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IMPROVING THE EFFICIENCY AND EFFECTIVENESS OF AGRI-ENVIRONMENTAL POLICIES FOR THE CHESAPEAKE BAY

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The Chesapeake Bay is North America's largest and most biologically diverse estuary. Its watershed is home to more than 17 million people. For over 200 years it provided a rich bounty of crabs, shellfish, and fish, and high quality recreational opportunities. However, as the region's population grew and land was converted from forests to farms and to urban development, the quality of the Bay's waters declined, along with its living resources. Significant reductions in polluting discharges from sewage treatment plants, factories, and other point sources of pollution have been achieved in the Bay watershed since the 1970s. But these reductions have not been enough to meet established water quality goals because point sources are only part of the problem. Nonpoint sources, especially agricultural nonpoint sources, are a major source of the nutrients and sediments degrading the Bay.

The history of efforts to restore the ecosystem of the Chesapeake Bay is emblematic of the failure to solve the agricultural nonpoint source (NPS) problem. The Bay has been a focal point of federal and state initiatives to reduce nutrient pollution from agriculture and other sources. Beginning in 1983, there have been several agreements between the U.S. Environmental Protection Agency (EPA), the Governors of Maryland, Pennsylvania, Virginia, West Virginia, Delaware, and New York, and the Mayor of the District of Columbia that established the Chesapeake Bay Program, set nutrient reduction goals, and developed strategies for nutrient reduction. U.S. Department of Agriculture (USDA) conservation programs have made large public investments in improving the management of agricultural resources and reducing agriculture's negative impact on environmental quality. Additional investments have come from EPA programs, for example the Sec. 208 and 319 funds, and from the watershed states. Yet, the problems remain—largely due to limited success in implementing policies that effectively reduce environmental stress from agricultural nonpoint sources of pollution.

The limited progress has led the EPA to establish a Total Maximum Daily Load (TMDL) for the Bay. The TMDL calls for reductions in nitrogen (25%), phosphorus (24%) and sediment (20%) in the Bay watershed. The states were required to develop Watershed Implementation Plans (WIPs) for achieving load reductions from agriculture and other sources. Although there are some exceptions, the WIPs largely call for ramping up traditional policy approaches rather than for innovations to improve the effectiveness and efficiency of the mosaic of federal and state programs. The core elements of the traditional approaches are voluntary adoption of pollution control practices with financial support from federal, and to a lesser degree, state cost-sharing. We believe innovations are imperative for achieving water quality improvements and to do so in ways that are compatible with other societal goals. We present a menu of options for federal and state programs.

What Is the Problem?

Two basic issues must be addressed if water quality goals are to be achieved. First, the regional nutrient budget is out of balance: more nutrients, primarily in the form of animal feed, are being brought into the watershed than can be assimilated, in the form of manure, by the crops grown. Second, not enough farmers are using the most effective—best—nutrient management practices. The persistence of these problems is not entirely due to a lack of resources. In the Bay, as elsewhere in the United States, water quality protection in agriculture has largely been pursued through voluntary strategies, supported by government financial and technical assistance. Only recently have large animal intensive enterprises been subjected to National Pollutant Discharge Elimination System (NPDES) permit requirements, thereby applying to only a small part of the population of farms. States in the Bay region have had nutrient planning requirements, but historically these have represented a very light form of regulation, with little monitoring and enforcement (USEPA, USDA, 2006).

Progress will require the implementation of programs that lead to increased effort on a much larger number of farms. But given the multiplicity of societal interests related to agriculture and the environment, new initiatives must be more effective than the old. An important goal is the preservation of a vibrant agriculture in the region. This is an established policy goal of the states in the Bay watershed and an expressed priority in the Obama Executive Order on the Bay (White House). It implies the need for instruments that minimize any economic harm to agriculture. Providing farmers with financial assistance for pollution control is consistent with the goal, but the capacity to follow this strategy is likely to become increasingly constrained in the near to medium term due to tight federal and state budgets. Consequently, it is essential that the future mix of policy instruments emphasize cost-effectiveness in pollution abatement; efficiency in the use of public resources for monitoring and enforcement; and, to the extent that these remain mainstays in agricultural nonpoint programs, efficient technical and financial assistance.

