Special Article

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USDA's Water Quality Program: The Lessons Learned

USDA's Water Quality Program (WQP) promotes adoption of alternative management practices by farmers, in an effort to protect the nation's waters from agricultural chemicals and waste products. Established in 1990 under a Presidential initiative, the WQP builds upon past programs—such as the Model Implementation Program of the 1970's and the Rural Clean Water Program and Water Quality Special Projects of the 1980's—to reduce nonpoint-source pollution (pollution that enters waterways over a dispersed area). Farmers who voluntarily participate are provided education, technical assistance, and financial assistance for adopting alternative management practices.

Agricultural production often emits pollutants that affect the quality of water resources and impose costs on water users. In 1994 the Environmental Protection Agency reported that agriculture is the leading source of impairment in surveyed U.S. rivers and lakes, and a major source of impairment to estuaries. Agriculture is also an important source of contaminants in some aquifers. Major agricultural pollutants that have been found in water resources include sediment, nutrients, pesticides, salts (from irrigation) and pathogens (from animal waste).

The WQP has strived to: 1) determine the precise nature of the relationship between agricultural activities and water quality; and 2) develop and induce voluntary adoption of technically and economically effective agrichemical management and agricultural production strategies that protect ground and surface water quality. Out of experience with these programs, 10 lessons have emerged for enhancing the probability that water quality programs will achieve goals in a cost-effective manner.

Lesson 1: Cost-effectiveness is enhanced when program activities are targeted to watersheds where agriculture is the primary source of a water quality impairment, and to critical areas within watersheds.

Maximizing program benefits depends on identifying those watersheds where changing farm management strategies will improve water quality, and where demand for water quality is highest. Watersheds with water quality problems differ greatly in the improvements that can be achieved through changes in agricultural management practices and in the economic benefits of these improvements. When agriculture is not the primary source of pollutants in an impaired watershed, the degree to which agricultural nonpoint-source pollution programs can improve water quality is limited. Point sources (e.g., factories), urban runoff, and even natural sources may predominate.

In some watersheds, the demand for water quality may be very low, due to small population, low economic activity, or an abundance of alternative, high-quality water resources. While water quality may be degraded from the standpoint of aquatic life, scarce program dollars are better spent by first concentrating on those watersheds where economic benefits from improvements are greatest.

Program cost-effectiveness is also enhanced when critical areas for priority treatment within watersheds are identified. Not all farms are the same, differing in topography, soils, management practices, and proximity to water resources. Identifying those critical areas that are likely to contribute disproportionately to a water quality problem greatly increases the effectiveness of assistance.

Identifying critical areas for treatment may be difficult because of the diffuse nature of nonpoint-source pollution. However, local personnel may be able to identify such areas based on knowledge of local production practices and resources. Models can also be used to identify critical areas based on their potential for contributing pollutants to water resources.

Lesson 2: Voluntary programs are likely to be most successful when farmers recognize that agriculture contributes to severe local or on-farm pollution problems such as ground water impairment.

One of the most important tasks of staff involved in WQP is to convince farmers that the water quality problems in the project are real, and that farmers are part of the solution. If farmers are motivated to alter production practices for reasons other than enhanced profits, the set of practices they might be willing to adopt is increased. Farmers who display some degree of stewardship or altruism toward the environment may even be willing to adopt practices that increase risk or decrease profits, as long as

the local environment will benefit and the farms remain financially viable.

Lesson 3: Voluntary programs are likely to be successful when the programs' alternative practices generate higher long-term returns.

The success of voluntary programs depends on whether farmers continue to use new practices after assistance ends—USDA assistance for new practices has typically extended only 1 to 5 years. The condition that remedial practices increase net returns as well as protect the environment limits the set of practices available to address a problem in any project area, and on any farm. The set of practices that fulfills this condition for any particular farmer is frequently unknown by program managers. Among the practices that protect water quality and have been shown to be economically attractive are conservation tillage, nutrient management, irrigation water management, and integrated pest management.

