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Session VI

Food Quality and Safety: Impacts on Marketability

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SAFETY AND QUALITY CONSIDERATIONS IN MARKETING CALIFORNIA'S SPECIALTY CROPS

Safety as a Factor in Marketing Specialty Food Products

Food safety continues to be a thorny issue that defies easy resolution. The thorniness relates to the dynamic nature of our scientific and technological progress on the one hand, and the growing consumer apprehension of chemicals on the other. Producers maintain that the evolution of new processes in food production and processing has led to reduced costs and an increased quantity and a greater diversity of available foods. But some consumers are wary of change and tend to favor governmental intervention to mitigate perceived risks to health and safety.

Risks to consumer health and safety from food consumption are posed by the presence of potentially harmful materials, including naturally occurring toxins, microbes and microbial toxins, pesticide residues, processing chemicals, and foreign or extraneous matter. Safety risks are also posed from poor handling practices by consumers themselves.

Consumer surveys in recent years indicate that there is a persistent concern by the general public regarding the hazards of pesticide residues and similar chemicals of production on the public health. When asked to rank the seriousness of the perceived hazards, the general public consistently ranks pesticide residues at the top of the list and, in decreasing orders of seriousness, such nutritional components as fat and cholesterol, salt, sugar, food additives, food preservatives, food colors. And, if asked, they ranked the microbial hazards towards the bottom of the list (Figure 1). This is in sharp contrast to the belief of many scientists and most food producers that microbial hazards are the main concern, due to outbreaks of food poisoning caused by micro-organisms. Pesticide residues ranked fairly close to the bottom when listed by food experts (Figure 2).

However, in support of the consumers' listing, there was one notable occurrence. This was the recent outbreak of illness caused by the ingestion of watermelons contaminated with a pesticide, aldicarb, which is not supposed to be used on such crops. Note that this incident was not caused by the residue of a *legal* pesticide for melons.

Figure 1.

Food Safety Concerns of Consumers

Higher Concern



Lower Concern

**Irradiation of Foods
Pesticide Residue
Cholesterol and Fats
Salt and Sugar
Food Additives
Microorganisms
(Salmonella, Botulism)**

Figure 2.

Food Safety Concerns of Experts

Higher Concern



Lower Concern

**Microorganisms
Fats
Salt and Sugar
Cholesterol
Pesticide Residue
Food Additives
Irradiation of Foods**

At about the same time were a number of microbial-caused problems. There was an outbreak of listeriosis from cabbage that had been fertilized with the manure of sheep that had had the disease and another of salmonellosis from apple juice. In this latter case, the apples had come in contact with manure used as fertilizer, had been rinsed, pressed for juice, refrigerated, but not heat-treated. And, of course, you recall the large-scale outbreak of salmonellosis from milk and of listeriosis from soft Mexican-style unripened cheeses. All of these were cases of foodborne infection or an intoxication from food that occurred a relatively short period after ingestion of the food. These serious problems support the scientists' listing.

There is considerable concern, however, among many consumers about the long-time effects of chemicals of various types used in food production and processing. The big worry is their possible contribution to cancer in humans and to unwanted mutations and birth defects in children whose mothers ate food contaminated with these chemicals.

Although assessment of the risk of cancer from chemicals in the environments is imprecise, it is nevertheless necessary, in order to allow a reasonable determination of the risk/benefit status of any single chemical. A system to evaluate and compare such risks has been developed by Ames, Magaw, and Gold.¹ The system is called the Human Exposure Rodent Potency (HERP) index which is the ratio of the estimated amount of exposure to a chemical to the amount of the chemical that causes cancerous tumors in mice or rats. In this system, for example, residues of ethylene dibromide (EDB) on grain has a HERP about 100 times less than the HERP for aflatoxin in peanut butter, so it is peanut butter that has the considerably greater risk of causing cancer.

