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MANAGING FOOD SAFETY RISKS IN THE FOOD SYSTEM: POLICY OPTIONS AND OPPORTUNITIES FOR EXTENSION

Carol S. Kramer

*National Center for Food and Agricultural Policy
Resources for the Future*

Food safety, public health, and environmental risk management issues related to agriculture have grown in prominence and controversy over the past decade. These issues are personal, local, national, even global, in scope. They raise many complex management and policy issues for government, agriculture, the food industries and the consuming public.

Some recent examples illustrate the point. Recently, the U.S. Department of Agriculture (USDA) issued a press advisory about eggs, warning that they should not be consumed without thorough cooking. The Food and Drug Administration (FDA) has developed recommendations for food service establishments that largely counsel eliminating the use of raw eggs. The Centers for Disease Control (CDC) estimates that at least forty-three persons died between 1985-1989 from disease caused by *salmonella enteritidis* with 75 percent attributed to eggs. An additional 6,604 nonfatal cases of this foodborne disease were reported in that period. Of the sixty-five outbreaks of salmonellosis reported since February 1990, twenty-two were linked to eggs (Sugarman).

How should this issue be managed at the policy level and what are the implications of alternative approaches? Should policies focus on changing consumer or food service cooking techniques (equivalent to "blaming the victim" in the eyes of some consumer advocates and restaurateurs), or on cleaning up chicken feeds, chicken production facilities, or processing practices? Each of the options implies different distributional sets of costs and benefits of overall cost-effectiveness.

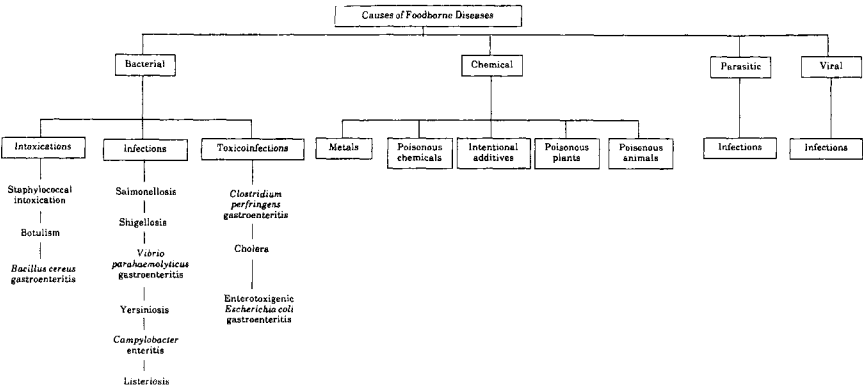
Another recent food safety issue is seafood inspection, championed by Public Voice for Food and Health Policy, a Washington, D.C., advocacy group. Consumer groups have fought for mandatory inspection for the past four years. Action has stalled currently but many consumer groups believe an eventual congressional victory is likely. Whatever the ultimate bill, several significant risk management issues remain to be worked out in implementation including program scope; inspection priorities; allocation of resources between species, agencies, and loca-

tions; and designation and implementation of jurisdictional responsibilities among federal agencies, industry, and other bodies.

Assuring the food safety of internationally traded foods constitutes yet another important set of contemporary risk management issues. Currently the General Agreement on Tariffs and Trade (GATT) negotiating parties in Geneva are attempting to hammer out agreements related to the harmonization of food safety standards (sanitary and phytosanitary standards). Essentially, the harmonization issue is a two-fold problem: how to protect the health and safety of animals, plants and humans living in distinctive environments, cultures and economies around the world; and, at the same time, how to facilitate trade among nations having inconsistent standards and conditions by assuring that food and agricultural standards do not unduly impede trade. Concerns have been expressed by consumer and environmental groups as well as U.S. agencies that U.S. standards should not be weakened. Some indications are that a coalition of consumer groups, environmental groups (and agencies), and commodity interests might combine to torpedo GATT action in this area. Changing the rules will certainly change property rights along with risk configurations.

In the past decade, numerous food safety concerns have emerged including those related to pathogenic microorganisms (or their toxins), poisonous chemicals including pesticide residues, parasites, or viruses (Gravani). Figure 1 provides a classification of foodborne diseases. In addition, new technologies such as food irradiation or various applications of biotechnology are challenged by opponents on safety or socioeconomic grounds just as they appear to offer new policy choices for food safety risk management.

