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■ Non-agricultural groups are increasingly challenging agriculture as a polluter of the environment. Policy responses to findings that groundwater in some cases is contaminated with farm chemicals demonstrate that there are limits to good will towards farmers. Society is prepared to socially control the use of agricultural technology if necessary in order to protect the environment as well as the safety of food and water. In turn, agricultural leaders and scientists are increasingly expected to give priority attention to research issues and approaches that will enhance the quality of the environment. They can no longer give exclusive attention to ways to make agriculture more "efficient" and more productive of food and fiber.

■ THERE IS A STRONG PUBLIC COMMITMENT TO THE welfare of American farmers. Increasingly, however, there is also public recognition that impacts of agricultural science and policy on farm labor employment, the environment, the structure of agriculture, and rural communities are negative and, in some cases, severe.

A major development in recent years is for non-agricultural groups to point to agriculture as the source of problems that affect them. Agricultural issues are on the agenda of groups concerned about "cancer," "clean water," and "food nutrition." Consequently, farmers and ranchers increasingly face a new set of socially imposed, socially sanctioned constraints on their activities: how they use the land and water and how they manage hired labor.

The new perceptions of agriculture as the problem mean that institutional change is inevitable on farms and in producer organizations, processing plants, universities, and government offices. There are many examples of the changing public attitudes toward agriculture—and the subsequent implications for changing institutions—that can be provided. One of the most illustrative, however, is that of groundwater management.

The targeting of agriculture as the cause of social problems is partially due to the great successes of agricultural science, agribusiness and producers. An abundant food supply is now assumed—the mission is accomplished.

The public increasingly perceives that groundwater is being contaminated by agricultural chemicals. In turn, they insist on instituting changes in groundwater management involving new constraints on farmers' decisions. These responses indicate that the rules for agriculture can change and that farmers' will have to adjust in order to assure safe drinking water.

Agriculture As The Problem

The Case of Groundwater Contamination

by Sandra S. Batie

Agriculture and Chemicals: A Brief History

Public doubt about the wisdom of widespread chemical use dates from 1962 when Rachel Carson published her book, *Silent Spring*. This book alerted many Americans to problems associated with widespread use of chemicals. The expansion in chemical use accelerated in the 1960s and 1970s. U.S. farmers went from hoes to herbicides in less than four decades. Between 1964 and 1985, farmers' use of pesticides more than tripled. In this time the use of nitrogen fertilizer increased to 10 million metric tons per year. Today over 91 percent of the U.S. row crop acreage and 44 percent of the U.S. small grain crop acreage have herbicides applied annually.

Increasingly, agricultural chemicals are indicted as possible human health risks, as catalysts in the evolution of pesticide resistant plants and insects, as destroyers of non-targeted species, and as creators of new pest infestations. Despite some university activities to assure safer handling and application of chemicals, the initial Land Grant-USDA system response to aroused public concerns was, in the main, denial and neglect.

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Even though Carson's book focused media and public attention in the 1960s on widespread chemical use, substantial attention to groundwater concerns did not appear until the late 1970s. It was then that scientists discovered that what had become normal agricultural use of chemicals was causing groundwater contamination. The 1979 discovery of aldicarb in the groundwater in Suffolk County, New York, caused many states to begin monitoring groundwater. Evidence that agricultural pesticides and fertilizers are contaminating groundwater has been accumulating rapidly.

New Agendas, New Constraints

The evidence of agricultural chemicals in groundwater proved to be a catalyst for formulation of policies which increasingly constrain or redefine property rights of farmers. Despite fragmentary knowledge of the extent or definition of groundwater pollution, a particular view has emerged: agriculture is seen as the source of serious water quality problems.

Fragmentary Knowledge

Little is known of the extent to which agricultural chemicals have leached to groundwater, and, perhaps most important, the body of evidence as to the carcinogenic, mutagenic, and neurological effects of pesticides is not conclusive. Despite many correlations, there is no undisputed association between exposure to low levels of pesticides in groundwater and adverse health effects. As a result, our current ability to detect pesticides and nitrates in groundwater far exceeds our understanding of their significance.

Yet the scientific controversy is not the concern of the general public. The origin, relative toxicity, and pervasiveness of different contaminants are not separated in the mind of the public. It may even be said that there is a fairly virulent form of "chemophobia" in many public responses to the finding of agricultural chemicals in groundwater. The public perceives that products of chemical science can be harmful, and they do not want groundwater contaminated with these chemicals. The perceptions that agricultural chemicals can be harmful, has been reinforced by chemical poisoning of water life, the discovery of ethylene dibromide (EDB) in Florida drinking water, and aldicarb (Temik) contaminated California watermelons.

Scientists may argue whether concern over the residual level of pesticides is rational when these health risks are compared to other risks in which the public voluntarily partakes—smoking, skiing, motorcycling, or whatever. But the general public does not view involuntary risks, such as those associated with food or drinking water, in the same way it views voluntary risks. People demand a high level of protection from involuntary risks.

