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## AGRICULTURE AS THE PROBLEM: NEW AGENDAS AND NEW OPPORTUNITIES

Sandra S. Batie

Agriculture was once seen as the solution to many of the nation's problems. A strong agricultural sector translated into a strong America. Kohl et al. have presented four reasons for the past public commitment to agriculture. First, the agricultural sector has had considerable political power; second, there has been a widely held perception that farmers were economically disadvantaged relative to the rest of society; third, for many decades the growth of rural economies has been dependent on healthy agricultural sectors; and, finally, information produced by colleges of agriculture has been seen as a public good worthy of support by general tax revenues.

While public sentiments in support of agriculture are still prevalent, they are eroding as the impacts of agricultural science and policy on farm labor employment, on the environment, on the structure of agriculture, and on rural communities are increasingly perceived as negative and severe. The erosion of commitment is accelerating as the farm population loses political strength, as environmental interests gain in legitimacy, and as commercial agriculture is increasingly perceived as comprised of a few "factory-like" farms which neither need nor deserve special societal-funded benefits and exemptions from societal rules (Kohl et al.; Batie et al.).

As a result, not only does the agricultural establishment no longer control much of the agricultural policy agenda (Paarlberg), agricultural issues are now routinely placed on non-agricultural agendas. For example, agricultural issues are on the agenda of groups interested in "cancer policy" or "clean water policy." In such agendas, agriculture is perceived not as a solution but rather as a problem, a problem mainly fashioned by incentives created by agricultural science,

agricultural technology, and agricultural policies. As public attitudes change, farmers and ranchers increasingly face a new set of socially imposed, socially sanctioned constraints on the property rights associated with the use of labor and land.

While many colleges of agriculture faculty may agree that agriculture is increasingly perceived as "the problem," there remains considerable denial of the implications of this attitude change and a concomitant refusal to recognize that institutional change is inevitable. It is imperative that colleges of agriculture—if they are to remain relevant—evolve to reflect these changes and assist in designing new institutions<sup>1</sup> that achieve public goals. The public desire that has provided a mission and has nurtured colleges of agriculture in the past—the need for reliable supplies of high-quality, reasonably-priced food—can no longer be used to justify the existence and taxpayer support of land grant universities. Provision of an abundant food supply is now assumed—the mission is accomplished. In addition, "[c]olleges of agriculture are generally regarded as concerned not with food supply and nutrition, but with the special interests of farming and agribusiness. In terms of the vital needs perceived by the American public, colleges of agriculture would generally be classified as irrelevant" (Mawby, p. 199).

The public's contemporary agenda does not include an abundant domestic food supply; it addresses instead the social problems that have partially and indirectly been generated by past land grant successes—environmental pollution, bankrupt farmers, or poor human nutrition. Colleges of agriculture need to demonstrate efficacy in addressing these issues.

If colleges of agriculture are perceived as

Sandra S. Batie is a Professor, Department of Agricultural Economics, Virginia Polytechnic Institute and State University. Presidential address presented at the annual meeting of the Southern Agricultural Economics Association, New Orleans, Louisiana, February 1-3, 1988. Invited papers are routinely published in the July *SJAE* without editorial council review but with review of the copy editor (as per Executive Committee action June 25, 1982).  
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<sup>1</sup>Institutions are collective rules, actions, and conventions that control individual and group behavior.

spokespersons or apologists for commercial agriculture or if they cling to the mission of increasing production, they will be perceived as irrelevant to societal goals and thereby will be increasingly criticized, attacked, and underfunded (Libby; Bonnen; Schuh).

The rapid transition of both agriculture and the public's perception of agriculture's role in society creates many challenges and many opportunities—for new research and extension directions as well as for new funding sources. The new agendas and opportunities created by the evolving relationship between agriculture and the rest of society are best illustrated with examples. We need to consider how agriculture affects such societal concerns as food safety issues, biotechnology, wildlife habitat, rural poverty, agricultural policy, sustainable agriculture, trade, and rural development. Rather than give many brief examples, however, I will illustrate my points with a discussion of agriculture's relationship to groundwater quality.