Figure 1. Classification of Foodborne Diseases



Source: Gravani

Finally, scientific consensus has emerged in the last decade that total diet is potentially more important than single-ingredient or single-toxicant foodborne concerns in health promotion and disease avoidance. Important current policy issues related to dietary risk management include regulatory decisions on labeling and, especially, nutrition labeling; decisions on proper regulation of dietary health claims so consumers are not misled or defrauded; policies stipulating the commodity composition of federal or state food assistance programs and its relationship to nutritious diets; and policy defining the appropriate basis for establishing the Recommended Dietary Allowances (RDAs) of various nutrients. RDAs are used in a multitude of public and private dietary recommendations and formulations and, thus, it matters whether they are established for the "average" person or on some other basis. Finally, new food products produced or formulated to conform to altered nutrient profiles — such as substitute ("fake") fats, nonnutritive sweeteners, high fiber cereals, etc. — raise new issues with respect to product approval, labeling and effects on both diet and markets.

Fundamental Public Policy Questions

Public policy questions exist about each of these categories of food safety issues or potential public health hazards and the use of various agrotechnologies, the most fundamental being:

1. How do we determine acceptable levels of safety — in concert with the other goals of society — and what should these levels be?
2. How do we establish food safety and public health priorities?
3. What should be the relative role of governments, the private sector, and individuals in assuring food safety, health, environmental quality and other desired goals of the food system?
4. What is the best combination of policy instruments available to attain both the desired level of food safety and other goals?

Current Policy Environment

Both administrative and Congressional bodies exhibit renewed attention to food safety and the environment. Current expectations are that federal food safety research expenditures are likely to double in FY 1991 in response to public and Congressional pressures to devote more attention to food safety, particularly the control of pesticide residues and microbiological contaminants (*Food Chemical News* 1990A). The 1989-1990 Congressional session has included the introduction of approximately forty food safety bills. In addition to food safety, other concerns include environmental quality, water quality and worker safety associated with agricultural and food processing technologies. Many of these non food safety issues fall outside the jurisdiction of the FDA and can be acted on outside the jurisdiction of the agricultural committees of Congress. Indeed, the states exert increasing control over many environmental quality issues.

Against this backdrop, characterized by widespread interest and participation in food safety, public health and environmental policy making, agriculture in general and the extension service in particular are challenged to articulate a strategy relative to food system risk management that is two-fold: (1) anticipatory and (2) responsive. Obviously, many of the food safety, health and environmental issues — in the form they have arisen in the last decade, characterized by sudden media attention and chaotic public reaction — have been unanticipated. Controversy over Alar used in apple production is perhaps the primary example. This has led to many challenges to be responsive to crisis situations for which neither agriculture and the food industry nor the extension service have been adequately prepared. However, much can and should be learned from the many cases of the last few years and substantial groundwork already exists to better anticipate and manage food safety and associated risks that will arise in the future. This paper will discuss food safety risk management and some policy options in the next section followed by four brief points.

Risk Overview: Assessment, Abatement, Management, Communication

Clear thinking about the necessity for and distinctions between risk assessment, risk abatement, risk management, and risk communication strategies is critical to satisfactory risk management and policy making in both public and private food and agricultural arenas. An example illustrates the frequent confusion between risk assessment and risk management.

A major theme that has emerged in the recent food safety policy literature is the apparent mismatch between the relative concern of the consuming public and food safety experts about pathogenic microorganisms on the one hand and chemical contaminants on the other (Kramer). The majority of food safety experts in and out of government stresses the public health importance of microbiological contamination, pointing to the 6.5 million to 84 million cases of disease and approximately 9,000 deaths annually associated with such diseases as salmonellosis, *campylobacter* enteritis, listeriosis, or congenital toxoplasmosis (Roberts and van Ravenswaay). These are diseases associated with increasingly well-known frequencies of morbidity and mortality. Also increasingly well understood are the etiologies and pathologies involved. Finally, possibilities for management of the conditions leading to contamination and subsequently to exposure are also relatively well understood although the knowledge is continually evolving. On the other hand, most public health risk assessment experts, including cancer risk specialists, believe that pesticide residues in foods are relatively minor contributors to cancer, as an upper bound causing less than 1 percent of cancers in the United States (Gough; Ames; U.S. Environmental Protection Agency). Dr. Richard H. Adamson, director of the National Cancer Institute's Division of Cancer Etiology, has written that he is "unaware of evidence that suggests that regulated and approved pesticide residues in food contribute to the toll of human cancer in the U.S." (*Food Chemical News* 1990B).