Another system of risk assessment was used by the National Academy of sciences (NAS) which was commissioned by the Environmental Protection Agency to evaluate the risks of cancer by residuals of approved pesticides. Although the full report has not yet been studied, the NAS announced that 10 pesticides contributed about 80 percent of the risk and that the use of these plus 18 additional pesticides could possibly cause six cases of cancer per 1,000 population. It must be remembered, however, that this was a worst-case scenario, for it assumed that the maximum legal limit of pesticides was consumed daily for a period of 70 years by the population. The NAS recommended that the Delaney clause of the Miller Amendment of the Food, Drug, and Cosmetic Act of 1958 should be extended to cover both processed and raw food products. But, at the same time, they recommended that the Delaney clause should be modified from the present "zero" risk requirement to a "negligible" risk. A negligible risk of one case of cancer per one million population was suggested. The NAS report also ranked several raw foods, with respect to their extent of residue of the 10 pesticides, implying thereby a ranking of risk. The hope is that the NAS report is not misconstrued as providing evidence that the U.S. food supply is unsafe in constituting a serious risk of cancer.

Policy Implications

Important issues of food safety remain unresolved; questions once settled are being challenged. Consumers express strong preference both for more enforcement and for more information on food safety. On the other hand, industry

and many in the scientific community perceive that the existing system of overregulation imposes a constraint on research and development. For policy makers the challenge is to discover an optimum level of enforcement. Too little enforcement increases consumer and producer risk; too much may increase the costs of enforcement, retard technological development, and yield only small marginal improvements in safety. Many feel that cost-benefit calculations ought to be more frequently used in forming regulatory policy. And the issue about patent life for new substances, given the producer cost and the risk involved, needs to be addressed.

Government, industry, and educational and research institutions need to clarify their respective roles with respect to food safety. Consumers desire and need extensive education on safety hazards. Once they understand that it is not possible to eliminate all risks, they may accept the notion of focusing their effort and resources in combatting risks in accordance with their level. Yet, we must observe that techniques to measure actual consumer risk remain problematic. Tolerance levels and licensing and registration procedures will, therefore, probably tend towards the conservative side.

Because the most common food safety hazards occur in the home, consumer education, with respect to handling, storage, and food preparation will continue to be a critical need. This is not simply a matter of public health, for the best interests of many food industries are served by insuring informed, careful, and appropriate consumer use of their products. This may call for increased investment by the food industries to reduce household sources of risk associated with their products.

Health and safety regulations in international trade require further development of international protocols to create global standards. Effective global standards would remove one important barrier to movement of food and agricultural products across borders. The widespread practice of using health and safety standards to restrict imports is of long historical standing. Virtually no nation is innocent of its practice. International guidelines for health and safety are being promulgated by the United Nations. Although these guidelines are voluntary, if adopted by a large number of countries, they may enhance the efficiency and flow of international trade in food and agricultural products.² However, pending the establishment and acceptance of universal health and safety standards, national standards will continue to be used, thereby continuing to create friction in the international flow of products.

Quality as a Factor in Marketing Specialty Food Products

Perishability and its quality implications have been approached from two directions: (1) There has been considerable research in food storage and preservation, and variety selection has tended towards those that produce a hardier, less vulnerable product. (2) Most fruits for the national market are harvested prior to their optimal level of maturity. Neither of these techniques, however, eliminates risk of quality deterioration.

Increased temperature probably has the greatest effect on the postharvest quality of perishable products. For each increase of 10°C (18°F)

above the optimal level, the rate of product deterioration increases—doubles or triples. Temperature influences the effect of ethylene, oxygen, and carbon dioxide on the product as well as the activity rate of certain plant pathogens and nonpathogenic spoilage microbes.

Much emphasis has, therefore, been given to cooling as a way of retarding deterioration and preserving quality. However, too low a temperature can itself cause product damage. The temperature range that can cause chilling damage varies with the commodity. Chilling injury results in such faults as surface and internal discoloration, pitting, watersoaked areas, uneven ripening or failure to ripen, off-flavor, and the development of surface molds and decay.

As markets have widened geographically and times between harvest and consumption have lengthened, producers have increasingly utilized varieties that produce hardier fruit and vegetables. The California iceberg lettuce market probably owes as much to the product's keeping qualities as it does to its flavor. The fresh tomato market is increasingly dominated by varieties that ship and handle well. Strawberries have similarly seen a trend toward hardier varieties.