The public goal is no longer, if it ever was, productivity at any price. Once they perceive that groundwater is being contaminated by agricultural chemicals, the public and the public's elected officials are rapidly instituting changes in groundwater management that involve new constraints on farmers' decisions. Such response indicates how quickly institutions influencing agriculture can change and how rapidly farmers may have to take these new constraints into consideration in their decision making. Changes in groundwater management illustrate that if property rights<sup>2</sup> of land owners must be changed to assure the safety of drinking water as perceived by the public, then rights will give way to restraints.

### **AGRICULTURE AND CHEMICALS: A BRIEF HISTORY**

We are so accustomed to an agriculture dependent on chemicals for its productivity that we tend to forget that chemical agriculture is of recent origin. We have gone from hoes to herbicides in less than four decades (Hallberg). Between 1964 and 1985, farmers' use of pesticides has more than tripled (USDA). In this time nitrogen fertilizer use has grown to 10 million metric tons per year (Hallberg). 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 (Conservation Foundation, 1987).

Public doubt about the wisdom of such widespread chemical use dates from as early as 1962 when Rachel Carson published her book, *Silent Spring*. *Silent Spring* alerted many Americans to possible problems associated with widespread use of chemicals. Agricultural chemicals were indicted as possible human health risks, as catalysts in the evolution of pesticide resistant plants and insects, as destroyers of nontargeted species, and as creators of new pest infestations. Despite some university activities to assure safer handling and applications of chemicals, the initial land grant system response to public concerns was, in the main, denial and neglect (MacIntyre).

While Carson's book focused media and public attention as to widespread chemical use, similar attention to groundwater concerns did not appear until the late 1970s. It was not until then that there was scientific corroboration of groundwater contamination resulting from normal agricultural use of chemicals (Holden). The 1979 discovery of aldicarb in the groundwater in Suffolk County, New York, caused many states to begin monitoring their own groundwater. Because of increased monitoring, evidence of contamination of groundwater by agricultural pesticides and fertilizers is accumulating rapidly (Nielsen and Lee).

### **NEW AGENDAS, NEW CONSTRAINTS**

The evidence of agricultural chemicals in groundwater proved to be a catalyst for public policy formulation—policies which are increasingly constraining or redefining farmers' property rights. Kingdon, a political scientist, writes that major policy development can occur when three separate streams or "families of processes" converge and create "windows of opportunity" for change. The three streams are the problem stream, the policy stream, and the political stream. These three streams are converging with respect to groundwater policy as well as with many other policy issues affecting agriculture.

<sup>2</sup>Property rights are socially sanctioned decision-making powers.

## Problem Recognition

The first Kingdon stream, the problem stream, starts with problem recognition. The way a problem is perceived, defined, and interpreted will determine crucial components of any forthcoming policy. Despite fragmentary knowledge of the extent or meaning of groundwater pollution, a particular view has emerged: agriculture is seen as the source of a serious water quality problem.

*Fragmentary Knowledge.* There is no up-to-date data set on the location and amount of pesticide use (Gianessi). 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 (Evans; Blair et al.). As a result, our ability to detect pesticides and nitrates in groundwater currently 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 (Holden). 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 (Holden). The public suspicions that products of chemical science can be harmful have been reinforced by the incidents of chemical poisoning of waterlife, the discovery of ethylene dibromide (EDB) in Florida drinking water, the Love Canal incident, contaminated California watermelons, and similar events.

Scientists may argue whether concern over the residual level of pesticides is rational when these health risks are compared to others in which the public voluntarily partakes—smoking, skiing, motorcycle riding, or whatever. But the general public does not view involuntary risks, such as those accompanying eating food or drinking water, in a manner consistent with its view of voluntary risks. The public demands a high level of protection from involuntary risks.

*Conflicting Perceptions.* In groundwater quality, farmers' actions are perceived as a source of safety and health problems the public wants "solved." Therefore, the agricultural

sector will be included in the "solution" to the problem.

The view of "agriculture as the problem" tends to be new to agriculturalists. They are unaccustomed to being perceived as a polluting industry, similar to any other polluting industry. In addition, agriculturalists, in general, tend to have a different "problem definition" with respect to agriculture's role in groundwater quality management (Abdalla and Libby).