Furthermore, neither epidemiology nor toxicology-based risk assessment (animal studies) are likely to definitively prove or disprove what is believed to be the relatively minor contribution of pesticides to the overall cancer burden (485,000 deaths per year). Some of the reasons that definitive conclusions cannot be drawn include the possibility that the substances are not human carcinogens at actual exposure levels; that the contribution of pesticide residues to cancer cannot be distinguished from "background" carcinogens; or that long latency periods for cancer obscure the causal relationships.

For the public, however, chemical threats to food and water safety have assumed increasing importance, seeming to overshadow most other foodborne hazards. The public is frequently perceived as extraordinarily consumed by the threat of cancer which overhangs one in four lives. This threat may attribute, erroneously and disproportionately, cancer causation to pesticide residues in foods. However, it is also possible that consumers and experts, presented with the same numbers, would disagree on the acceptability of the risks and on what to do. In addition to cancer, some consumer representatives and analysts fear that noncancer threats from chemical residues, which may not be thoroughly understood at present, are also relevant and worrisome (van Ravenswaay; U.S. Environmental Protection Agency; U.S. Congress, Office of Technology Assessment).

Thus, discrepancies in judgments about the acceptability or importance of relative health risks or in what to do about them represent differences in risk management preferences. They may or may not represent differences in risk assessments. This is a critical point because it implies that merely comparing probabilities of death or illness or the expected dollar costs associated with death or illness from various health hazards and then allocating resources to risk abatement accordingly may be an inadequate risk management strategy from a sociopolitical perspective. Factors such as the degree of involuntariness of the risk, the nature of symptoms involved, or the effect on children or the aged also influence judgments of acceptability.

Now for a definition of important terms:

Risk assessment refers to techniques for estimating the magnitude of risk people face or, in other words, "the process through which we attempt to determine the likelihood and extent of harm that may result from a health or safety hazard" (Glickman and Gough, xi). Quantitative risk assessment is commonly executed in four stages: hazard identification, estimation of the population exposure to hazard, estimation of dose-response relationships, and characterization of effects.

Risk abatement, by contrast, refers to techniques to control risk from given hazards. For example, alternative risk abatement strategies to control *salmonella* contamination in poultry might include use of irradiation, a chemical rinse or alternative livestock feed or poultry plant processing methods. Risk abatement alternatives are amenable to cost-effectiveness analysis in which strategies are compared and the distributional impacts on different food system participants analyzed.

Risk management involves decision making that integrates knowledge and values from multiple information sources including economics, the physical sciences, epidemiology, toxicology, politics, sociology, ethics, the law, psychology, communications and other fields. Alternatives are discussed below.

Finally, *risk communication* is increasingly understood to involve multidirectional (at least two-way) communication among parties concerned about or involved with health or environmental hazards and risk. Key points in risk communication as the literature is evolving are the importance of iterative two-way flows of information and the criterion that successful risk communication should be measured, not by persuasion to a single point of view, but by the extent to which levels of understanding of all parties are elevated (National Research Council, 1989).

Risk Management Options

In bare-bones fashion, this section lays out a risk management framework with application to controlling food safety risks. Figure 2 presents an overview of the managerial role including some of the most important sequential functions involved. The overall managerial mission (step 1) varies with the type of organization.

FIGURE 2: Risk Management Steps.

1. define problem and/or mission
2. gather information
3. identify alternatives
4. evaluate consequences
5. apply a decision rule
6. take action
7. communicate action
8. bear consequences
9. receive feedback

The mission associated with a public health agency will obviously differ from that of a private sector agricultural or food manufacturing firm which has profit objectives dependent on a host of factors in addition to food safety. Differences in managerial objectives between organizations, then, stem from assorted factors including legislative mandate; agency versus corporate incentives such as optimization of agency budget, votes, profit, or market share for the bureaucracy, political candidates, or private sector actors; administrative requirements; political reality; the scope and magnitude of risks involved; technical know-how; or economic resource availability. Each can constrain the food safety risk management alternatives actually applicable or feasible in any given situation. Similarly, the decision to seek information (based on data) relevant to food safety risk management (step 2) and each of the subsequent steps in the managerial process may be influenced by many of the same factors. Information and abatement costs vary extremely broadly as do the potential benefits.