Conflicting Perceptions

Farmers, along with the chemical companies, are perceived as a cause of contaminated groundwater. Therefore, agriculture will be included in the "solution" to the groundwater quality problem.

This view of "agriculture as the problem" is new to agriculturalists. We are unaccustomed to being perceived as a polluting industry, similar to any other polluting industry. Accordingly, many agriculturalists tend to see water quality as mostly an information problem. They argue, "If farmers are educated about water quality problems and if technical and cost-sharing assistance is provided, then farmers will voluntarily improve their efforts to protect water quality." Consequently, as groundwater problems have become a greater concern to the public, many agriculturalists call for a continuation of current agricultural programs with only minor modifications, as well as more governmental assistance, more study and research time, and minimal regulatory involvement. In most agriculturalists' view, reallocation of property rights are not needed.

In contrast, many non-agriculturalists see existing water quality problems as mainly problems of policy. They argue "Society has an obligation to develop new policies that redefine the rules and alter farmers' rights." Under the "polluter pays" principle, regulation, not cost sharing, is required. In this view, the interests of farmers and society do not converge with voluntary programs. Rather than adopting the agriculturalist's "bottom up" approach, many non-agriculturalists see a "top down" mandatory approach as necessary to achieve water quality improvement; institutional change is needed.

The conflicting views of agriculturalists and non-agriculturalists are also evident in debates focused on food safety and biotechnology. Increasingly, the non-agriculturalist's definition of the problem is gaining prominence and, hence, the "top-down" solution becomes more likely.

New Problems, Perceptions, and Policies

An increasing number of people and their institutions embrace the notion that something must be done about groundwater quality. These concerned people represent The Audubon Society, The Natural Resources Defense Council, The National Coalition Against the Misuse of Pesticides, The Center for Responsive Law, The National Agricultural Chemicals Association, The League of Women Voters, as well as other public interest groups. Also included are academics, consultants, journalists, civil servants, and congressional staffers. Agriculturalists are also hesitant to publicly argue that contaminated groundwater is safe.

Together those really concerned about the problems constitute an informal policy community. They share a concern about agriculture's contamination of groundwater. They generate groundwater management proposals. Eventually the policy



The National Mood

proposals that survive are those which are technically feasible, are compatible with the values of many of the policy specialists, and are promoted by individual "policy entrepreneurs"—people who invest resources to further their preferred policy.

The groundwater policy community has created and taken advantage of opportunities to influence new legislation. One such opportunity to initiate new federal groundwater legislation came with the reauthorization of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) this year. While there is not yet an amended FIFRA, there are currently two major amendments that reflect several of the "policy community's solutions." Similarly, further refinement of the Safe Drinking Water Act (SWDA) and the newly proposed Environmental Protection Agency (EPA) strategy with respect to agricultural chemicals in groundwater create opportunities for the groundwater policy community to influence groundwater policy. It is probable that the Conservation Title of the 1990 Farm Bill will also emphasize water quality concerns.

Despite new groundwater legislative activity at the federal level, the majority of the current initiatives are at the state level. This emphasis may be because groundwater protection is perceived as a land use issue and therefore normally within the province of the state. But state dominance is also reinforced by the Reagan administration's emphasis on states' rights, reduced federal regulation, and reduced funding of domestic federal programs.

The Reagan administration has also encouraged a more risk-tolerant view of environmental hazards than did the Carter administration; and, under the Reagan administration, the EPA has had difficulty in collecting sufficient scientific evidence to set maximum contaminant levels in groundwater as health standards. As a result, states have taken the lead in protecting groundwater quality. To quote Skip Stiles, staff director of the subcommittee of the House Agriculture Committee that deals with FIFRA: "The states are the escape valve for public concern. Given our inability to pass federal legislation, the only outlet is the states."

State Initiatives

States with groundwater protection legislation tend to be those with two characteristics in common: they have a high proportion of their population dependent on groundwater for drinking water, and, they have found evidence that their groundwater is contaminated. In several cases, a threat of citizen action through a referendum, initiative, or media pressure has sped the process along faster than would otherwise have

been the case. For example, consider Arizona. Arizona relies heavily on groundwater for drinking water. Almost 58 percent of the total water supply is from groundwater sources, and groundwater quality has been a major state concern since the 1970s.

In 1982, the discovery of organic chemicals and pesticides in Arizona's groundwater prompted Arizona legislators to establish a one-half million dollar fund to be used for cleaning up groundwater contamination problems, but there was much dissension over who had the authority to protect groundwater within the state. The state attorney general advised that legislative action was called for to resolve the authority issue, and in 1984 comprehensive legislation to address water quality issues was introduced. Strong opposition from mining and agricultural representatives kept the legislation from passing.

The stalemate was not broken until 1985 when a citizen-led groundwater quality initiative was drafted. As Pfister and Hawke relate, "group after group signed resolutions in support for fear of being on the wrong side of the dirty water issue." The initiative provided the needed catalyst for seeking compromise legislation and, with the strong commitment of Governor Babbitt, Arizona created the Arizona Environmental Quality Act.