There are several characteristics that are conducive to cost-effective pollution abatement. An instrument should have low transactions costs, be durable but flexible, lead those who can reduce pollution at the lowest unit cost to abate the most, and facilitate innovation. Environmental quality in agriculture presents a difficult management problem because of spatial heterogeneity and temporal variability in production conditions relevant to compliance costs and environmental impact. Pollution from farms is highly variable, unpredictable, and for all practical purposes, unobservable. Technological and management innovations in agriculture are rapid and adaptation is essential for economic success, so a policy should not place unnecessary constraints on farmers' actions.

The USDA administers a number of programs to help farmers reduce polluted run-off from farms. The largest is the Environmental Quality Incentives Program (EQIP). EQIP provides financial and technical assistance to farmers for the adoption of specific management practices that protect water resources. Annual funding nationally is currently about $1.2 billion. From 1997 through to 2002, 37% of EQIP funds were spent on water quality and water conservation-related practices; another 28% were spent on managing livestock manure, which is a major source of water pollution (USDA, ERS, 2006).

For a voluntary program to be efficient, it must enroll farmers who can provide abatement at least cost. Current USDA cost-share programs are not designed to do this. Whether a farmer participates and what practices are adopted are the result of a private decision calculus based on perceived private benefits. Since a practice-based cost-share does not take into account the level of pollution abatement provided, private benefits may have a low correlation with downstream water quality outcomes. The consequence is that the use of measures for improving water quality is limited to farmers and practices for which the combination of private benefits and incentive payments is sufficiently large enough to make adoption economically rational. It is improbable that the set of farmers and practices will be optimal for achieving water quality gains at least cost. Indeed, if farms with low pollution control costs or high water quality impacts are not in the set of adopters, the pattern of adoption limits water quality gains and increases the costs of those actually realized. The status-quo approach also requires continuing public and political willingness to foot the bill, which currently appears to be in doubt.

A factor that strains conservation program budgets and diminishes the return on public investment in pollution control is the distortionary effect of nonenvironmental agricultural policies. There is ample evidence that price supports, input subsidies, crop insurance, and other agricultural policies influence the nature, size and spatial distribution of agricultural externalities through effects on the scale and location of input usage and production structure. The best known recent example is the current policy to promote ethanol production, most of which is based on corn. A combination of tax rebates, blending mandates and import protection has boosted corn prices and expanded crop production on sensitive lands (Westcott, 2007). Higher crop prices increase the opportunity costs of participating in the Conservation Reserve Program, leading farmers to seek to opt out, and increasing the public expenditures required to achieve conservation goals.

Improving the System

The effectiveness of current conservation programs based on financial assistance can be improved through better targeting. However, this does not address the underlying shortcoming of a technology-based cost-share approach. Getting enough of the "right" farmers to adopt the "right" practices in the "right" places will require much higher payment rates; rates that are not constrained by practice costs. This would substantially increase program costs, and raise the question of whether it is appropriate to "pay the polluter" when a "polluter pays" approach is applied to other sectors of the economy. Alternative approaches that have been applied in other economic sectors deserve a look.

Pay for Performance

Performance-based instruments generally provide pollution control at a lower cost than technology-based instruments, as long as performance can be measured at a low cost. The complex pathways and temporal variability

of nonpoint pollution have been major barriers to performance measurement in agriculture. However, the continuing development of models for estimating changes in field losses provides an opportunity to give pay-for-performance a try. Such models are now considered acceptable by several states and by the EPA for determining the number of "goods" that can be bought and sold in regulation-driven water quality trading markets in the Bay watershed and elsewhere. Such models could be used in a pay-for-performance program.

