DISCUSSION: NON-POINT SOURCE POLLUTION ABATEMENT—POTENTIAL IMPACT AND RESEARCH NEEDS

Wesley N. Musser

Hurt and Reinschmiedt have reviewed current non-point source water pollution policy, considered the potential impact on Southern agriculture, and presented some directions for future research. Their general conclusions include: (1) information upon which to base non-point source water pollution policy for agriculture is severely deficient, (2) implementation of pollution policy for agriculture will cause a severe economic impact on agriculture in the South, and (3) research is needed to develop farming systems that will reduce agricultural pollution while maintaining farm income. Their broad overview of this policy area is helpful for Southern agricultural economists because more public interest in these policy questions will undoubtedly arise as the 1983 and 1985 targets for achieving the goals of PL92-500 approach, and especially because research in this policy area in the South has been limited.

As a guide for future research on non-point source water pollution, their presentation does have deficiencies. Consideration of non-point source pollution policy in terms of general concepts of political economy and natural resource economics provides a broader and different viewpoint on this policy area. Concepts of political economy are helpful in developing an understanding of the emergence and evolution of non-point source pollution policy. Such questions as, "Why a national pollution policy?", "Why an agricultural pollution policy?", "Why the particular program form?", and "What are the expected impacts?" are in the realm of the theory of political economy. Consideration of such questions is particularly helpful in devising research on the impact of pollution policy.

EMERGENCE OF A NATIONAL POLLUTION POLICY

The need for a government pollution policy is readily demonstrated by the concept of externality. The relevance of this concept for pollution policy has been discussed extensively in the literature—for example, [14] and [20]. The presence of externalities from pollution implies that government policies to control pollution will provide benefits to the general populace. Hurt and Reinschmiedt did not emphasize these benefits as much as the costs of the policies to farmers and consumers. In interpreting costs of pollution abatement, one must consider the potential benefits—a judgment that costs are unacceptable can be made only in relation to the level of benefits.

Though helpful in understanding the basis for pollution policy in a market system, the existence of externalities is not sufficient to explain the recent emergence of environmental policy. Pollution has been present throughout human history. For example, the horse manure in city streets before automobiles was an analogue to the current air pollution from exhaust fumes. More specifically related to non-point source pollution is the reduction in cultivated cropland since the 1930s in the nation and particularly in some Southern states [17], which has undoubtedly reduced erosion and probably sedimentation. Though some authors [8] argue that pollution has worsened because of the use of more synthetic inputs and the concentration of populations in urban areas, this judgment is subject to controversy.

Downs [7] proposed an alternative hypothesis that seems more reasonable. His viewpoint is that environmental quality is a highly superior good, and that pollution became a political issue only when economic development reached recent levels. A worsening level of pollution is not necessary for this proposition to hold. However, if environmental quality is a superior good and has worsened, the case for the emergence of pollution policy is strengthened. More importantly, both propositions suggest that pollution policy is not a passing political fad, but a political development that is consistent with the level of national economic development. For persons considering beginning research in agricultural pol-

Wesley N. Musser is Associate Professor, Department of Agricultural Economics, University of Georgia.

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lution, this viewpoint suggests that the topic will be of interest in the future.

THE AGRICULTURAL COMPONENT OF POLLUTION POLICY

The inclusion of a non-point source pollution policy as a component of national pollution policy is consistent with recent rural policy evolution. As documented by Fuller [11] and Musser [16], the recent inclusion of farm populations in social and labor policy was an important reversal of precedents of the New Deal. The inclusion of a program component for non-point source pollution in PL92-500, which mostly relates to agriculture and forestry, is consistent with these trends in other policy areas. The declining political power of agriculture, documented by Hathaway [12], Bonnen [3], and Paarlberg [20], accounts for the reversal of the New Deal precedent.

This change in the policy environment affects the nature of the research in agricultural pollution. As Bonnen [3] emphasized, agricultural leaders may continue to subscribe to agrarian fundamentalism even though it is inconsistent with the current *realpolitik*. When agricultural economists continue to assume implicitly that what is good for agriculture is good for the nation despite the decline in power of agricultural groups, they can be included in Bonnen's indictment. When agricultural firms have to adjust their farm organization to comply with federal pollution law, the temptation to adopt an agrarian fundamentalist viewpoint in research in this area will be great. However, maintenance of scientific credibility with ever broadening constituencies requires a perspective on agricultural pollution policy encompassing more than agricultural interest. Hurt and Reinschmiedt at times fail to maintain this perspective. For example, the conclusion that reducing erosion to tolerance levels would have an unacceptable economic impact on agriculture in Mississippi and the recommendation that research focus on practices that maintain farm income while improving water quality implicitly assume that the benefits of reduced pollution could never justify reduction in net farm income. A methodological view more in accord with modern policy analysis is that these propositions are political rather than scientific and should be confined to the appropriate sphere.

