POLICY ISSUES IN WATER QUALITY

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Water quality is a matter of some public concern. The focus of this concern is not whether the nation's surface waters will be "fishable and swimmable" by the now past 1984 deadline suggested in Public Law 95-200, nor whether it is important to protect the quality of the nation's groundwater in general; the focus is on the quality of those supplies that ultimately provide drinking water. Nationally, about 50 percent of our population relies upon groundwater for a drinking water supply [3]. This means, of course, that the other 50 percent are dependent upon surface water supplies.

An estimated 20 percent of our population — those people living in rural areas — depend almost exclusively on groundwater for drinking water supplies. To state the same situation somewhat more dramatically, more than 95 percent of our rural population depends upon groundwater for drinking water.

The situation is complicated somewhat by the physical relationship of surface water and groundwater. Groundwater supplies an estimated one-third of the base flow in the nation's streams and rivers. For this process to continue, the groundwater supply must be replenished. Virtually all of the replenishment is done by surface water. If contaminated surface water replenishes the groundwater supply, it may be too much to expect that this same polluted water will not eventually be discharged as base flow to streams that will ultimately provide drinking water supplies to developed areas adjacent to large streams or rivers.

The level of public awareness and concern is presumably reflected in the interest at the federal level — the Congress and the directly involved federal agencies. Members of Congress have voiced concern about the quality of the nation's water resources. The Environmental Protection Agency (EPA), in addition to the issuance of a National Policy Statement on Non-Point-Source Pollution [5], has issued a National Groundwater Strategy [4], and is implementing that strategy. The United States Department of Agriculture (USDA) is formulating its groundwater strategy. The United States Geological Survey has issued annual reports [6,7] which have become very popular sources of data.

Such activities at the federal level may well reflect public concern. The public is becoming aware of the importance of wholesome drinking water. But this is not now — and is not likely ever to be — a national issue characterized by demonstrations or marches. There is not likely to be a wholesale panic; but there may well be some very great degrees of localized concern and calls for public action to protect the health and welfare of local populations. Such concerns will result in demands for quick corrective action; will uncover multitudes of experts; and will provide a real challenge for educational organizations. They will also require some understanding of public moods and expectations, and the problems of suggesting that affected groups wait for statistically acceptable documentation of cause and effect.

When a public learns that their water supply contains "chemicals," which were previously not known to be present, they tend to be concerned. Such natural concerns are exacerbated by the inclination of the media to publicize, and sometimes to exaggerate, overstate, and sensationalize. When barraged by such news, opinions, and experts, even educated citizens, who are otherwise wholesomely cynical about general statements, become concerned.

In this situation, it requires great leadership and courage to point out that the newly discovered chemical may have long been present; that "micro numbers" do not necessarily indicate serious dangers; that the long-term effects of such chemicals are not known; and that dosages (and hence effects) are not necessarily additive.

In additon to courage and leadership, such situations also require information sources and data that have public credibility. These sources may include a wide range of nontraditional sources; the local medical society; local colleges or universities; land grant colleges; schools of medicine; public health officials; local government officials; local civic groups; and the individual members of the concerned public. The emphasis must, of course, be on *credible* sources.

Credible information, while necessary, is not sufficient. There must be linkages to the decision makers who are involved. Such linkages presumably exist among cooperative extension and the decision makers at the local level, but perhaps not in an educational sense. Have these decision makers previously been actual audiences for cooperative extension programs? Can they now be brought into such a relationship? As the public officials under direct pressure to take appropriate remedial action, they are quite likely to be looking for objective information and are also likely to be flooded with subjective information.

The development of credible education programs depends upon a broad base of support. As an educational agency, cooperative extension cannot be perceived as representing any of the potential principals in a polarized situation. The careful choice of an advisory committee representing the broad spectrum of legitimate interests may be crucial to such efforts. Such a broad based advisory committee will certainly include representatives of nontraditional audiences, and perhaps even some antitraditional groups. Cooperative extension must think broadly about addressing the real problems, not of defending one or another of the principals.