Many agriculturalists tend to see water quality as mostly a problem of information. If farmers are educated with respect to water quality problems and if technical and cost-sharing assistance is provided, then farmers will voluntarily improve their efforts to protect water quality. For example, if farmers were informed so they used less fertilizer, both society's and farmers' welfare would improve. Thus, farmers' and society's interests can converge with voluntary information-based programs (Abdalla and Libby). Therefore, as groundwater problems become more of a public concern, 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 (Copeland and Zinn). In most agriculturalists' view, property rights reallocations are not needed.

In contrast, many non-agriculturalists tend to see the existing problems as mainly problems of policy. The existing "rules-of-the-game" lead to groundwater contamination, and therefore, 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, farmers' and society's interests cannot converge with voluntary programs (Abdalla and Libby). 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 (Feliciano); institutional change is needed.

The conflicting views of agriculturalists and non-agriculturalists can be seen in many debates in addition to those surrounding groundwater, such as food safety or biotechnology. Increasingly, the non-agriculturalist definition of the problem, and, hence, the "top-down" solution, is gaining prominence.

## Policy Stream

The second Kingdon stream, the policy stream, involves formulating and developing proposals. "[T]here are, in each issue area, policy communities made up of specialists, each with their [sic] own set of proposals. The specialists may be members of interest groups, agencies, universities, think tanks . . ." (Rushefsky, p. 62). In groundwater issues, these specialists include the Audubon Society, the Natural Resources Defense Council, the National Coalition Against the Misuse of Pesticides, The Center for Responsive Law, 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.

Together they form what Kingdon terms a "policy community." The members of the policy community share a concern about agriculture's contamination of groundwater. "This community of specialists hums along on its own, independent of such political events as changes of administration and pressure from legislators' constituencies" (Kingdon, p. 124). They generate groundwater management proposals which float around in what Kingdon refers to as a "primeval soup." Eventually the policy 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 values reflected by successful proposals include not only notions of the proper role and size of government, but also concepts of equity and efficiency; they reflect budget constraints as well as the "national mood" (Kingdon). "Specialists in a policy community know that ultimately their proposals must be acceptable to the public" (Kingdon, p. 146).

*The National Mood.* There is ample evidence of strong public sentiment in favor of the protection of environmental quality in general and water purity in particular (Halstead et al.; Padgitt; Pins; Sachs et al.). A 1985 opinion poll conducted by the Center for Communication Dynamics found that nationwide nearly 60 percent of respondents (80 percent of the college-educated respondents) agreed with the statement that "farmers use too many pesticides," and only 23 percent were willing to accept as safe the drinking of water that has only "small amounts of chem-

icals" and that meets government standards. In a survey of the general public in Iowa—a strong farm state—52 percent of those surveyed identified farm chemicals as the biggest threat to their drinking water; 78 percent of those surveyed favored limiting the amount of fertilizers, herbicides, and insecticides farmers could use, even if such action resulted in reduced grain production (Pins).

This concern over environmental quality in general supersedes concern over the federal budget deficit; in a 1986 poll, a 69 percent majority was opposed to cutting funds to be used to clean up the environment in order to reduce the deficit (Harris). Similar results can be found in food safety polls.

*Solutions Looking for Problems.* The diffuse policy community eventually generates a list of proposals that in one way or another reflects public opinions. To quote Kingdon:

. . . advocates lie in wait in and around government with their solutions at hand, waiting for problems to float by to which they can attach their solutions, waiting for a development in the political stream they can use to their advantage (p. 173).

In federal groundwater legislation, for example, one such opportunity came with the reauthorization of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). In 1985–86, representatives of 41 environmental, labor, and citizen groups as well as chemical industry representatives attempted to achieve some compromise on FIFRA amendments. While there is not yet an amended FIFRA, there are currently two major legislative amendments under consideration with proposed amendments that reflect several of the "policy community's solutions." Similarly, the further refinement of the Safe Drinking Water Act (SDWA) creates opportunities for the groundwater policy community to influence groundwater legislation.

## Political Stream

The third Kingdon stream is the political stream which consists of elections, ideological changes in Congress, changes in White House administration, or similar activities.

While there is currently some new legislative activity at the federal level with respect to groundwater, most of the current initiatives are at the state level. State 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 (*New York Times*); and, under the Reagan administration, the Environmental Protection Agency 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" (Freistadt, p. 27).

