6.5 USDA's Water Quality Program

USDA's Water Quality Program, now in its fifth year, is achieving reductions in agricultural chemical use in the targeted areas. Research efforts have developed water quality protection measures, including new nitrogen tests to help farmers avoid overapplication of fertilizer. Surveys are gathering valuable data on chemical use related to agricultural practices and environmental conditions.

Agricultural production is causing water quality problems in parts of the United States (see module 2.2). Consequences of farm production include soil erosion; runoff of fertilizers, animal waste, and pesticides into rivers and streams; and leaching of nutrients and pesticides into ground water. While laws such as the Clean Water Act improved water quality by reducing the pollution from factories, sewage treatment plants, and other point sources, progress in reducing pollution from agriculture and other non- point sources has lagged. In 1990, USDA made a commitment to protect the Nation's waters from contamination by agricultural chemicals and waste products by establishing the Water Quality Program (WQP). This program builds upon past experimental efforts, including the Model Implementation Program of the 1970's and the Rural Clean Water Program and Water Quality Special Projects of the 1980's.

The WQP strives to (1) determine the precise nature of the relationship between agricultural activities and water quality and (2) develop, and induce the adoption of, technically and economically effective agrichemical management and agricultural production strategies that protect surface and groundwater quality (USDA, 1993b). Greater regulatory activities may result if the program does not achieve sufficient participation and demonstrable results. Already, some EPA-administered programs, such as the Coastal Zone Management Act, are proposing nonvoluntary measures for reducing agricultural pollution (see module 6.6).

The WQP is carried out through (1) research and development; (2) education, technical, and financial assistance; and (3) database development and evaluation. The relationship between agricultural management systems and resource quantity and quality is being analyzed through area-wide field studies and cooperative research projects.

WQP works with States to identify areas where agriculture threatens water quality, and it encourages farmers and ranchers in those areas to use practices that are safe to the environment yet economically practical. The program also provides farmers information they can use to assess their production systems to reduce agrichemical use (and production costs), thereby enhancing the quality of their drinking and irrigation water.

The database development portion of the program collects data on chemical use on the major field crops, vegetables, and fruits. In addition, important data on the linkages between the resource base and farming practices are being collected in the Area Studies Survey project. These data will enable a better understanding of how farmer decisions affect resource quality and onfarm profitability.

Research and Development Activities

The Agricultural Research Service (ARS) and the Cooperative State Research Service (CSRS) are studying the scientific principles upon which good natural resource management is built. ARS funded 62 research projects at 26 locations in 1990-93, while CSRS awarded 199 competitively selected projects (table 6.5.1). Research grants have been awarded for studies involving the fate and transport of contaminants within surface and groundwater systems, sampling and testing methods, and management and remediation practices. New technologies made available for immediate application include easier-to-use, precise, and practical techniques for chemical and soil characterization, the use of orchardgrass to trap nitrogen from dairy manure, new nitrogen tests for increasing nutrient efficiency, and the use of subsurface drip irrigation for increasing water use efficiency.

The Midwest Initiative on Water Quality Systems is evaluating the environmental and economic performance of corn and soybean production systems in Management Systems Evaluation Areas (MSEA's). These are farm-, field-, and watershed-size test sites in Iowa, Minnesota, Missouri, Nebraska, and Ohio. The MSEA's have installed state-of-the-art field equipment to determine the effects of various crop management systems on water quality. Modified cropping systems specifically suited to the soil, geology, climate, irrigation, nitrogen, and pesticide needs are being tested. Soil and water tests are providing valuable data concerning the fate and transport of agricultural chemicals within the environment.

Educational, Technical, and Financial Assistance

Educational, technical, and financial assistance activities help farmers and ranchers in applying improved production practices based on available techniques and new practices and systems developed through the research and development component of the WQP. Adoption of practices is encouraged and accelerated where existing potential contamination of water resources from agricultural nonpoint sources has been identified as a public concern. By 1994, the WQP had extended assistance to farmers and landowners in over 400 selected project areas in all States but Nevada (fig. 6.5.1). The Soil Conservation Service (SCS), Agricultural Stabilization and Conservation Service (ASCS), and Extension Service (ES) manage these projects. These projects are of four types, each with a slightly different strategy to induce farmers to adopt improved practices.