The development of such educational programs must recognize the public mood and expectations. Many members of the public will find the matter of newly discovered chemicals in their water supply very upsetting. While the risks may be small, they will be — initially at least — socially unacceptable. If one were to construct a spectrum of risk acceptability ranging from acceptable to absolutely unacceptable, the risk of an automobile accident would be rated close to acceptable; the risks of airline travel would be slightly less acceptable; while impurities in the drinking water supply would probably be somewhat less acceptable than medical malpractice. Such problems of social acceptability will add to the challenges of nontraditional audiences and to a potential public perception of cooperative extension as a vested interest in particular solutions to the problem(s).

While there are numerous examples of water contamination by a wide variety of sources, it is clear that there is not — and may never be — a documentation of the overall extent of such problems [3]. At lower levels of aggregation, there are somewhat better characterizations [6]. At the local level, we must recognize that there are few requirements for regular testing for any potential problems, and that many chemicals are not included in any testing procedures.

Cooperative extension will probably not be faced with the need for programs on statewide bases. It makes no practical difference whether the extent of contamination of the nation's groundwater is 1 to 2 percent, or even 5 percent [3]. At the place in crisis, whether a small municipality or a group of private wells, the educator is likely to face a situation in which 100 percent of the water supply is impaired.

But the problems have been generally classified. The EPA has identified three classes of problems and their components. These are:

a) Major problems: industrial landfills and lagoons; municipal landfills and lagoons; underground storage tanks; and chemical, oil and brine spills.

b) Intermediate problems: well injection; pesticides; fertilizers; septic tanks.

c) Minor problems: saltwater/brackish water intrusion; road salts; feedlots.

While the traditional cooperative extension subject matters seem to lie primarily in the classification of "intermediate problems," one must remember that this classification from a national perspective is of little relevance to a specific local problem such as (for example) aldicarb, nitrates, or ethylene dibromide (EDB) in the water supply.

The cooperative extension system has been studying these problems, along with other agencies and organizations. The Extension Committee on Organization and Policy (ECOP) and the Extension Service, USDA, have appointed a National Groundwater Task Force to address the challenges of groundwater contamination and protection. The task force has surveyed all of the state cooperative extension organizations, and has concluded that the major concerns/opportunities for cooperative extension are centered around three major topics:

1) The health effects of contaminated water.

2) Sources of contamination and their routes to groundwater.

3) Programs to reduce groundwater contamination and depletion.

There are challenges in the first two of these topics; the third is not a radical departure from the traditional kinds of extension programs. The area of health effects is likely to present both strains and opportunities, since it will require new kinds of programs, new kinds of linkages, new kinds of technical resource persons.

The "contaminant source and movement" area will also present challenges in several ways:

— Some of the contaminant sources will be traditional extension clientele.

— Some land uses may need to be dramatically changed.

— Some traditional support groups may well be offended by needed changes.

— There will be considerable overlap between traditional and non-traditional areas, where communications linkages have not usually been strong.

— There is a great potential for polarization within cooperative extension.

Attention is being directed toward the lack of data at the national level. EPA is planning a nationwide program of well testing. The state of Illinois is beginning a large scale well testing program. The Experiment Stations Committee on Organization and Policy is preparing a national funding proposal. The Congress has been holding public hearings on the groundwater issue, in contemplation of a National Water Policy.

It appears that we may soon have much data on groundwater quality. But such data will be in the form of measured contents of specific substances; we still will not know what it means in terms of the health and well-being of those who ingest those waters.

Extension Program Opportunities

There are many kinds of chemicals that enter water supplies, some of which are generally beyond the usual scope of cooperative extension programs. But public policy education programs must be broad enough to prevent a public stereotyping of extension programs as defenders of the status quo in agriculture. The EPA has identified three areas (fertilizers, pesticides, and septic tank systems) that are close to the extension experience base, its linkages, and its support groups. There have been, and continue to be, program elements that deal with those topics in technical ways, but few that address them as policy matters. "Municipal landfills" are nontraditional, but are primarily a policy issue.