Marketing Implications of Quality

Innovators in the produce industry are taking advantage of increased consumer interest in fruits, vegetables, and specialty foods and are using freshness and quality as competitive factors. While cost will continue to influence consumer decisions, choices will increasingly be driven by quality considerations. As a consequence we are likely to see more differentiation on the supply side to match the increased heterogeneity occurring on the demand side. Although some producers and marketers will continue to target the mass market, emphasizing cost competitiveness, and selecting products with longer shelf life—and perhaps less flavor. Other producers and marketers choose to target a more specialized but growing class of consumers who demand higher quality products, i.e., fresher and more flavorful. Some producers are already tapping this market by advertising “vine-ripened” and “tree-ripened fruit.” But more mature fruit and younger and more tender vegetable products cost more to market. They must be handled and packed more carefully to reduce the risk of damage and spoilage. Whether it is economically rational to produce or market a higher quality product depends on the elasticity of the demand for the various levels of quality, the cost of producing each quality level and the risk attached to the production and marketing of each type of product.

Studies indicate that U.S. households discard a surprisingly large percentage of the food they purchase. Food handling up to the retail level is responsible for some of the problem. But consumer lack of knowledge and neglect of appropriate storage, handling, and preparation of perishable food commodities is a fundamental cause. It is, therefore, in the best interest of the production and marketing systems to inform and educate consumers of the requirements and characteristics of these commodities.

Case Studies

In the longer report of the study group on food quality and safety are found several case studies on proper postharvest handling to present, preserve, and maintain a safe, quality product on the market. Details are presented for

California's stone fruits, table grapes, cole crops, and fresh tomatoes. Postharvest handling and transportation are also discussed in Session V of these proceedings.

Endnotes

¹See Bruce N. Ames, Renae Magaw, and Lois Swirsky Gold, "Ranking Possible Carcinogenic Hazards," *Science*, Vol. 236, April 17, 1987, pp. 271-280.

²In 1977 the U.N. Economic and Social Council commissioned a survey of regulatory and legal consumer protection systems in member countries. Subsequently in 1984, after three years of discussion and debate, the United Nations adopted a set of guidelines that establish minimum standards that may be adopted by U.N. members.

HIGHLIGHTS OF PANEL DISCUSSION

Quotes paraphrased

There are three important issues related to food quality and safety in the United States: (1) an increasing public awareness of the role of food and nutrition in health, (2) a heightened public concern that the current regulatory process may not be dealing effectively with food safety problems, and (3) a lack of consensus among producers, consumers and the scientific community on questions of risk assessment.

Archibald: These issues are important not only for future marketing of California agricultural products but for future technology and its rate of adoption....And this involves biotechnology, not just agricultural chemicals.

The extent of consumer concern about pesticide residues is a central question. One view is that, despite mass media reports and the statements of advocacy groups, most consumers are not particularly worried—or, at least, become worried only when a particular incident puts pesticide residues on the front pages.

Obbink: Food safety is a latent concern...You ask them, and people will tell you that yes, food safety is very high on their agenda. But people have not stopped buying....During the past two years, despite attacks on the table grape industry in the press, we've shipped the biggest crops ever.

However, these latent concerns have led to use of residue testing as a marketing technique, with certain grocery chains advertising that they have instituted their own private testing programs.

Obbink: This crazy quilt of promotional schemes is confusing the consuming public....I would like to see a national commission

of some type established to develop public policy in the arena of food safety, so that we as consumers know that when we buy something in the store...it is a safe thing to do....

A contrasting view is that the public considers food safety assurance to be a basic function of government, and that the public, by and large, assumes that food in the market is safe. However, this crucial assumption can be weakened by doubts about government credibility. To avoid this, more information is needed.

Salisbury: Some kind of constructive solution is needed to the problem of the inadequate base of information we have about food safety. I'm speaking particularly about pesticides in the food chain....