*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 source, and they have found their groundwater 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 (National Research Council), and groundwater quality has been a major concern since the 1970s. In 1982, the discovery of organic chemicals and pesticides in Arizona's groundwater prompted the 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 (Briggs). The stalemate was not broken until 1985 when a citizen-led groundwater quality ballot initiative was drafted. "Group after group signed resolutions in support for fear of being on the wrong side of the dirty water issue" (Pfister and Hawke, p. 9). The initiative provided the needed catalyst for seeking a compromise legislation,

and with the strong commitment of Governor Babbitt, Arizona created the Arizona Environmental Quality Act. The Arizona Act is considered by some to be one of the "toughest" laws in the nation protecting underground water—particularly with respect to agricultural chemicals (*Los Angeles Times*, May 12, 1986, as quoted by Derouin and Bartlett).

In California—for another example—over 46 percent of the population is served by groundwater sources (National Research Council). In 1986, after numerous discoveries of agricultural contamination of 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 (Conservation Foundation, 1986). Proposition 65 makes it illegal for businesses employing ten 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 safety is on the accused party (Cohen).

A third example 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, under Connecticut's 1982 Potable Drinking Water Law, the responsible party must provide potable drinking water to replace contaminated water (Goodhouse). Strict liability does not require the state to prove fault, negligence, 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 has used the Potable Water Law against five of Connecticut's largest and most profitable farms. However, all of the farmers have appealed the orders—although none have been granted a hearing (National Association of State Departments of Agriculture).

In February 1986, the Connecticut Governor's 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. "No one wanted to unravel a successful program of pollution abatement laws" (Goodhouse, p. 135). But the Task Force did recommend that farmers, manufacturers, commercial operators, golf course owners, and 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 (Goodhouse, p. 136). Thus, despite two and a half years of debate and consistent opposition from farm groups, farmers remain strictly liable for groundwater damage from agricultural chemicals.

*Windows of Opportunity.* Even with only a brief review of institutions influencing farmers' use of groundwater, it is obvious that the institutions are undergoing rapid change. The three streams—problem, policy, and political—in groundwater management are now merging; “the windows of opportunity” for change have opened—widely in many states.

However, it is not only in the area of agriculture's contamination of groundwater that the Kingdon three stream model applies and that “windows of opportunity for change” are emerging. For example, consider changes in the Food Security Act of 1985 that prohibited farmers from receiving farm program benefits if they drained wetlands—the popularly termed Swampbuster provision. The inclusion of the Swampbuster provision in the Farm Bill was considered a tremendous success by the environmental community (Cook). Recently, as North Dakota farmers lobbied for more leeway to achieve compliance, Senators Robert W. Kasten, Jr., (R-Wis) and Dale Bumpers (D-Ark) warned that Congress would tighten the law before they would liberalize it.

Senator Kasten reflected a changed public perception of the role of farm programs when he noted:

The government also has a right to make these [farm program] payments on condition that the farmers receiving them do—or in this case, not do—certain things. . . . It is time to stop complaining about the law and begin working on ways to live with it. (Sinclair, 1988a).

For another example, California Judge Raymond L. Marsh recently ruled that the University of California had conducted research that violated the Hatch Act when researchers assisted in the “industrialization” of agriculture without adequate consideration of the consequences to the family farm and farm labor. One participant, James B. Kendrick, Jr., who retired in 1987 after 18 years as Vice President of Agriculture at the University of

California, summarized the implications of Judge Marsh's decision:

The leadership of state agricultural experiment stations and Cooperative Extension urgently need to begin adjusting their programs so that the public interest is served. It is debatable to assume that research and extension programs designed primarily to serve the needs of the 50,000 largest U.S. farming units are in the public interest. (Sinclair, 1988b).

The land grant responses to these “windows of opportunity” have not always been constructive. For example, there is presently interest among farmers in systems of farming that reduce chemical use, use less energy, reduce soil erosion, and/or are more diverse. Recently some universities have made changes so that they can supply this information. For example, at least two states—Arizona and Iowa—require research into agricultural practices that use fewer chemicals. Iowa just recently funded the Leopold Center for Sustainable Agriculture located at Iowa State University. The Center is funded from pesticide fees, fertilizer taxes, and other sources; this year \$1.8 million will be allocated to the Center (Williams). The purpose is to find ways for farmers to eliminate the leaching of chemicals to groundwater. Paul Johnson, one of the architects of the center, states that the center is dedicated to reducing the negative impacts of agriculture: “it is not an approach to maximize the profits of agriculture” (Mueller).