Pesticide education is not new to cooperative extension. There have been very successful educational efforts in Pesticide Applicator Training (PAT) and in Integrated Pest Management (IPM). These have some obvious, but indirect, impacts on the potential for groundwater contamination. A long-term cooperative effort between the EPA and the cooperative extension system has reached more than 90 percent of the potential PAT audience. IPM has spread rapidly, and is now cited as a success in reducing unwarranted use of pesticides.

Large quantities of pesticides are used in agriculture [2]. Their use is seldom an issue. A more likely issue will center around ways to prevent contamination (or further contamination) of water supplies. It is extremely difficult to prove cause-and-effect relationships specifically enough to identify single (or even multiple) causes. If the presence of a pesticide in the drinking water is confirmed, if specific cause-and-effect cannot be proven, and if many of the farmers in the watershed use the pesticide, one logical solution might be to ban the use of the pesticide.

The EPA is planning a program to test 1,500 wells across the nation. They will be looking specifically for pesticides. Such a program could focus much attention on pesticides and agriculture. Pesticides (in general) may be ubiquitous at "micro-number" concentrations. If the established maximum contamination level (MCL) is zero, it is likely to matter little whether the observed level is one part per million; per billion; per trillion; or per quadrillion. After all zero is zero — no matter what the level of detection — and regardless of the uncertainty of the health impacts of such concentrations.

It helps little to point out that there are other users of pesticides beyond extension's traditional agricultural-production clientele. Nonetheless, it bears stating that other sectors have been involved. Electric power companies, highway departments, turf farms, golf courses, and homeowners use pesticides with varying degrees of environmental awareness.

Soil fertility and fertilizer-use education are probably some of the oldest extension programs, while being some of the newest in terms of technology. There is no consensus about the environmental sensitivity of such programs.

While the EPA groundwater strategy has identified fertilizers as one of their intermediate problems, the topic emerges with alarming frequency in discussions with various interest groups in Washington and elsewhere. It should be recognized that while EPA used the generic term "fertilizers," the usual topic is really "nitrates."

A recent review of the topic has largely dismissed nitrates as a cause for concern — especially in the absence of reported cases of methemoglobinemia. But there is a persistent undercurrent that expresses concern for the potential long-term, chronic effects of nitrate in drinking water. In the case of nitrate contamination, a somewhat clearer identification of the contributors can be made.

The importance of fertilizers — and especially nitrogen fertilizers — in agricultural production is generally not challenged. While many of the niceties of soil-nitrogen interactions are not appreciated by policymakers, there is a general perception that many farmers use more nitrogen fertilizer than necessary, and that such overuse is likely to impact the quality of drinking water — especially if the source is groundwater.

A recent publication [7] indicated that, of about 124,000 wells for which data were available, only 6.6 percent exceeded the drinking water standard for nitrate nitrogen. On a national scale, these data — which are declared to be skewed toward problem wells — indicate that the problem may not be widespread. At the same time, it can be argued that — since 20 percent of these wells exceed the arbitrary background level (3 mg/l); and that since this is not a comprehensive sample — there may be some cause for concern.

There is little awareness of extension programs in soil fertility and/or fertilizer use among interest groups and policymakers. There is even less consensus — among any groups — about the thrust or emphasis of such programs. There is a common suspicion that cooperative extension continues to focus on agricultural production, and perhaps even on maximum production, at the expense of environmental quality. The issue becomes especially pointed with respect to nitrates in groundwater.

Septic tanks are another potential source of contamination of drinking water supplies. There are an estimated 17 million septic systems in the nation [1]. They are usually located in areas that have no public water supply; many of these systems have exceeded their design life; few political jurisdictions have more than nominal control over the operation and maintenance (or lack of maintenance) of such systems; many of the soils once considered "best suited" to such systems constitute excellent paths to groundwater; and many proprietary products sold for septic system maintenance are potential groundwater pollutants.