This viewpoint suggests that consumers' purchasing behavior in the market is not necessarily a true indication of their feelings about food safety in the long run.

Salisbury: When you look, for example, at the tremendous change in people's attitudes toward smoking during the last decade, you see the potential for the public really exercising its will in this arena....We have plenty of indication of profound public concern over pesticide residues.

The Risk Element

Public attitudes toward risk are a central issue. Surveys have shown that the public rates pesticide residues as unrealistically risky, compared to other sources of danger. This is taken by some to indicate that the public's judgment is faulty. But the public may be considering other factors besides those in actuarial tables—factors such as the potentially catastrophic nature and the delayed and unknown effects of pesticide residues, and the amount of choice consumers will have in taking the risk.

There are two important groups of consumers—the public in general, and a small component of the public that pays particular attention to food safety issues.

Jones: However, the general public has a kind of basic uneasiness about the safety of the food supply....Since most people realize they can't be scientists or regulators, they want to know that there is a system in place that protects consumers....

Two forces are weakening public trust in such a system. The first is a general distrust of government. The second is the conflict between special interest groups—producer groups on one side and environmental and consumer groups on the other. The immediate political struggle is at the national level over revision of major federal food safety and pesticide laws.

Also, as mentioned before, some are seeking to take advantage of the public's uneasiness by private residue testing. In the long term, this could create problems.

Jones: If the system of private residue testing says or implies that food isn't safe to eat unless tested by a particular firm or chain store, then the whole concept of government regulations and government's ability to protect us is brought into question....The bottom line is that consumers are looking for a system of protection in which they can have confidence...

Assessment of Risk

Would improved scientific risk assessment by public agencies reassure consumers? It's doubtful, considering the general distrust of government, the psychological and political dimensions of the problem, and the fact that even scientists don't agree.

York: It's a lot easier to scare people than it is to reassure them....Maybe a national consortium of some kind can approach this risk assessment problem so that consumers—and we're all consumers—can allay their own fears...

Jones: It's simplistic to say we just have to get people to better understand risk assessment....There has to be a way to more meaningfully involve the public in these decisions, because that's what they are asking for....Their attitude is: Once I know the level of risk involved, then I'll make the choice if I want to take that risk.

Some retailers of organic produce indicate that their customers may not always buy it, but they want to know that it's available—so that they have the choice. However, current consumer behavior may not indicate long-run trends.

The question of risk assessment is complicated by what some see as inadequacies of the current system. Consumer groups, for example, point out that many pesticides now in use have not been re-evaluated with more current scientific methods. Another complicating factor is that the question of "zero risk" versus risk-benefit analysis can only be resolved in the political arena.

Finally, there is the question of differing pesticide-residue standards for domestic produce compared with imported produce. Differing standards may give imported produce a cost advantage. Weaker standards raise safety concerns with consumers—with potential negative spillover effects on U.S. produce marketed alongside.

Obbink: There is great concern about the importation of products, especially from Third World countries....There are people who would like to use the importation issue as a trade barrier, as part

of the protectionist wave....That's why there must be a national public policy on this issue.

Other Issues

Questions to the panel and their responses included:

1. Will increasingly stringent regulations on California agriculture hamper the state's competitive situation, or can the claim that California has the world's strictest protection be turned into a market advantage?

Obbink: We don't need more laws; we need to enforce the ones we have.

Salisbury: I suggest that there could be tremendous advantage here for California, in terms of its leadership in meeting safety regulations, which could enhance marketability of its products...

York: We have to be careful with this—it's a two-edged sword. Don't present California to the rest of the nation as somehow superior because our rules are more stringent for some commodities....

Jones: On one hand, I love to hear that California has a competitive advantage in abiding by more stringent standards. On the other hand, I hate to hear the implication that another state's or another country's food is not safe, when I'm not sure that is the case....In the long term, if consumers feel that food isn't safe, then we have a real problem....I don't think we have to specify how many pesticides were used, or that there aren't any residues on a particular product—that may be overkill. I think promoting the generic quality of California-grown produce is a better way to go.

2. Considering recent discoveries about natural mutagens and carcinogens in various foods, should growers of particular commodities be concerned?