While specific "best management practices" guidelines have yet to be developed, the Arizona Act has the potential to be one of the "toughest" laws in the nation protecting underground water—particularly with respect to agricultural chemicals.

In California—for another example—over 46 percent of the population is served by groundwater sources. In 1986, after numerous discoveries of agricultural contamination in private and public wells, 63 percent of the voters expressed their concern by passing Proposition 65—the first major environmental initiative to succeed in the state since 1972. Proposition 65 makes it illegal for businesses employing 10 or more people to contaminate water beyond scientifically safe levels with any chemicals known to cause cancer, birth defects, or other reproductive problems. The burden of proving water safety levels is on the accused party.

A third example that demonstrates that farming activities are seen as the problem is Connecticut. Connecticut follows the principle of strict liability for groundwater contamination. Strict liability rules make the polluter responsible for damages—no matter how much care was exercised.

Thus, as initially implemented, under Connecticut's 1982 Potable Drinking Water Law, required the responsible party to provide potable drinking water to replace contaminated water. Strict liability does not require the state to prove fault, negli-

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gence, or harm, nor does strict liability exempt a farmer who carefully follows all chemical label restrictions. While designed to be a remedial policy, the strict liability rule can result in deterrence; that is, a farmer has an extra incentive to be careful.

Connecticut used the Potable Water Law against five of Connecticut's largest and most profitable farms; all of the farmers appealed. In February 1986, the Connecticut Governors' Task Force on Pesticides and Groundwater—which had been formed to examine farmers' concerns—issued recommendations that strict liability remain in force even for farmers. Mary Goodhouse, Connecticut Department of Agriculture employer summarized: "No one wanted to unravel a successful program of pollution abatement laws". But the Task Force did recommend that farmers, manufacturers, commercial operators, golf course owners, and chemical applicators make mandatory contributions to a self-insurance fund. The proposed changes have not received legislative support, however, since farmers' organizations opposed any admission of liability such as contributing to a self-insurance fund. On the other hand, chemical companies lobbied to continue to hold farmers liable. After two and half years of debate and consistent opposition from farm groups a compromise was reached. While many farmers will probably remain strictly liable for groundwater damage from agricultural chemicals, some may—under limited circumstances—be exempt from the requirement to supply potable drinking water.



ment advice becomes critical. Agricultural chemical companies, food processors, and retailers need to recognize the public concern about food and water safety as legitimate.

In the past, agricultural researchers have worked to optimize (and sometimes maximize) yields without regard to effects on groundwater or other environmental conditions. It is necessary now to make improved environmental quality part of the research objectives even if the new objectives imply lower yields.

Much is already being done, universities are developing more environmentally sound technologies and advice on prevention of groundwater contamination. Commodity representatives are communicating with members of the environmental community, farm management advice is being revised, and agribusiness firms are responding to public concerns. Yet there remains a regrettable amount of animosity and mistrust on all sides of the policy debate. The pursuit of special interests appears to dominate concern for a transcending common interest: insuring the long-term productivity and economic viability of agriculture with adequate protection of natural resources and human health. By responding to assure this common interest, agriculturalists and their representatives will be reflecting the broad

interests of society and will reap the rewards of greater public support.

This paper draws freely on the article by Sandra S. Batie "Agriculture As The Problem: New Agendas and New Opportunities," Southern Journal of Agricultural Economics, forthcoming, and is included with permission of that Journal. **C**

Implications to Agriculture

State and federal groundwater policies provide ample evidence that society places a high value on human health and safety and environmental quality and that society is willing to socially control the uses of agricultural technology in order to mitigate or reduce negative impacts of agricultural science.

When agriculture is perceived as the problem, agricultural institutions need to respond constructively. Researchers must reorient intellectual efforts from a primary focus on the economic consequences of chemical research for farmers, to also include consideration of the consequences these chemicals have on the environment.

Agriculturalists must communicate better with non-agriculturalist members of the "policy community" that share concerns about agriculture's role in society. Agricultural policies need to reflect farmers' economic realities, as well as protection of human health and environmental quality. As farmers face new constraints on their property rights, farming becomes more difficult and objective information more valuable. In groundwater management, for example, farmers also need to know how to protect groundwater quality, instead of only being told what not to do. Revised and informed manage-

For More Information

For further information on changing social attitudes toward the environment see the article by Sandra S. Batie, Leonard A. Shabman and Randall A. Kramer entitled "U.S. Agriculture and Natural Resource Policy: Past and Future in an Iowa State University Book entitled *The Future of the North American Granary: Politics, Economics, and Resource Constraints in North American Agriculture*. The 1986 book is edited by C. Ford Runge and can be obtained by contacting the Iowa State University Press, 2121 South State Avenue, Ames, Iowa, 50010. The book including shipping is priced at \$25.50.

For more discussion of the relationship between groundwater quality, agriculture, and policy, see the entire volume of the 1987 Winter edition of the *American Journal of Alternative Agriculture*, Volume II, Number 1. Single copies can be obtained from the Institute for Alternative Agriculture, Inc., 9200 Edmonston Road, Suite 117, Greenbelt, MD, 20770 for \$6.00.