PROGRAM FORM IN NON-POINT SOURCE POLLUTION POLICY

The standard welfare economics perspective is that pollution taxes or effluent charges are the most efficient program form for pollution policy [2, 13, 15, 25]. However, current policy is structured with a combination of regulations and subsidies with an emphasis on erosion control practices for agriculture. Two concepts of political economy provide hypotheses about this divergence between practice and theory. First, the theory that the benefits of alternative programs to important groups in society predict outcomes in the political process supports the regulation form for pollution policy. Environmental groups, which have articulated the goals expressed in PL92-500, desire an end to all pollution and interpret the effluent charges as a license to pollute; in addition, the necessary errors in determination of the appropriate tax for each water body would allow pollution to continue in the short run. As one example, Zwick [29] argues that strong standards are a sure, immediate method of obtaining pollution control. Businesses, which will bear the costs of pollution control at least in the short run, can also be considered to favor standards. Buchanan and Tullock [5] argue that the increase in price resulting from direct or indirect output restrictions associated with controls can produce increases in revenues in comparison with cost increases associated with taxes. Because an inelastic demand is necessary for this argument to hold, it is particularly relevant for agriculture. From a more dynamic perspective, businesses also probably recognize that the administrative record of past regulation procedures will preclude enforcement of standards in such a manner as to cause significant losses to business [10]. Though this benefit-cost calculus results in an interesting political coalition supporting standards, the coalition could be very unstable as it is based on different perspectives as to the enforcement of standards.

The other political economic concept that supports standards is disjointed incrementalism [4, 22]. This viewpoint of the policy process emphasizes lack of information on social production functions and public objectives in the policy process. One method of managing this uncertainty involves linking new policies and programs to past experiences. The use of standards and subsidies in current pollution policy is therefore not surprising because previous federal activity in water pollution emphasized standards and subsidies for municipal sewage treatment. With respect to agricultural non-point pollution, the emphasis on best management practices is also consistent with incremental policy development. This program emphasis directly links water quality with the past program experience in soil conservation.

The concept of incrementalism is particularly reassuring when the lack of information about non-point pollution is considered. The lack of information which Hurt and Reinschmiedt discuss is common in a new policy thrust. Until new policies are begun, few incentives for research are available. When one examines this lack of knowledge, it is obvious that agricultural scientists, including agricultural economists, have placed little emphasis on research on water quality linkages with agriculture. However, new public support, including funds, is now available to generate knowledge that can be used in refining current policy. An indication of the public commitment to further policy development in agricultural non-point source pollution is found in the Soil and Water Conservation Act of 1977 (PL95-192) which requires the Soil Conservation Service to develop an appraisal of resources and problems and a program to accomplish the goals of the agency. These reports will provide needed information for future direction in this policy area.

POTENTIAL IMPACT ON AGRICULTURE

As discussed in the preceding section, standards potentially could increase returns in agriculture as a whole. The direct restriction of output by quotas or the indirect restriction of output due to the cost-increasing features of pollution control would be expected to lead to increased prices of agricultural output. Whether these price increases would be sufficient to compensate for the cost increases is an empirical question. Currently, the evidence is mixed. Taylor and Frohberg [25] found that producer surplus increased with pollution standards. However, Osteen and Seitz [19] recently reported the opposite result with an adaptation of the model used in the earlier research. The aggregate effect is therefore still uncertain. Hurt and Reinschmiedt's point that the adjustment toward this new equilibrium can result in reduced profits for some farm firms and areas is important. Evidence on this question is even more sparse—Osteen and Seitz [19] evaluated the impact of differential adoption of standards between Illinois and the rest of the Cornbelt and found little difference with the long-run solution with uniform standards. However, this analysis is probably also too aggregate for the structural questions raised by Hurt and Reinschmiedt. In the study of the firm-level adjustments to water quality restrictions, the rich experience with studies of firm adjustments to new technology and government commodity programs suggests that the aggregate effects are important and ultimately must be considered. Besides the previously noted impact on product prices, previous firm-level adjustment studies have abstracted from aggregate impacts on input prices and balances on intermediate commodities such as feeder cattle [23, 28]. These aggregate problems led Nix, Martin, and Hubbard [18] to recommend an aggregate model with disaggregated structural components.