Paying farmers for abatement would encourage those who can provide it at least cost to enroll in voluntary programs. Payments would not be limited by cost and would be paid for as long as abatement occurs, which make them more financially attractive than traditional cost shares. A drawback is the equity question: should taxpayers foot the bill? A compromise approach would be to establish a minimum performance baseline. Payments would be based on abatement achieved through practices that are implemented after baseline requirements are met. The states in the Bay watersheds have all used the TMDL to define minimum levels of performance in terms of best management practices employed, such as conservation tillage and nutrient management.

Expanded Conservation Compliance

Conservation compliance provisions require farmers to meet a minimum standard of environmental protection on environmentally sensitive land as a condition for eligibility for many federal farm program benefits, including conservation and commodity program payments. Compliance requirements are currently in place to protect highly erodible land and to prevent the draining of wetlands. Extending compliance to nutrient management by making program benefits contingent on following an approved nutrient management plan would provide an incentive to adopt best management practices (BMP) without imposing a burden on taxpayers. Compliance can be effective when those who receive the largest payments use the most polluting inputs—nitrogen, for example, and when the program benefits are greater than the cost of adopting best management practices. Data suggest that this is the case for fertilizers applied to cropland, particularly corn. However, the effectiveness of compliance is unpredictable, as total government payments can fluctuate with crop prices and disasters such as drought. Given the prospects of continued high crop prices and of reduced commodity program benefits due to budget concerns, mechanisms other than compliance provisions are probably needed.

Regulation

Water quality regulation has rarely been applied to agriculture in the United States. Currently, animal feeding operations designated as concentrated animal feeding operations (CAFOs) are subject to the permit requirements of the Clean Water Act. Regulated CAFOs—a small percentage of all animal feeding operations—are required to have a nutrient management plan that addresses the storage of manure and its application to land. A plan sets a limit on the amount of nutrients that can be applied per acre, and specifies erosion control measures to prevent the loss of sediment and nutrients. CAFOs that are not required to have an NPDES permit, but wish to claim the Clean Water Act's storm water exemption for runoff from fields, must develop and implement a nutrient management plan to demonstrate that due care is being taken to minimize polluted runoff from manure spread on fields. If a waterway becomes polluted with animal waste from field runoff and a CAFO does not have a nutrient plan the farm would be in violation of the Clean Water Act. Of course, strong enforcement, or at least the expectation of strong enforcement, is necessary for this approach to work.

It is technically possible to apply a similar regulation to all farms. The Watershed Implementation Plans of the Bay States indicate that certain BMPs, such as cover crops and nutrient management plans, would be mandatory if sufficient progress is not being made with voluntary approaches. While mandating required technology is often viewed to be inflexible, a nutrient management plan is actually a very flexible tool, since it can be tailored to each operation. How effective the approach would be is questionable, however, since following a nutrient management plan does not guarantee that the desired environmental outcome will actually occur. The burden is on regulatory authorities to specify required practices that achieve environmental goals at least cost.

Compliance Rewards

Designing and enforcing economically and environmentally sound regulation for agriculture poses large challenges because of the spatial heterogeneity of agriculture production and its relation to the environment, the intra-annual temporal variability of agricultural production, and the large number of farms that an agency would have to contend with in permitting and enforcing regulations. While extensive regulation might be impractical, an effective use of limited funds could be to provide compliance rewards for farmers whose operations are inspected and found to be meeting or exceeding established standards of environmental protection on environmentally sensitive land. For this approach to work there would need to be a finite probability that a farm will actually be inspected. Effectiveness is likely to increase if penalties are applied to farms that are found to be in violation of established standards when

inspected. Compliance rewards need not be solely financial. Many organizations use public recognition for high levels of performance—and sometimes the same approach for nonperformers—to increase the productivity of their staff. The same could apply to performance under environmental programs.