There are excellent extension *materials* available to help homeowners with correct selection, installation, and operation of septic systems. Since the general topic is seldom a major issue, however, there are few, if any, *programs* to provide homeowner education about such systems and the implications for their own drinking water supplies or those of their neighbors. Septic systems are a classic representation of the "out-of-sight, out-of-mind" situation.

While the actual impacts on human health of septic system leakage have not been documented, it seems clear that the potential for nitrates and viruses to enter groundwater is substantial, and contributions of nitrates, phosphates, and viruses to surface water have been well documented [1].

Sanitary land fills ("municipal landfills" in the EPA classification) are listed as one of the major problems of groundwater contamination. While few will argue the practical and social necessity of municipal landfills, they create special problems for extension educators. When a municipal landfill is established (usually in a rural area), there is an immediate effect on surrounding property values, a short-term effect on the immediate environment, and an absolutely predictable effect (long-term though it is) on the groundwater resource. It requires a great deal of sophistication for the affected populace to reconcile such impacts with the public concern for environmental quality; a great deal of courage to discuss the cumulative effects of dispersed septic tanks as opposed to a concentrated (landfill) source of pollutants; and an immense amount of technical and political credibility to accomplish any education. This may seem like an impossible situation, but it is one that directly impacts rural residents — a traditional sort of extension clientele. How can it be sidestepped?

Policy Issues — Internal

Before any educational organization can effectively deal with public policy issues, it must weigh the costs of such efforts. It is unlikely that a formal review would be undertaken, and programs may well proceed with implicit approval of administrators. The drinking water concerns are likely to escalate rapidly, however, and may well outstrip the resources available to sustain effective programs. A formal assessment of the likely demands — and costs — may be desirable to preclude emergency decisions after the program has begun.

There will be an urgent need for credible information. Not data — not knowledge — but *information*; the kind that can help build perspective and assist the community in understanding the problem and its likely impacts on them. The information may not be the kind that is well received. It may be "hard to swallow." It may provoke jibes in the local media.

The subject matter is likely to be somewhat unusual. It may well involve nontraditional audiences, and require similarly nontraditional subject matter specialists. It may strain existing institutional relationships and require new ones. It will require new linkages at the state specialist level. It may threaten some traditional support groups.

If, for example, the problem is excessive levels of nitrate in a community (public) water supply, who can/should provide leadership at the county level? Should it be a public policy issue? (There may be no choice). Which state specialists should be involved — the agronomists, the agricultural engineers, the environmental toxicologists, the geohydrologists, the extension veterinarians, faculty from the school of medicine? Any or all of the above? Can they agree on cause and effect, or on feasible solutions? What role can/should/might the extension home economists play?

Can innovative new solutions be found? Or is it adequate (best, safest) to rehash all of the old ones? Is it sufficient to suggest the use of extension fertilizer recommendations, or might more drastic steps be required? What are the likely impacts if farmers are encouraged to reduce their nitrogen use by 50 percent or more? Will the local fertilizer sales people continue to support such educational efforts? Will their mid-level managers, or their parent corporation? Will local government officials throw their support to a helpful agency under attack?

How will program coordination — among extension specialists — be coordinated at the state level? Can the organization reach a consensus on such issues, on an as-needed, case-by-case basis, without pleading for endless years of new research efforts?

In addition to all of these potential pressures and problems, there will be no little temptation to define existing programs as new efforts in water quality education. IPM, PAT, and irrigation scheduling may all impact water quality or quantity. Can they honestly be called water quality education programs? Should the organization conduct "business as usual" and redefine the objectives (but perhaps not the methods)?

The organization must avoid internal polarization. It must, in the final analysis, be a single organization, not a loose association of many separate program areas. Can such integration be accomplished?