In addition to aggregate effects, the firm studies in Mississippi undoubtedly are also biased by exclusion of technology now being developed in response to environmental policy. This propensity for economic analysis not to recognize the technological change that will be induced by economic and political change is nearly as old as the discipline of economics. Barnett and Morse [1] traced this tendency from the theories of Malthus to current times as a major weakness in viewpoints on natural resource economics. A recent example is provided by past analysis of pesticide restrictions. An economic analysis of pesticide use in 1966, which was released in 1970, noted that there were no substitutes for part of the toxaphene and DDT used on cotton or for part of the aldrin and heptachlor used on corn in 1966 [6, pp. 12, 15]. However, the 1976 Survey of Pesticide Used by Farmers found that toxaphene was the only one of these four that was a major chemical used on corn and cotton [9, p. 18].

Though forecasting the advance of technological change is a hazardous exercise, using only currently accepted practices appears overly conservative. At the minimum, monitoring of current research of other agricultural scientists whose experiments concern the interface between production and environmental quality provides information on emerging technology. An example of this process is evident in some recent research at the University of Georgia. Reduced tillage is a promising practice at least for sediment control. In addition, Osteen and Seitz [19] found it a profit maximizing practice without environmental controls. Development of this practice in the Southeast is probably lagging that in the Cornbelt; however, more interest is currently being expressed [26]. In a recent study, Smathers et al. [24] used such experimental information in a firm study of a Georgia Piedmont farm with 300 acres of cropland. Though reduced tillage was not profit maximizing, reduction of sediment delivery 50 percent below the unconstrained solution was possible by these new methods with a reduction in net farm income from $25,545 to $25,275; further reduction to 90 percent of the base solution caused net income to drop only to $23,115. Because the reduced tillage methods also reduce runoff, the nitrogen, herbicide, and insecticide delivered also decreased [24]. These results indicate a much smaller impact of pollution policy on agriculture than was shown by the Mississippi studies.

Hurt and Reinschmiedt's conclusion about necessity to change management practices on much of the land in Mississippi can probably be generalized over much of the South. Data collected in a study by White et al. [27] indicated that conventional tillage practices would allow meeting the five ton per acre restriction on only 17 of the 60 major soil resource groups used for crop production in Georgia. However, the combination of induced technology change, federal cost subsidies, and increases in crop prices will have a questionable effect on net farm income and changes in farm structure. At the minimum, a reasonable hypothesis is that these impacts on agriculture will be much less than the past impacts of technological change and government commodity programs. Finally, it must be stressed again that these impacts can be associated with benefits of reduced water pollution, much as earlier structural impacts were associated with reduction in consumer food costs.

IMPLICATIONS FOR FUTURE RESEARCH

In summary, this discussion supports the proposition that much research is needed on the non-point source water pollution policy for agriculture. However, the current lack of knowledge is not atypical for an emerging policy area. In approaching research in this area, one must take a positive scientific viewpoint rather than an agricultural advocacy position. This position may not involve altering current research approaches. For example, the research on Mississippi agriculture undoubtedly reflected sound economic analysis. Only the discussion of the studies' implications included normative propositions that were not based on economic analysis.

For specific research topics, empirical evaluation of the political economic hypotheses presented in this discussion has a high priority. Consideration of the evolution of current policy and particularly the likelihood of enforcement of the current standards is necessary as a framework for future analysis. Resolution of the contradictory results on aggregate impact of pollution policy also has a high priority; this research needs to be extended to commodities other than corn and soybeans. Some of the implications for research of Hurt and Reinschmiedt can also be endorsed. Certainly, research knowledge of the linkage between agriculture and water quality and of the benefits of alternative levels of water quality would allow improved public decisions on water quality standards for agriculture. Magnitude of alternative benefits, such as reduction in water treatment costs, increased reservoir life, and improved recreation quality, has had even less emphasis than the costs of water quality improvement and warrants examination. Research on the incidence of the cost of non-point source water pollution policy on different segments of agriculture would be helpful in assessing equity issues of alternative policies. In addition, interdisciplinary research is needed to develop new non-point pollution control technology that has a lower cost than current practices.

The merit of the optimal firm enterprise organization methodology for research in this area can be questioned. Though these studies do indicate the reorganization necessary to meet pollution restrictions at current prices, the failure to reflect supply response impacts on prices can lead to both less than optimal farm organizations and grossly misleading impacts on net farm income. Because of these deficiencies, a major emphasis on firm adjustment studies across the South is not warranted. At the minimum, the sensitivity of the solutions to price changes likely to be generated from the changes in level of production should be evaluated. In general, aggregate models, which consider the effects of supply response on prices, are the preferred method.

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