Demonstration Projects (Demos), 16 in 1994, are primarily educational and technical assistance efforts for showing farmers and ranchers cost-effective

Table 6.5.1—Status of Water Quality Program activities, fiscal 1991-94

Activity	Unit	1991	1992	1993	1994
Educational, technical, and financial assistance activities:					
Demonstration Projects:					
Number of active projects	Number	16	16	16	16
Demonstration farms	Number	135	135	NA	NA
Total USDA funding[1]	Mil. dol.	8.5	8.5	7.7	6.1
Ratio education/technical/financial	Percent	25/54/21	25/54/21	29/60/11	35/65/0
Hydrologic Unit Area projects:					
Number of active projects	Number	74	74	74	74
Total USDA funding	Mil. dol.	31.5	28.1	17.3	14.1
Ratio education/technical/financial	Percent	12/50/38	14/43/43	20/60/11	29/71/0
Water Quality Special Projects:					
Number of annual projects	Number	35	35	2	0
Total USDA funding	Mil. dol.	9.1	9.1	1.1	0
Ratio education/technical/financial	Percent	0/5/95	0/5/95	0/5/95	NA
Water Quality Incentive Projects:					
Number of projects started	Number	0	0[2]	106	71
Project acres	Mil. acre	0	0[2]	4.8	3.8
Total USDA funding	Mil. dol.	0	6.8	15.0	15.0
Regional activities:					
Regional continuing projects	Number	5	5	6	6
Estuaries of National Significance	Number	17	21	21	21
Total USDA funding	Mil. dol.	22.7	23.1	22.1	22.9
Ratio education/technical/financial	Percent	0/61/39	0/62/38	0/63/37	0/64/36
Improved program support:					
ES	Mil. dol.	3.9	4.5	4.5	4.1
SCS	Mil. dol.	7.5	7.6	7.6	7.9
ERS	Mil. dol.	0.5	0.5	0.5	0.4
Research and development activities:					
Management System Evaluation Areas	Number	5	5	5	5
ARS expenditures	Mil. dol.	12.9	15.3	15.3	15.3
CSRS research grants	Mil. dol.	9	9	9	4.5
ERS collaboration	Mil. dol.	0.5	0.5	0.5	0.4
Database development and evaluation activities:					
ERS for agricultural chemical database	Mil. dol.	1.9	1.9	2.3	1.0
ES for chemical database support	Mil. dol.	0.3	0.3	0.3	0.4
National Agricultural Library for information center	Mil. dol.	0.3	0.3	0.3	0.3

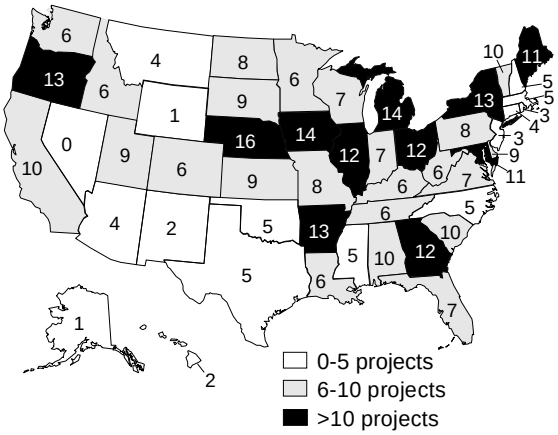
[1]Excludes funds to ERS, which are included under improved program support.

[2]Funds distributed to 49 existing HUA's.

NA = Not available.

Source: USDA, Office of Budget and Program Analysis data.

