an effort to determine how farmers make decisions to adopt or reject new practices, ERS launched the Area Studies Project in 1991, in collaboration with USDA's National Agricultural Statistics Service and Natural Resources Conservation Service. The U.S. Geological Survey and the U.S. Environmental Protection Agency were also extensively involved. For the next 3 years (1991-93), a survey team collected data from farmers operating in 10 U.S. watersheds, spread throughout the country. All these areas were under study by the U.S. Geological Survey's National Water Quality Assessment Program, which was initiating an extensive effort to monitor water quality.

In each watershed, the Area Studies team designed the survey that was conducted

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Association of Farm and Operator Characteristics with Adoption of Agricultural Production Practices

	Production practices										
	Any soil conservation	Soil and water quality ¹	Residue management for pest control	Biological pest control	Scout for pests	Modern nutrient practices		Traditional nutrient practices		Decision to irrigate	
						Nitrogen testing ²	Split nitrogen application ³	Legumes	Manure		
Operator characteristic:											
Education level	+	*	-	+	+		+			+	
Degree of farming experience			-	-*	-*	-				-	
Land ownership	-				-			-	+	+	
Farm program participation		+			+	+	+	+		+	
Seek expert advice	+	+	+	+	+	+	+			na	
Use of crop insurance	+				+	+		-			
Farm characteristic:											
Farm size	+			+	+	+		-*	-	-	
Use of irrigation			+	+	+	+	+	+	+	na	
Rainfall	+	+	*	+			+		na	-	
Temperature	+		+	+			+	na	-	+	
Soil productivity	+	+	*			-*	+	-	+	+	na

Effect on adoption: + = positive; - = negative; blank = no effect; na = not applicable.

Area Studies Project-combined-area model. Statistical relationships are confirmed with 95 percent confidence (90 percent for items with *).

1. Use of practices designed to prevent soil from being transported to waterways once soil has left the field (grassed waterways, filter strips, grade stabilization structures, and critical area plantings). 2. Nitrogen tests to determine fertilizer needs. 3. Applying half or less of required amount of nitrogen for crop production at or before planting, with remainder applied after emergence.

Economic Research Service, USDA

through extensive personal interviews with farmers to determine the kinds of operations they ran and their agricultural production practices. The team gathered a wealth of information on farmers (e.g., age and education level) and on how they work: kinds of crops and animals they raised; cropping, tillage, and soil conservation practices they had employed for the past 3 years; biological and chemical pest control methods they used in individual fields and on the farm as a whole; and how they tested soil, applied manure, sought information about fertilizer, and actually used fertilizer. The farmers were asked about a wide range of practices used to manage nutrients, pests, soil, and water, along with participation in government programs and use of crop insurance. The survey sample was chosen to correspond to sample points from the National Resources Inventory (NRI).

After collecting information from the farmers, Area Studies researchers matched it with information from the NRI about environmental characteristics such as soil erosion potential, leaching potential, and productivity, as well as regional temperature and rainfall. Researchers looked at the relationship of these factors to various technologies, cropping systems, and watersheds to identify principal factors discouraging farmers from adopting certain conservation practices. Area Studies researchers analyzed adoption of soil conservation and sediment reduction practices (e.g., conservation tillage and filter strips), pest management practices (e.g., rotations and professional scouting), and modern nutrient management practices (e.g., N-testing and split nitrogen applications).

Each analysis used the same set of variables to compare influences of knowl-

edge, government policy, and farm and natural resource characteristics on a farmer's decision to adopt a specific practice. Data from all the watersheds were initially combined for each analysis. Analysis was then conducted on selected individual areas to determine whether the conclusions were similar, or whether combining the data for all the watersheds had skewed the results.

The Will to Change

The sheer amount and richness of the Area Studies survey data offered researchers a unique opportunity to perform a wide range of analyses that would assess farmers' receptivity to new production practices. Clearly, for the 10-watershed area as a whole, education had a significantly positive effect on farmers' willingness to adopt practices that require specialized knowledge such as biological

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pest control or split nitrogen applications. This means that government agencies or other technology providers will need to consider the increasing complexity of new practices when targeting certain groups of farmers. Technical assistance, demonstrations, or consulting services may be the keys to encouraging farmers to adopt these practices. Interestingly, experienced farmers are less likely to adopt information-intensive practices than novices.

Researchers had initially hypothesized that farmers who owned their land would be more likely to invest in new practices than farmers who simply rented. However, ownership was less of a factor than expected, perhaps in part because most of the practices included in the study did not require a major financial outlay.

Farmers who owned their land were indeed more likely than renters to invest in new irrigation technologies, which are initially quite expensive, but the difference between the two groups was small. Farmers who chose to invest in irrigation were also considerably more likely to adopt the pest and nutrient management practices considered in the study. That result is not surprising: because water is the primary conduit for chemicals that end up in ground or surface water, water and chemical management naturally go together. Managing water is harder for farmers who rely exclusively on rain to water their

The 10 watersheds included in the Area Studies Project are: 1) Central Nebraska River Basins, 2) the White River Basin in Indiana, 3) the Lower Susquehanna River Basin in Pennsylvania, and 4) the Mid-Columbia River Basin in Washington (all surveyed in 1991); 5) the Albemarle-Pamlico Drainage in Virginia, 6) the Georgia Coastal Plain, 7) Illinois/Iowa Basin, and 8) the Upper Snake River Basin in Idaho (1992); and 9) the Southern High Plains in Texas, and 10) the Mississippi Embayment, which includes parts of Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee (1993).

crops, and so their chemical management strategies may be less effective.

Farmers who participated in government programs and benefited from expert advice were much more likely to use virtually all the preferred practices to conserve soil, deal with pests, and manage nutrients. At the time the Area Studies survey was conducted, farmers who received benefits from a number of USDA programs were required to use conservation practices: for instance, farmers whose farms had potentially critical erosion problems had to adopt relevant conservation practices in order to participate in the programs. However, the study findings suggest that the availability and use of technical assistance

would in any case have helped determine the choices they made to use specific practices. Extension and education efforts are both important tools for promoting the adoption of new production practices—especially with regard to practices that require specialized knowledge and practices designed to protect the environment beyond the farm gate.

When considering specific regions, certain resources (e.g., soil characteristics and climate) often proved to be a significant factor in farmers' decisions to adopt some of the practices—confirming the idea that site-specific information about resources is vital to examining and explaining success or failure of conservation efforts. Accordingly, it is important to remember that the results above represent an aggregation of data gathered from 10 distinct watersheds, and that important information can be lost in the process of combining such data. From a policy perspective, it means that incentives developed to address environmental concerns identified in an analysis of several regions may actually be appropriate for only one region and counterproductive if used in others. Also, results from individual watersheds can be useful in addressing issues such as water quality, specific to that particular watershed or site. **AO**

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What makes farmers opt for conservation?

Data and details on farmers' use of:

- soil management practices
- pest management practices
- water management practices
- nutrient management practices

In the recently released ERS report:

*Adoption of Agricultural Production Practices:
Lessons Learned from the U.S. Department of Agriculture Area Studies Project*
AER No. 792

www.ers.usda.gov/publications/aer792/