Policy Issues — External

The major public policy issues are likely to be:

1. *Is agriculture an environmentally responsible business?*
2. *Are agriculture and "safe drinking water" compatible?*
3. *What is "safe drinking water"?*

Agriculture has been identified as a major cause of the inability of states to achieve their water quality goals [4]. As an extensive industry, agriculture is hard pressed to refute such charges.

The issues will seldom, if ever, be so clearly stated. The more likely, more apparent issues will deal with more pressing kinds of concerns. They are likely to be stated in terms of the immediate problem — whether it is nitrates, pesticides, or other toxics, from whatever source — in the water supply. These issues will revolve around the community health and welfare impacts; immediate (and later, long-term) remedial actions; and then the assignment of responsibility.

The health impacts issue — "What is this doing to me and to my family?" — will usually be of concern to everyone affected, whether because of their own sensitivity or because of media coverage (or overcoverage, or exaggeration). There will be no need to publicize this issue. It will become a major topic of conversation in the affected community. There will be demands for prompt action; and local officials will experience considerable pressure to take remedial action immediately, or sooner if possible.

A major problem is that there are no established standards for most substances in drinking water. This allows nearly anyone with an impression or an opinion to become an instant expert. Such a profusion of experts generally complicates the educational task.

The educational program on health effects should be followed closely — or perhaps even accompanied — by a program to provide information about remedial action. How badly/how soon is it needed? What are the options for remedying the problem? Should it be at the municipal level or at the household level? Who should bear the costs of such treatment? Who should ultimately pay for such treatment?

Policy Choices

When the immediate problems are addressed, there is likely to be some question of long-term remedial action. The public might afford an opportunity to be taught about the mechanisms that contributed to the water quality problem. It may be possible to specify with a fair degree of precision the source of the problem, and its movement to the water supply. If not, a number of alternative scenarios may be suggested, along with alternative strategies to prevent a recurrence.

In most situations, a number of potential alternatives may exist. One is to take no action at all. This is seldom an acceptable alternative in the face of public demand for action. It may also be a real challenge for policy educators!

A second alternative is to place restrictions on the use of contaminating material. This might range from a complete ban on a pesticide (e.g. EDB), to voluntary restraints on the use of nitrogen, to a ban on the acceptance of some materials in municipal land fills.

A third potential alternative is the use of different management systems. If the product requires the use of a specific chemical, perhaps the product can be changed. If EDB is essential to crop production, and is also contaminating the water supply, tobacco production will ultimately be forced out. If aldicarb is necessary for potato production, and is also contaminating water supplies, either a substitute will be found for the chemical or the potato production will be forced out of the area.

With the matrix of potential problems and alternative solutions, the reader is challenged to imagine the long list of potential consequences of such alternatives.

Implications for Citizen Education

In an area of public policy with such broad implications for a wide range of the populace, it will be essential to determine who the decision makers are. Who is the audience? This situation illustrates the basic strength of the decentralized delivery system that characterizes cooperative extension. The county agents are likely to know the decision makers at the local level. The public policy education specialists can define the decision makers at the state level. Few water quality issues are likely to be escalated beyond the state level.

There will be an urgent need for program integration within the cooperative extension system. There are likely to be honest and serious differences of opinion, which must be articulated in the development of reasonable alternatives. There is seldom a single answer for any real-life situation. There are educational opportunities for agriculture, for community and rural development, for home economics, and for 4-H in dealing with water quality problems. Such programs require program coordination and a firm commitment to honest discussion of both problems and alternative solutions.

Such programs will require a broad base of support. New clientele groups may emerge; old ones may assume different stances.

The issues will be *local, immediate* and *urgent.* They will not be at all amenable to "further study."

The challenges of water quality — and especially those of drinking water — will be with us for some time to come. Cooperative extension is a logical system to meet the needs for credible, factual information. The basic knowledge exists. Public policymakers can accept the fact that not every answer is known. Cooperative extension is well placed and quite capable of delivery. The challenge is ours to meet.

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WORKSHOPS

DIET-HEALTH ISSUES

WATER QUALITY — EVERYONE'S PROBLEM