As one contemplates the steps in the managerial process, it is obvious that risk management integrates risk assessment, risk communication and evaluation of risk abatement strategies in an ongoing process. For example, risk communication is integral to steps 2, 3, 4, 7 and 9 while risk assessment contributes to steps 2, 4 and, eventually, step 10. Risk abatement strategies are considered or relevant in steps 3, 4, 9 and 10.

Public policy options for controlling food safety risk include several distinct options. A primary tool is regulation including establishing standards and carrying out their enforcement. Regulatory authority flows from each of the major federal food safety and marketing laws including the Federal Food, Drug, and Cosmetic Act, administered by the FDA; the Agricultural Marketing Act, the Wholesome Meat Act, the Poultry Products Inspection Act, the U.S. Grain Standards Act, and the Eggs Product Inspection Act, administered by the USDA which shares authority for egg product inspection with the FDA. In addition, the Environmental Protection Agency (EPA) administers the Federal Fungicide, Insecticide, and Rodenticide Act and, through this authority, approves and otherwise regulates pesticides used in agricultural production.

Regulatory standards include some basic alternatives used singly or together: (1) final product standards; (2) production and processing standards; or (3) information standards or requirements. Public requirements for private sector information may include: research and data demands, accounting requirements, records of chemical audits (inflows-outflows), or labeling information. Public agencies may be required to perform formal risk assessments according to established rules or protocols and drawing on private sector laboratory studies.

In addition to these regulatory approaches, increasing consideration is being given to the role of market-based incentives including use of taxes (or fines) or subsidies or disclosure rights (such as health claims) that can discourage or encourage adoption of particular safety-related practices. One major area of public subsidy leading to decreased costs of safety information available to the private sector is publicly supported food safety-related research.

Finally, a classic risk management policy option is reliance on the legal liability system to redress grievances. For a number of reasons, mainly imperfect consumer information and high transactions costs involved in organizing a legal suit, legal redress has been considered largely unsatisfactory for settling many food safety problems. Many foodborne diseases cannot be easily traced back to the originating source. This means that producers or food distributors are frequently unaware of their contribution to foodborne illness.

Important factors in making a risk management determination are the possibility, feasibility and costs of risk reduction. Here an understanding of HACCP or Hazard Analysis Critical Control Point methodology is critical. HACCP methodology was formulated to systematically

integrate an assessment of health hazards associated with the production and processing of food, the identification of critical control points necessary to prevent or control the identified hazards, and the establishment of monitoring procedures.

The HACCP approach emphasizes those aspects of an operation that are critical to ensuring food safety and preventing spoilage; it therefore relates more specifically to health hazards than to other aspects of the total quality control approach, such as aesthetic considerations, quality, or compliance with a set of regulations (National Research Council, 1985, p. 124).

Using this approach, all suspected hazards emanating in the food production, processing and distribution process must be identified and tested for; in addition, those critical points at which hazards may be eliminated through a control procedure (abatement procedure) should be identified and methods devised and tested to assure that control is reliably carried out. Monitoring systems are critical to the successful operation of this approach.

The determination of how important a particular potential risk associated with the production and marketing of food is and how it compared to all other potential risks is a complex and unsure matter. Coupled with the challenge of relative risk assessment is the further challenge of a risk management strategy integrating information about abatement options, their cost-effectiveness and acceptability to consumers, regulators and employees. Finally, as Figure 1 indicates, interactive risk communication that builds in adequate feedback is an essential part of the challenge. A risk communication component of risk management should incorporate both anticipatory and responsive approaches.

In closing, I would like to make, and briefly discuss, four points relevant to public and private sector risk managers:

Uncertainty and Risk Assessment

1. *Risk assessment is a highly imperfect exercise, almost by definition, due to multiple sources of uncertainty and the need to make judgments about the magnitude and importance of the uncertainty.* This is so despite the seeming scientific technicality of the estimates and the "experts" involved (Finkle). Uncertainty surrounding estimates may stem from the fact that values of important variables may not be known with certainty—for example, neither dose-response mechanisms or relationships nor their distributions may be understood—and extrapolations must be made from animal laboratory tests to determine potential human effects.