York: It's true that some naturally occurring chemicals are potent in test animals. Mother Nature has done some special things with a lot of plants. But I don't think this will lead to any widespread banning of products....Professor (Bruce) Ames has made these comparisons to show that in the minds of many people who study the causes of cancer, pesticides are really a very minor risk in comparison to naturally occurring carcinogens.

Jones: It's unlikely that we will see commodities banned, for two reasons. One, there's a cultural acceptance of foods that we have eaten for centuries. Two, we really don't know that much about naturally-occurring carcinogens in our food, and

research money is not going into that area to the degree needed to get something banned. The only problem might be where you are deliberately breeding for the natural pest resistance in a plant....

Salisbury: I would caution against assuming that the food safety problem will be solved just by telling consumers that they ought to be more concerned about naturally-occurring carcinogens than those from the chemical industry. That approach is not going to be very effective in terms of the long-term solutions we need. Besides, we need to look beyond carcinogenicity to other physical effects—birth defects, sterility, allergic reactions.

3. What would be the effects of labeling California food products as pesticide-tested, or pesticide free?

Salisbury: Labeling could help solve the need for national uniformity, as well as give California a chance to promote its advantage....

Obbink: We don't need labels, we need to have the confidence back that if it's on that retail shelf, it is safe to eat....

Jones: Labelling of fresh produce would be very difficult. We may need to educate consumers beforehand, so they know what the label is for....And it may be only a very small segment of the public that is concerned enough to want to know....

Salisbury: The question of voluntary choice is important. There is some protection for agriculture in being sure that the consumer is making an informed choice....Labeling might provide that benefit.

Comment from audience: It depends on the scope of the labeling requirement....If the label says there is a carcinogen in this produce, that would surely work against us. And how would labeling requirements affect overseas marketing?

4. How does the consumer movement view the problem of food hazards from microbial activity, compared to chemicals? (Many scientists consider chemicals to be relatively less threatening.)

Salisbury: Consumers Union, for example, is litigating against raw milk products....The typical consumer is more likely to be informed about microbiological dangers than pesticide residues; so consumer organizations tend to focus on arenas where consumers are less likely to delve in and understand the issue....

York: The microorganisms of most concern do not change the appearance, the texture, the odor of the food...the best thing we can do about microbial problems is to alert the consumer on the proper way of handling foods to avoid the problem....But, even so, diarrhea and vomiting are really not as life threatening as cancer—the extent of the possible hazard is also very important in the public's perception.

5. What is the role of biological pest control in this issue?

Archibald: Increasing levels of pesticides are being used in California on crops where pest resistance has emerged. The economics of alternative, or nonchemical, pest control technology is an important question.

York: Integrated pest management is important in California....But some nonchemical approaches, such as genetic engineering of resistant species, also stir up some problems.

Obbink: Most fruit growers would love to avoid the use of chemicals for cosmetic reasons. They are all working on integrated pest management.

The University of California Agricultural Issues Center

In recognition of the increased complexity of the agricultural sector, in July 1985 the Regents of the University of California established the Center for the Analysis of Western Agricultural Issues (Agricultural Issues Center). The Center conducts applied research and analysis of issues important to California and western agriculture. The Center also has an outreach function as it extends knowledge to agricultural organizations, state and federal agencies, interest groups active in the policy process, and the general public. The interdisciplinary nature of the Center facilitates its analysis of complex multidimensional agricultural issues and their public policy implications.

The California Legislature has endorsed six priority areas of concentration:

1. International trade, with particular attention to its effect on economic stability and market development. Special emphasis is to be given to trade with Pacific Rim nations.
2. The effects of advances in productivity and technology on agriculture, with particular attention to social and economic impacts.
3. Natural resources, with particular attention to water, land use, and energy policies.
4. A heightened awareness of the role of various minority groups in agriculture and allied industries.
5. The impacts of national agricultural policies and of fiscal, tax, and monetary policies on agriculture in the West.
6. The implications of changing domestic and worldwide food consumption patterns on western agriculture.

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