Lesson 4: Programs with flexible financial assistance are more efficient than those with fixed rates and limited lists of supported practices.

The availability of financial assistance is an important part of a successful voluntary program. Even when alternative management practices are profitable, constraints may prevent a farmer from adopting them. Such constraints include increased risk and inexperience with a particular practice, as well as other management factors. Financial assistance in the form of short-term incentive payments covers at least part of the risk of economic losses over the adjustment period, but as offered, does not extend over the long term.

A financial assistance program should be flexible in incentive levels and in the practices eligible for assistance. Ideally, the level of assistance for a practice should reflect the expected environmental benefits. This information is often lacking. An alternative strategy is to set rates at levels sufficient to ensure the adoption of practices believed necessary to meet project goals. This rate would vary among farmers. Cost-effectiveness is enhanced when differences in the financial and risk characteristics of farmers are considered when offering financial assistance. Determination of eligible practices needs to be made at the project level, with an oversight role at the national program level.

Lesson 5: Project success is enhanced when education, technical assistance, and financial assistance are offered in a coordinated fashion.

Projects that offer education, technical assistance, and financial assistance have the best chance of promoting alternative production practices. There are a number of constraints to the adoption of alternative management practices, and not all can be addressed by one type of assistance.

Education and technical assistance can inform producers about new and innovative practices, reduce the cost of obtaining information about practices, and clarify what may be inconsistent and conflicting information about a new practice. Technical assistance also helps provide managerial skill that may be lacking, and enables the producer to handle increasingly complex practices. Financial assistance helps overcome a short planning horizon, allows the farmer to accept greater risk over the short run (during the learning phase), and provides an incentive to try a nontraditional practice.

Not all farmers require the full spectrum of assistance, but it should be made available since project staff cannot determine a priori what types of assistance will be needed. Even when regulations provide the impetus for adopting alternative management practices, education and technical assistance are needed to ensure proper use of the new practices.

Lesson 6: Local research on the economic and physical performance of recommended practices can improve practice adoption.

Farmers are often skeptical of practices that do not have a local history of use. This becomes a problem when new and innovative practices are promoted to address a local water quality problem. Where local experience is lacking, field testing and demonstrations of new practices should be implemented to investigate the local economic, environmental, and agronomic features of promoted practices.

Lesson 7: Interaction with non-USDA agencies and with organizations and local businesses within a watershed is important.

Involving local stakeholders has been a particular strength of WQP projects. Local environmental and resource entities such as soil and water conservation districts, drainage districts, irrigation districts, and natural resource districts may be operating in project areas. These special districts, as well as local business and environmental groups, may have some interest in water quality issues. Involving these stakeholders early in project planning can minimize future conflicts, and may bring in additional resources and expertise.

Lesson 8: More attention to water quality monitoring and project evaluation can help determine the cost-effectiveness of alternative practices and assist in the development of targeting strategies.

Ongoing performance evaluations should be an integral part of every project. Progress assessment can identify problem areas in time for corrective action, and improve targeting criteria for future projects. Water quality monitoring is the most defensible means for evaluating whether a water quality project achieves its goal. An effective monitoring program must establish a baseline of water quality conditions and be maintained long enough to account for lags in the movement of agricultural pollutants and natural fluctuations in weather.

An acceptable alternative to monitoring may be water quality modeling. A number of models have become available that can

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USDA Water Quality Program Components

Demonstration projects—multi-county educational and technical assistance efforts located in regions where agriculture is believed to affect water quality. Sixteen Demonstration Projects, started in 1990 and 1991, exist under WQP.

Hydrologic Unit Area Projects—projects in small watersheds with identified nonpoint-source water quality problems that provide education, technical assistance, and financial assistance to local landowners for applying alternative management and structural practices. Seventy-four HUA's, started in 1990 and 1991, exist under WQP.