Water Quality Trading

Regulations are most often applied to industrial and municipal point sources that are required to have a discharge permit under the Clean Water Act. The programs have been demonstrably inefficient. Trading programs have been developed recently in several of the Bay States and elsewhere in the United States, with a key objective of increasing the economic efficiency of pollution control by allowing sources subject to NPDES permits to trade abatement with each other and with nonpoint sources. From a farmer's viewpoint, trading is very similar to a pay-for-performance approach, the major difference being the source of payments. The track record for point/nonpoint trading programs is not encouraging. There have been a few successes, such as the South Nation River trading program in Ontario, Canada, but experiments to date are more often characterized by limited participation and trading activity. Market design issues, the characteristics of nonpoint source pollution, and farmer reluctance to enter into contacts in a regulatory-driven program have limited the number of offset trades that have actually occurred. It is an open question whether the apparently high transactions costs of point/nonpoint trading will ever allow it to become a major component of pollution abatement policy. Pennsylvania and other Bay States' trading programs are key tests of the potential of trading to improve the efficiency of water pollution control. Agencies developing water quality trading programs have focused on rules to assure environmental compliance. Essential to the success of water quality trading will be investments in the development of the markets and market institutions to reduce transactions costs and reduce perceived risks to participants.

Moving from the partially capped to a fully capped trading model that includes nonpoint sources would be one way of stimulating both farmer interest and innovations in tools or program designs that reduce transactions costs. This extension would, however, entail many of the public sector transactions costs that make extensive technology-based regulations unattractive for agriculture. It would also test the limits of political and legal acceptability of models used for estimating agricultural emissions.

Manure Markets

Another potential role for markets in the Bay region is to improve the regional nutrient balance. Specifically, manure markets could be used to incentivize a redistribution of manure from surplus to deficit locations. This mechanism has been demonstrated in the Netherlands and has been receiving attention in the Bay watershed. Demand exists for manure and manure by-products in nutrient deficit parts of the watershed, but the economic value of manure to recipients relative to the cost of hauling currently limits the geographic scope of markets. Like water quality markets, the development of effective manure markets would require regulatory drivers—restrictions on the application of surplus nutrients—and public investments in market development.

Taxes

Input taxes have several desirable features as a policy tool, and have been used to manage agri-environmental problems in several European countries. They have low public and private transactions costs. Input taxes induce innovation and encourage farmers to manage input use more carefully. Input taxes also generate revenue that can be used to offset the costs of providing targeted incentives for improving environmental performance to farmers. However, environmental taxes of any type carry considerable political baggage that makes them an unlikely tool in this country for the foreseeable future. Since the tax is on an input, the actual environmental outcome is also uncertain. Performance would be improved if environmental performance could be taxed, but this greatly increases transactions costs.

Where Do We Go From Here?

Meeting the water quality goals laid out by the Bay TMDL will require greater effort than to date. More financial resources for conservation programs and improved targeting will help, but that will probably not be enough. State and federal water quality managers need additional tools to see the Bay program through.

Some type of pay-for-performance approach may be the easiest to implement, possibly as a pilot program. Modeling tools currently being used in water quality trading programs could be used to estimate farm-level abatement, and appropriate payments made. The potential for enhanced incomes should provide a greater incentive to farmers than traditional cost shares. If successful, federal conservation programs could move in this direction.

One step that states could take to influence farmer decision-making is to put in place credible backstop regulations. Regulations on fertilizer use or management practices would be implemented only if voluntary approaches fail to produce the desired outcomes. A “safe harbor” provision that protects farmers from future regulations if appropriate management practices are adopted would be an added incentive.

State and federal governments can work together to remove bureaucratic barriers that hinder cost-effective approaches. For example, EPA and the states could agree on a standardized baseline for water quality trading. This could open the door for trading between states, which could increase the volume of trades and improve market efficiency. As it stands now, different baseline rules are a major obstacle to interstate trades.

Another area where a regional solution could provide a big payoff is the disposition of animal waste. A coordinated effort to move manure to areas within and outside the watershed where it can be safely applied to the land would likely be less costly than letting each animal operation deal with the problem independently. In addition, finding other uses for manure, such as energy production, would improve the overall nutrient balance of the watershed and reduce the pressure on all other pollution sources. Ideally, markets in these areas would develop that would not need taxpayer support, but in the interim the benefits of public involvement might be worth the cost.

For More Information

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