Figure 6.5.1
Water Quality Program projects, by State, 1990-94



Regional and estuary activities not included.

agricultural production techniques and systems that minimize the movement of pesticides and nutrients into water resources. Elements of these systems include nutrient management, alternative cropping systems, integrated pest management (IPM), alternative pest control strategies, appropriate chemical application and disposal techniques, and integration of weather data into farm decisions.

Hydrologic Unit Area Projects (HUA), 74 in 1994, are watersheds with identified nonpoint-source water quality problems. With financial assistance from ASCS and information and technical assistance from SCS and ES, local landowners apply water quality practices to meet State goals without undue economic hardship. Water quality practices implemented in HUA's are concentrated on nutrient and pesticide management and animal waste utilization. Assistance is also provided to protect wellheads, increase irrigation efficiency, and decrease erosion and sediment delivery to receiving waters.

Water Quality Special Projects (WQSP) extended cost-share assistance to farmers and ranchers for installing approved water quality practices in small watersheds with identified agricultural nonpoint-source problems. Funding was through the Agricultural Conservation Program (ACP). WQSP's were annual projects, although landowners and ASCS could enter into multiyear agreements. No new projects were funded after 1992, with resources being shifted to the Water Quality Incentive Projects.

Water Quality Incentive Projects (WQIP), 177 in 1993-94, are designed to achieve reductions of nonpoint-source agricultural pollutants in an environmentally and economically sound manner. Projects are targeted to small watersheds generally of less than 100,000 acres. Agricultural producers in the project area are provided with the necessary financial assistance required to make changes in management systems to restore or enhance water resources impaired by agricultural sources of pollution. Incentive payments are for management practices such as IPM, not for structural practices requiring construction or earth movement, and are funded through the ACP program. Agreements with landowners are generally for 3 years.

USDA is also helping non-USDA water quality programs by providing technical and financial assistance to the 21 National Estuary Program projects and the 6 regional programs being coordinated by EPA (see module 6.6). Other USDA conservation programs (see modules 6.1-6.4) also contribute to water quality improvement.

Achievements of the Targeted Projects

One component of the WQP is evaluation of the various projects. Progress is assessed through annual reports, surveys, and special studies. Most projects have been in operation for only a few years, so measurable improvements in water quality are not yet apparent. Water quality improvements depend on sufficient watershed acreage under improved management practices and sufficient time for the practices to work and for the pollutants already in the system to be flushed out. Progress is currently being measured in adoption rates of water quality practices in targeted areas and estimated reductions of pollutants. Evaluations will occur throughout the lives of the projects.

Annual reports for the Demos and HUA's indicate that, through 1992, nitrogen management practices had been installed on 1.2 million acres of land. Annual nitrogen reductions averaged almost 73 pounds per acre. Pesticide reductions totaled nearly 1 million pounds active ingredient (AI) on the acreage under treatment in 1992 (table 6.5.2). By 1993, the WQIP's had cost-shared management measures on over 400,000 acres of cropland.

A study of producer involvement in eight Demos is using surveys to track adoption of water quality practices. Preliminary findings suggest that the Demos are successfully conveying to producers information about new practices, although farmers use

many sources for their information and carefully evaluate information before adopting the practice. Financial assistance enhances the adoption process.

SCS evaluated the extent to which 16 projects (8 HUA's and 8 Demos) are improving or protecting water quality. SCS used physical process simulation models to estimate reductions in sediment and agrichemical losses from the practices implemented in the project areas. The models estimated the following load reductions: 64-73 percent reduction in nitrogen percolating below the root zone; 63-66 percent reduction in nitrogen leaving the field in surface runoff; 63-77 percent reduction in phosphorus leaving the field in surface runoff; 91 percent reduction in sediment leaving the field; and 90 percent reduction in pesticides percolating below the root zone.

The Economic Research Service (ERS) conducted an evaluation of five projects (three HUA's and two Demos) and found that opportunities exist for increasing farm profitability by reducing the use of commercial fertilizer, by improving the scheduling of nutrient applications and irrigation, and by applying conservation tillage. However, alternative management systems may yield improvements in water quality only over the long term.