Arizona's new legislation gives authority to its Commission of Agriculture and Horticultural Use to require Integrated Pest Management (IPM) strategies, provided there is an adequate scientific and economic base. In addition, the legislation establishes an IPM program within the Commission's office to determine effective and economical ways to provide IPM to individual farmers. Other states, such as Connecticut and Minnesota, have increased their budgets to land grant universities to support IPM or alternative agriculture research.

However, not all of these initiatives had the support of their state's colleges of agriculture administration. Negative responses to initiatives attempting to achieve new public goals appear obstructionist to the “policy communities” responding to public concerns.

Nevertheless, one interpretation of changed public attitudes toward agriculture has been that they are producing forces which colleges of agriculture must resist. This interpretation



is counterproductive. An alternative interpretation is that these are forces to which colleges of agriculture must adapt. While there is truth to this second interpretation, it reflects an unnecessarily passive view of the colleges of agriculture's role. We can respond to "windows of opportunity" too. We can influence emerging agendas and policies that will, in turn, influence agriculture.

## IMPLICATIONS FOR RESEARCH AND EXTENSION PRIORITIES

There is clear evidence that society is placing high value on human health and safety, environmental quality, social control of the uses of agricultural technology, and mitigation or reduction of negative impacts of agricultural science. To address these evolving public goals, the land grant colleges of agriculture's programs must be reoriented. If not the owners of the largest commercial farms, then who is our clientele? If not agricultural productivity and profitability, then what is our mission?

### Clientele

While we would be well advised not to constrain ourselves with rigid definitions of clientele priorities, we know that "agriculture is more than farms and that rural areas are more than agriculture" (Libby, p. 1315). This observation is particularly true of the South. Today only 1 out of every 39 Southerners lives on a farm; even in rural areas only 1 out of 15 do so (Healy). Furthermore, the relationship of agriculture to the rest of the citizenry extends beyond the rural communities. Both positive and negative externalities of agriculture, for example, are felt by urban residents. These same residents also pay taxes to support their land grant institutions.

If we embrace a mission of improving the quality of life, and if we focus on research and extension problems and products not apt to be supplied by the private sector,<sup>3</sup> then clientele priorities will emerge. The clientele will differ, depending on the issue—rural poverty issues will not suggest the same public as do environmental quality issues.

Even with a more diverse research and extension agenda, however, farmers and ranchers will remain an essential clientele—but they

will need assistance with farming under new constraints. Farm management advice developed in earlier years is not adequate. With new constraints on property rights, farming becomes even more difficult, and objective information becomes even more valuable. For example, keeping the groundwater illustration, farmers need to know what to do to protect groundwater quality; instead, in many instances they are being told only what not to do. It is not enough that farmers recognize where and when reducing chemicals is necessary to protect groundwater quality; farmers need advice on what practices to implement in lieu of dependence on pesticides and fertilizers. Information is needed as to what farming system is best for the farmer, given the environmental constraints that limit his or her choices. Natural resource management education is becoming as important as agricultural production education.

Colleges of agriculture need to transcend the current research and extension agendas focused mainly on farm productivity and farmers' profits and shift to considerations of broader social welfare. This reorientation will require delineating these broader concerns and defining them as researchable, yet relevant, problems. Furthermore, the need to convey information, to communicate between various interests and academic groups, suggests a major role for extension—as an antenna for identifying social issues that are emanating from outside the colleges of agriculture. Public concerns cannot be dismissed as uninformed; rather, we must find ways to better understand and communicate with groups that believe "agriculture is the problem." Not only do we need to communicate with members of the "policy community" sharing concerns about agriculture's role in society, we need to be a part of the community. New coalitions with new clientele are essential if intellectual efforts are to be accurately redirected.

