

Valuing the benefits and costs of improved food safety and nutrition[†]

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Assuring the quality of food products, especially their safety and nutrition levels, is an increasing focus for governments, companies, and international trade bodies. In choosing quality assurance programs, public and private decision-makers must assess the benefits and costs of expected improvements in food safety and nutrition. This article discusses methods for measuring these benefits and costs as well as how these valuations are related to the mix of voluntary and mandatory quality management systems used in particular countries or trading blocs. These relationships are illustrated by a short case study of safety assurance systems for meat and poultry products.

1. Introduction

Assuring the quality of food products is an increasing focus for governments, companies, and international trade and standards bodies. Their efforts are intended to influence the many attributes of food products (see table 1), with particular care given to food safety and nutrition attributes. Quality assurance is gaining in prominence because quality attributes are being more highly valued by governments, consumers and companies. This higher valuation is prompting more voluntary quality assurance by food companies *and* more regulation by government.

At the same time, regulations are under closer scrutiny both domestically and internationally. As demands for regulatory accountability have increased, governments are increasingly required to use risk assessment and benefit–cost analysis to evaluate whether existing or proposed food regulations enhance public welfare. For example, in the United States new major regulations must pass benefit–cost evaluation at both the agency and

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Table 1 Quality attributes of food products (with examples)

1. Food Safety Attributes
Foodborne pathogens
Heavy metals
Pesticide residues
Food additives
Naturally occurring toxins
Veterinary residues
2. Nutrition Attributes
Fat
Calories
Fibre
Sodium
Vitamins
Minerals
3. Value Attributes
Purity
Compositional integrity
Size
Appearance
Taste
Convenience of preparation
4. Package Attributes
Package materials
Labelling
Other information provided
5. Process Attributes
Animal welfare
Biotechnology
Environmental impact
Pesticide use
Worker safety

Source: Hooker and Caswell (1996).

presidential (Office of Management and Budget) levels. The agencies are also under increased pressure to design effective regulations due to new requirements under the Government Performance and Results Act (GPRA) of 1993. Internationally, trade and standards bodies are using agreements as a means of limiting the use of quality regulation as a non-tariff barrier to trade. Key examples are the Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) Agreements now being implemented by the World Trade Organization (WTO). To date, major food safety cases before the

WTO have focused on risk assessment. An example is the beef hormone case brought by the United States and Canada against the European Union (World Trade Organization 1998). However, the benefits and costs of a regulation and their incidence are an integral part in the interplay that determines which cases get brought and how they are judged (Caswell and Kleinschmit 1997; Hooker 1997).

This article provides an overview of what is known, economically, about the value, in terms of benefits, placed on a safer, more nutritious food supply. It also discusses efforts to measure the value, in terms of costs, of assuring higher safety and nutrition levels. Finally, it turns to what the mix of benefits and costs suggests about whether quality assurance is best provided voluntarily by companies or mandated by government regulation. A short case study of safety assurance in the meat and poultry industries illustrates the major considerations.

2. Placing a value on the benefits of food safety and nutrition

Placing a value on the benefits of improved food safety and nutrition is a key step in making choices between quality assurance programs. The major benefit of a safer and more nutritious food supply accrues directly to consumers in the form of better health. A higher quality food supply may allow consumers more easily to maintain their health, protect themselves against external health hazards, and rehabilitate their health in case of damage (van Ravenswaay 1995). Other benefits are important as well. Among these are avoidance of external costs imposed on the health care system by consumers' food choices and of expenditures related to averting behaviour by consumers to avoid risky or poor quality products. Food companies can also benefit from assuring higher quality, for example, by attaining a better reputation with consumers, longer shelf life for their products, or better access to foreign markets.

Economists use several different approaches to measure the benefits of safer or more nutritious foods, especially at the consumer end of the market. The variety of approaches is necessary because the food attribute to be analysed (e.g., lower levels of *Salmonella* contamination) and the benefit to be measured (e.g., from a lower incidence of salmonellosis) are rarely directly valued in markets. Market valuations are infrequent because of inherent information problems associated with the attributes (Henson and Traill 1993; Kinsey 1993). These are largely credence attributes where the consumer cannot judge the quality level even after consumption of the product. For example, the fat content of a frozen pizza varies substantially based on the amount and type of toppings used (cheese, pepperoni, etc.) and

the fat level of those toppings (e.g., low- or full-fat cheese). Fat content may be generally judged by the consumer by observing the pizza but with the large number of formulated ingredients in use today, this judgement may be inaccurate. Consumers have even more difficulty judging the level of safety (e.g., contamination by foodborne pathogens, amount of pesticide residues) in the products they buy and consume.