Database Development and Evaluation Activities

USDA's Water Quality Program is funding surveys to collect data on the aggregate levels of agricultural use and composition of pesticides, fertilizers, and related inputs. Agricultural chemical use surveys covering major crops and growing areas were initiated by ERS and the National Agricultural Statistics Service (NASS) in 1990. The Cropping Practices Survey is conducted annually and covers five to seven field crops and the agricultural chemicals applied to those crops. The Vegetable Chemical Use and Economic Survey is conducted semiannually and covers 23 crops. The Fruit and Nuts Chemical Use Survey is conducted semiannually and covers 24 crops. Data gathered include types, application, timing, and amounts of fertilizer, pesticides, and other chemicals. Also, data are obtained on irrigation, cropping, and production practices, and, for a subset of sample points, economic information on the farm unit.

Recently, data gathered with the 1989 Cotton Water Quality Survey (the pilot for the Cropping Practices and Chemical Use Survey) were used to assess the potential water quality problems that may be associated with cotton production (Crutchfield and others, 1992). The study found that targeting pollution prevention programs to areas most vulnerable to chemical contamination is more cost-effective than broad chemical restrictions.

Data from the Chemical Use Survey were also used to study atrazine management (Ribaudo and Bouzaher, 1994). Atrazine, a herbicide used extensively on corn, has been found in some drinking water supplies. Survey data show average application rates dropped from 1.22 lbs/acre in 1990 to 1.12 lbs/acre in 1992, indicating that State and USDA atrazine management programs are contributing to reduced atrazine use.

Area Studies surveys have been conducted in 12 critical water quality areas: Albemarle-Pamlico Drainage, Central Columbia Plateau, Central Nebraska, Iowa-Illinois, Lower Susquehanna Basin, Mississippi Embayment, San Joaquin-Tulare,

Table 6.5.2—Achievements in hydrologic unit area and demonstration projects, FY 1990-92

Conservation technique	Number of producers	Acres	Average reduction
			Pounds/acre
Nitrogen management	14,899	1,204,310	72.6 nitrogen
Phosphorus management	5,658	888,458	133.8 phosphorus
Animal waste management	920	93,353	NA
Pesticide management	5,720	1,190,900	0.8 pesticides
Erosion and sediment control	11,075	1,090,900	NA
Irrigation water management	642	88,769	16.7[1]
Wellhead protection	3,337	4,493[2]	NA

[1] Percent efficiency increase.

[2] Number of practices.

NA = Not available.

Source: USDA, 1993.

Southern Arizona, Southern Georgia, Southern High Plains, Upper Snake River Basin, and White River Basin. ERS and NASS have gathered chemical use and farm practice information to be correlated with soil, land use, water quantity and quality, and other hydrologic data supplied by the U.S. Geological Survey and SCS. These surveys are helping establish the links between production practices and resource characteristics. ERS has published data summaries for eight of the studies (Economic Research Service, 1993-94).

Author: Marc Ribaudo, (202) 501-8387.

References

Crutchfield, S.R, M.O. Ribaudo, L.T. Hansen, and R. Quiroga (1992). *Cotton Production and Water Quality: Economic and Environmental Effects of Pollution Prevention*. AER-664. U.S. Dept. Agr., Econ. Res. Serv., Dec.

Ribaudo, M.O., and A. Bouzaher (1994). *Atrazine: Environmental Characteristics and Economics of Management.* AER-699. U.S. Dept. Agr., Econ. Res. Serv., Sept.

U.S. Department of Agriculture, Economic Research Service. *RTD Updates: Area Studies.* Various issues, 1993-94.

U.S. Department of Agriculture, Soil Conservation Service (1993). *Physical Impacts of Selected USDA Water Quality Practices.* Oct.

_____ (1993a). *Agriculture and Water Quality: Progress Report FY 1990-1992*. Soil Cons. Serv., Agr. Stab. Cons. Serv., and Ext. Serv.

_____ (1993b). *The USDA Water Quality Program Plan (1989).* Working Group on Water Quality, Waterfax. April.