### Missions

Because farmers increasingly will be forced to maximize profits under a new, more restrictive set of constraints, our research agenda must also change. Not only are there the obvious farm-level research questions to be answered; there is need for research on how

<sup>3</sup>Castle notes that sorting which activities should be undertaken by public institutions and which by private requires "tough analytical work." Further, "... the state of scientific knowledge and the structure of agriculture has been changing rapidly. It is not clear that the present division of responsibility of conducting agricultural research and extension reflects these changes" (p. 50).



alternative farm, trade, and research policies, and alternative property rights will influence the farmers' choices of farm practices and the location, amount, and type of agricultural chemicals used. Researchable questions include:

- Is a policy of export subsidies for corn expensive in terms of pesticide use?
- Will a liability policy of "farmer pay" result in substantially different patterns of chemical use than one of manufacturers pay?
- Can the conservation compliance provisions of the 1985 Farm Bill be effectively used to protect groundwater quality?
- Will environment-protecting research come only at the expense of productivity-enhancing research?
- If so, will the U.S. be less competitive in world markets?
- If chemical use is restricted, will domestic consumers have inferior quality food at increased prices?
- What will be the differing distributional impacts (e.g. regional, type-of-farm) of any proposed groundwater policies?

Fortunately, research questions such as those posed above frequently have public funding—precisely because they are relevant. The sources of funds may not always be traditional sources such as United States Department of Agriculture or commodity groups, but then the questions are not traditional either. Additional financial support for agricultural research can be obtained if agriculturalists will cooperate more closely with non-agriculturalists. Research that reflects the interests of a broader based clientele should, in the long run, reap the rewards of greater public financial support.

The southern region offers particular obstacles and opportunities for more responsive missions. For example, "out-reach" to clientele is made even more essential, but more difficult, because of the rapid transition of southern agriculture. While the southern region's agriculture has much diversity (Babb and Long), overall southern agriculture tends to have more of a small-farm character than that of the nation at large (Wimberly). Also, Harris et al. report a growing separation of ownership and control in southern agricul-

ture. Osgood found in a study of a watershed in Virginia, for example, that 75 percent of the 1000 farms were composed of 100 acres or less, approximately 83 percent held either part-time or full-time jobs off the farm, and a significant proportion of the farms were owned by people who did not reside on them. Agricultural economists need to be cognizant of the implications for research and extension of a structure of agriculture with high proportions of absentee owners, hobby farm owners, and part-time owners, as well as low proportions of "mega-farms" and vertically integrated farms. Water quality programs, for example, designed around an image of agriculture that does not reflect the reality of the southern structure of agriculture will be less successful than ones designed with more accurate assumptions (Norris and Shabman).

## CONCLUSIONS

I have provided only a few examples drawn mainly from one aspect of one public concern. The groundwater quality issues are, however, an illustration of a broader set of public concerns addressing today's structure of agriculture and its relationship not only to the environment, but also to rural and Jeffersonian democratic values, rural communities, the international economy, and future societal options and choices.

If colleges of agriculture are to escape from the position of "agriculture as the problem," if they are to survive, then responsive, relevant research and extension programs must emerge. These programs must better address the current and future effects of agricultural technology and science on the environment; farm labor wages, safety, and employment; ownership patterns and property rights; food quality, safety, and price; farmers' health, safety, and profits; and the quality of rural life. The new agendas of a concerned public should be seen neither as a threat nor as irrelevant to the land grant tradition, but instead as challenges and opportunities to better serve the needs of society. Land grant colleges of agriculture must embrace opportunities to assist in identifying and designing solutions—it is in our finest tradition of being the "people's" University.

## REFERENCES

- Abdalla, C., and L. W. Libby. "Agriculture and Ground Water Quality: A Public Policy Perspective." *Amer. J. Alternative Agr.*, 2 (1987): 37-41.
- Babb, E. M., and B. F. Long. "The Role of Alternative Agricultural Enterprises in a Changing Agricultural Economy." *So. J. Agr. Econ.*, 19 (July 1987): 7-16.