Water Quality Special Projects—extended cost-share assistance under WQP to farmers and ranchers for installing approved water quality practices in small watersheds with identified agricultural nonpoint-source problems. WQSP's, started in 1990 and 1991, number 110.

Water Quality Incentive Projects—projects designed to achieve source reductions of nonpoint- source agricultural pollutants in small watersheds with identified water quality problems. Financial assistance is provided for the adoption of alternative management practices. WQIP projects, started in 1993-95, number 242.

Priority Components Research—grants award program supporting research on the scientific principles of good natural resource management. USDA's Agricultural Research Service has funded 62 research projects at 26 locations, while USDA's Cooperative State Research, Education, and Extension Service has awarded 245 competitively selected projects. Research grants have been awarded for studies involving the fate and transport of contaminants within surface and ground water systems, sampling and testing methods, management and remediation practices, and the economics of adoption.

Management Systems Evaluation Areas—farm-, field-, and watershed-level test sites for studying the environmental and economic performance of alternative management practices. 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 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. Five initial MSEA projects—in Iowa, Minnesota, Missouri, Nebraska, and Ohio—were established to study corn-soybean agriculture in the Midwest. Two additional projects—in Mississippi and North Carolina—have been started to study cotton and animal agriculture.

predict pollutant loadings at the watershed level. Models are useful when prolonged lags in observable water quality improvements are expected. In addition, models can be used to identify critical areas within watersheds and to establish project implementation goals. A drawback is that models must be carefully calibrated to local conditions.

In addition to water quality monitoring, an effective mechanism must be implemented for tracking changes in crop management in the project area. Such information enables interim assessments of whether program goals are being achieved, and where and what types of additional assistance might be needed. As with water quality, a land management baseline must be established. In order to properly evaluate what is happening in a watershed, it is also necessary to track management changes on those fields not receiving assistance.

Lesson 9: Water quality programs need a long-term focus.

Adequate resources must be made available for an extended period of time to ensure successful completion of a project. The physical processes that connect on-field management changes to downstream changes in water quality also may take years, and even decades. The adoption process, from first learning about a practice through implementation, can take years; while assistance is designed to speed up this process, overall progress can still be slow.

Water quality monitoring should be maintained beyond the time assistance ends, and realistic expectations should be set as to when observed improvements in water quality are likely. Adequate time must also be set aside for pre-implementation planning, including establishment of baselines and conducting field research on the performance characteristics of alternative practices. WQP projects were set up as 5-year projects. This period was found to be inadequate, and most projects have been extended for an additional 3 years.

Lesson 10: Voluntary programs are enhanced if backed by firm but flexible regulations.

While regulations may be considered onerous by many in the farm community, regulations can play an important role in promoting alternative production practices without placing overly

burdensome costs on farmers. Voluntary approaches supported by regulatory authority may be the most effective means of reducing pollution from agricultural sources. Regulations clarify goals and provide impetus for farmers to search for alternatives that may in fact maintain or even enhance net returns. Farmers may even favor regulations that recognize the efforts of conscientious producers and punish "bad actors."

Future Programs Build on Past Lessons

The lessons of the WQP and past USDA water quality programs provide important guidance for future programs. The new Environmental Quality Incentive Program (EQIP) that was established in the Federal Agriculture Improvement and Reform Act of 1996 (Farm Act) will continue the course set by USDA's Water Quality Program. The 1996 Farm Act authorizes a multi-year USDA commitment to provide education and technical and financial assistance in targeted watersheds to address water quality and other resource concerns. Many of the recommendations outlined above were incorporated in the enabling legislation, including targeting, increased and flexible financial assistance, a full range of education and technical and financial assistance, and an emphasis on evaluation and cost-effectiveness.

The experience and knowledge from the WQP will improve the performance of projects based on voluntary adoption of alternative management practices such as EQIP. While the voluntary approach probably cannot by itself achieve all national water quality objectives, it can be a valuable tool to state and Federal water quality protection programs.

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