In most controversies over risk management, disputes over risk assessment plays a role. Experts may disagree over assumptions, over models used and evidence admitted, over decision rules and over interpretation of results. Lay people may discount the entire exercise of

quantitative risk assessment for reasons they view as ethical differences. Yet the controversy over risk management could be considerably eased, if risk assessment itself were better understood and communicated. It is critical that the values, assumptions, purposes, quality of data, levels of uncertainty and models used be described, debated and communicated. It is even more critical that a general understanding be reached that risk assessment is not synonymous with risk management. It is merely one input into what must ultimately be a management and a policy decision.

2. *Risk management inevitably involves making trade-offs. These trade-offs are not only economic, but political and ethical, usually with winners and losers.* Risk management is a relevant concept—because it is an imperative—for all individual and collective entities participating in the food system. Risk management may be executed consciously or by default. It is perhaps most characterized by decision making with respect to alternative allocations of resources in a risky environment. In my opinion, the most critical missing insight in both private and public sector debates about the management of risks from food safety or environmental hazards currently is the lack of consideration of alternatives and of trade-offs associated with alternatives.

Far too often, food safety hazards or particular technologies are denounced as absolute evils which should be eliminated at all costs because of a moral imperative to eliminate a particular risk. Missing is the management framework, including economic analysis, which explicitly admits that there are trade-offs that matter; that information or abatement costs may increase at the margin, sometimes exorbitantly; and that other objectives must also be pursued. Ruckelshaus, two-time EPA administrator, makes the point:

... in confronting any risk there is no way to escape the question "Is controlling it worth it?" We must ask this question not only in terms of the relationship of the risk reduced and the cost to the economy but also as it applies to the resources of the agency involved. Policy attention is the most precious commodity in government, and a regulation that marginally protects only 20 people may take up as much attention as a regulation that surely protects a million (Ruckelshaus).

3. *One of the most difficult present problems is attaining agreement as to who should make risk management decisions.* The jurisdictional boundary issue is particularly problematic in the food safety debate. This is witnessed by conflicts between federal agencies and between state and federal government over management of toxics (Proposition 65 and the "Big Green" initiatives in California are two of the most obvious examples). Jurisdictional disputes are also emerging as a point of debate as the GATT negotiations wind up. Finally, the poultry and egg problems mentioned earlier are yet another manifestation of conflicts in judgments as to who should decide, act and pay to reduce risk of foodborne disease. Economic, legal and political rationales may sup-

port different jurisdictional decisions. It is frequently more cost-effective for particular decisions or actions to be taken at particular points. Ultimately, however, these jurisdictional issues require policy decisions which generally reflect traditions of both representative democracy and the need for delegated authority.

4. *Extension, with its long involvement in public education including public policy education, is uniquely placed to contribute to better risk management—including risk communication—and better policy formation related to food safety, health and environmental risks associated with agriculture in the future.* In order to do so extension must encourage multi- and interdisciplinary collaboration. In addition, new skills of risk communication, risk management, negotiation and conflict resolution must be learned and incorporated in the approach.

Several traditional areas of extension programming are directly pertinent to risk management of the type we have been discussing, including crop and animal science, food science, nutrition, farm management, home economics, etc. In addition, extension has an extensive history in public policy education which is increasingly issues-based.

What has been less frequently done in extension, is positioning and organizing knowledge and insights from these several fields in a risk management or risk policy framework. Too often, each specialist persisted in addressing the technical aspects of particular problems in isolation from complementary expertise or perspectives.

The value of a management or a policy framework in addressing issues associated with technological risk (resulting in food safety, health or environmental hazards) is to explicitly integrate information about trade-offs associated with uses of technology, information about consumers and other segments of the public, agricultural producers, food manufacturers and policy makers. The goal is to be able to generate systematic information about a variety of problems, technologies, abatement strategies, values and impacts (on profitability, on food safety, health, or environmental risk exposure).

My final point for extension is that considerable scope exists for expanding extension effectiveness in dealing with these issues by exploiting and adding to emerging knowledge about risk communication and conflict resolution. In each area, research and experience are accumulating that suggest new ways for extension to facilitate dialogue; help identify, and help participants identify, common ground among disputants; and to educate how policies can be shaped for the future.

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