- Batie, S., L. Shabman, and R. Kramer. "U.S. Agriculture and Natural Resource Policy: Past and Future." In C. F. Runge, (ed.), *The Future of the North American Granary; Politics, Economics, and Resource Constraints in North American Agriculture*. Ames, Iowa: Iowa State University, 1986.
- Blair, A., K. Cantor, and S. Zahm. "Cancer and Pesticides Among Farmers." In *Pesticides and Groundwater: A Health Concern for the Midwest*. Proceedings of a conference sponsored by the Freshwater Foundation and the U.S. Environmental Protection Agency, St. Paul, MN, October, 1986.
- Bonnen, J. T. "A Century of Science in Agriculture: Lessons for Science Policy." *Amer. J. Agr. Econ.*, 18 (1986): 1063-80.
- Briggs, P. C. "Arizona Program to Control Groundwater Pollution From Agricultural Chemicals." In L. W. Canter (ed.), *Agricultural Chemicals and Ground Water Pollution Control*. Proceedings of a National Symposium sponsored by U.S. Environmental Protection Agency, Kansas City, March 26-27, 1987.
- Carson, R. *Silent Spring*. Boston, MA: Houghton Mifflin Co., 1962.
- Castle, E. N. "How to Change Agricultural Research and Extension to Make a Better Investment." In *Increasing Understanding of Public Problems and Policies—1981*. Oak Brook, IL: The Farm Foundation, 1981.
- Center For Communication Dynamics. "Groundwater Contamination: The Measure of Public Concern." Unpublished manuscript. Washington, D.C., 1985.
- Cohen, D. B. "San Joaquin Valley, CA: Risk Assessment of Pesticides in Ground Water." In L. W. Canter (ed.), "Agricultural Chemicals and Ground Water Pollution Control." Proceedings of a National Symposium sponsored by U.S. Environmental Protection Agency, Kansas City, March 26-27, 1987.
- Conservation Foundation. "Environmental Momentum Picks Up Again." *The Conservation Foundation Letter* (November-December, 1986): 1-8.
- Conservation Foundation. *Groundwater Protection*. Washington, D.C.: The Conservation Foundation, 1987.
- Cook, K. "Commentary: Pinch Me, I Must Be Dreaming." *J. Soil and Water Conservation*, 41 (March-April, 1986): 93-94.
- Copeland, C., and J. Zinn. "Agricultural Nonpoint Pollution Policy: A Federal Perspective." Congressional Research Service 86-191 ENR, Washington, D.C., Library of Congress, 1986.
- Derouin, J. G., and Rep. D. Bartlett. "New Arizona Act Designed to Assure Water Quality." *Arizona Waterline*. Phoenix, AZ, Winter 1987.
- Evans, M. A. "Health Effects from Groundwater Pesticides." In *Pesticides and Groundwater: A Health Concern for the Midwest*. Proceedings of a conference sponsored by The Freshwater Foundation and the U.S. Environmental Protection Agency, St. Paul, MN, October, 1986.
- Feliciano, D. V. "Agricultural Effects on Ground Water Quality." Congressional Research Service, 86-891 ENR, Washington, D.C., Library of Congress, 1986.
- Freistadt, M. "Time for Cooperation." *Agri Chemical Age*, (January 1988): 22-27.
- Gianessi, L. P. "Lack of Data Stymies Informed Decisions on Agricultural Pesticides." *Resources*. Washington, D.C.: Resources For The Future, 1987.
- Goodhouse, M. "Connecticut River Valley: Public Response to EDB Contamination." In L. W. Canter (ed.), "Agricultural Chemicals and Ground Water Pollution Control." Proceedings of a National Symposium sponsored by U.S. Environmental Protection Agency, Kansas City, March 26-27, 1987.
- Hallberg, G. R. "From Hoes to Herbicides: Agriculture and Groundwater Quality." *Soil and Water Conservation*, 41 (1986): 357-63.

- Halstead, J. M., S. S. Batie, and R. A. Kramer. "Agricultural Practices and Environmental Attitudes of Rockingham County, VA, Dairy Farmers: Results of a Survey." Virginia Polytechnic Institute and State University, Department of Agricultural Economics Special Paper 88-1, January, 1988.
- Harris, C. K., J. Gilbert, and J. McAllister. "The Changing Structure of Farmland Ownership in the South." In J. J. Molnar, (ed.), *Agricultural Change*. Boulder, CO: Westview Press, 1986.
- Harris, L. "Environmental Issues Could Become a Factor in Congressional Race." New York, NY: The Harris Survey, The New York Syndicate, 1986.
- Healy, R. G. *Competition for Land in the American South: Agriculture, Human Settlement on the Environment*. Washington, D.C.: The Conservation Foundation, 1985.
- Holden, P. W. *Pesticides and Groundwater Quality: Issues and Problems in Four States*. Washington, D.C.: National Academy Press, 1986.
- Kingdon, J. W. *Agenda, Alternatives, and Public Policies*. Boston: Little, Brown and Company, 1984.
- Kohl, D. M., L. A. Shabman, and H. H. Stoevener. "Extension Economists in a Changing Agricultural Economy." *So. J. Agr. Econ.*, 19 (July 1987): 35-44.
- Libby, L. W. "Restructuring Agricultural Economics Extension to Meet Changing Needs." *Amer. J. Agri. Econ.*, 68 (1986): 1313-15.
- MacIntyre, A. A. "Why Pesticides Received Extensive Use in America: A Political Economy of Agricultural Pest Management to 1970." *Natural Resources J.*, 27 (1987): 533-90.
- Mawby, R. G. "Evolution of the Land-Grant System." In *Issues Facing Agriculture and Implications for Land Grant Colleges of Agriculture*. Proceeding of a workshop sponsored by North Central Council of Administrative Heads of Agriculture and The Farm Foundation, Chicago, IL, October 9-10, 1985.
- Mueller, W. "States Take the Initiative." *Agrichemical Age*, January 1988, pp. 30-33.
- National Association of State Departments of Agriculture. "Connecticut Struggles with Pollution Liability Issues." *Farmland Notes*, 6 (March, 1987): 1-3.
- National Research Council. *Ground Water Quality Protection: State and Local Strategies*. Washington, D.C.: National Academy Press, 1986.
- Nielsen, E. G., and L. K. Lee. "The Magnitude and Costs of Groundwater Contamination from Agricultural Chemicals: A National Perspective." USDA, ERS Agricultural Economic Report 576, October, 1987.
- New York Times*. "Cancer Risk Reassessed by EPA: Research Suggests Threats Overstated." Reprinted in the *Roanoke Times*, January 4, 1988.
- Norris, P., and L. Shabman. "Transition in Agriculture: Opportunities for Improved Water Quality for the Chesapeake Bay in Virginia." Unpublished paper, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, 1988.
- Osgood, B. T. "Marketing Strategies for Conservation Systems: Working With Changing Agricultural Clienteles." In *Optimum Erosion Control at Least Cost*. Proceedings of the National Symposium on Conservation Systems, Chicago, IL, December 14-15, 1987.
- Paarlberg, D. *Farm and Food Policy: Issues of the 1980s*. Lincoln: University of Nebraska Press, 1980.
- Padgitt, S. "Agriculture and Ground Water Quality as a Social Issue: Assessing Farming Practices and Potential for Change." Paper presented at the Agricultural Impacts of Ground Water National Conference, sponsored by the National Water Well Association, Omaha, NB, August, 1986.
- Pfister, A. J., and Rep. L. Hawke. "Struggle to Get Act Frustrating, Rewarding." *Arizona Waterline*. Phoenix, AZ, Winter 1987.
- Pins, K. "Poll: Iowans Want Limits on Agricultural Chemicals." *Des Moines Register*, Des Moines, Iowa, November 16, 1986.
- Rushefsky, M. E. *Making Cancer Policy*. New York: State University of New York Press, 1986.

- Sachs, C., D. Blair, and C. Richter. "Consumer Pesticide Concerns: A 1965 and 1984 Comparison." *J. Consumer Affairs*, 21 (1987): 96-107.
- Schuh, G. E. "Revitalizing Land Grant Universities: It's Time To Regain Relevance." *Choices*, 1 (1986): 6-10.
- Sinclair, W. "Swampbuster Penalties Irk Farmers: Law to Preserve Fragile Wetlands is Protested on Capitol Hill." *Washington Post*, p. A-4, January 27, 1988a.
- Sinclair, W. "The Agri-Biz Bonanza: How Your Tax Dollars Produced the Cubical Tomato." *The Washington Post*, p. A-1, January 10, 1988b.
- United States Department of Agriculture. "Inputs, Outlook, and Situation Report." Economic Research Service IOS-7, Washington, D.C., 1985.
- Williams, M. "Leopold Center is Not for 'Organic' Farming." *The Des Moines Register*, May 23, 1987, p. B-1.
- Wimberly, R. C. "Trends and Dimensions in U.S. Agricultural Structure." In J. J. Molnar, (ed.), *Agricultural Change*. Boulder, CO: Westview Press, 1986.