Quality signalling (especially labelling) can transform credence attributes into search attributes allowing consumers to judge quality before purchase (Caswell and Mojduszka 1996). The United States has taken this approach to improving markets for nutritional quality by making nutrition information panels mandatory on food products and strictly regulating the use of voluntary claims such as 'low in fat' (Caswell 1997). In contrast, many countries discourage or do not allow labelling of safety attributes, often hindering development of markets for this attribute. Regulatory regimes have focused instead on process and performance standards that assure uniform minimum safety levels for all products sold. Thus when we look at food products, an active market for nutritional attributes is relatively new, while the market for safety attributes is even less developed. In this context, how do economists measure the benefits of a higher quality food supply?

2.1 Using cost of illness

The most used, and perhaps most reliable, measure of the benefits of a higher quality food supply is actually a measure of avoided costs. The cost of illness approach measures the benefits of, for example, a food safety improvement, by the value (costs) of the avoided illnesses, deaths, losses in income and leisure, pain, and suffering. Over the last ten years this approach has been developed in the United States for the costs of foodborne pathogens by Tanya Roberts and her colleagues (e.g., *CAST Report 1994*; Roberts and Marks 1995; Buzby *et al.* 1996). This approach has been relied on in every recent benefit–cost study of major food safety regulations in the United States, including the adoption of mandatory Hazard Analysis and Critical Control Points (HACCP) programs for seafood, meat, and poultry (FDA 1995; FSIS 1995, 1996). Buzby *et al.* (1996) suggest that, even with partial coverage of pathogens and cost categories, the annual overall cost of bacterial foodborne disease alone in the United States is from \$2.9 to \$6.7 billion in 1993 dollars.¹ This cost is based on estimates of 3.6–7.1 million cases of foodborne disease and 2 600–6 500 deaths per year. Researchers

¹ All monetary values are in \$US.

working in this area note that these measures of possible benefits (avoided costs) tend to be sensitive to the value attached to a life saved (Roberts and Marks 1995; Buzby *et al.* 1996).

Some economists are critical of the cost of illness approach because it is, at best, a lower bound measure of consumer willingness to pay for higher quality foods. They argue it cannot successfully measure all the benefits consumers may derive from such foods. Government regulators, especially those who must prepare benefit–cost assessments of new regulations, often prefer to use cost of illness measures *because* they are conservative and relatively reliable measures of benefits. However, regulators, food companies, and, of course, economists would like to know the true willingness to pay for specific food attributes, which includes the cost of illness as one of its elements.

2.2 Using contingent valuation and experimental markets

Several studies have used contingent valuation and experimental markets to measure consumer willingness to pay for specific safety attributes. In their design these studies have benefited from lessons learned in the very large literature on contingent valuation of environmental goods. The food studies generally present consumers with two goods, one similar to products already on the market and one with an enhanced safety feature (e.g., lower risk from a pesticide residue, lower risk from *Salmonella* contamination). Elicitation techniques are then used to ask the consumer's willingness to pay for the safer product. Other studies have used experimental auction markets to measure the same willingness to pay.

The studies have found a range of willingness to pay levels for the enhanced as compared to the regular product. For example, using contingent valuation Lin and Milon (1995) found that on average consumers said they would be willing to pay from \$0.72 to \$0.80 more for a dozen oysters with reduced risk levels, assuming a \$4.00 price for oysters currently on the market. In another contingent valuation study, Buzby, Skees and Ready (1995) found that on average consumers said they were willing to pay from \$0.19 to \$0.69 more per grapefruit with reduced risk from pesticide residues, depending on the elicitation method used, given an initial price of \$0.50 per grapefruit. Researchers at Iowa State University used experimental auction markets in several related studies to measure willingness to pay for products with enhanced features. Fox *et al.* (1995), for example, found that participants in an auction, depending on the region of the United States they were from, would on average pay from \$0.43 to \$0.93 to upgrade from a chicken sandwich they already possessed to one that offered a reduced risk of getting salmonellosis.

Practitioners as well as critics have concerns about the reliability of contingent valuation and experimental market approaches for valuing food safety (Belzer and Theroux 1995; Cropper 1995). One problem is how effectively a survey instrument or experimental market design can convey relative risk to consumers. For example, if a consumer is offered products with different levels of *Salmonella* contamination, or even risk of illness, how will he or she judge the relative risk of the products? Consumers may be unfamiliar with or unaware of the risk thus requiring the survey to both educate and ask for a value (Buzby *et al.* 1995; Fox *et al.* 1995; Lin and Milon 1995).

A second problem is of aggregation and the effectiveness of the budget constraint. If a consumer is willing to pay, for example, 30 per cent more for a *Salmonella*-free chicken sandwich, does that mean that he or she would be willing to pay 30 per cent more to gain similar levels of enhanced safety over all foods bought? What if that extrapolation yields unbelievable expenditure figures? Despite these difficulties and reservations, we have learned a great deal about consumer valuation from these studies. Of particular importance is the impact of the types and quantity of risk information consumers have on their valuation of enhanced food quality. To date, the results of contingent valuation or experimental market studies have not played a role in formal benefit–cost analyses for adoption of new regulations in the United States. If used, adjustments would have to be made to reflect that willingness to pay measures do not capture potential benefits associated with reducing externalities.

2.3 Using conjoint analysis

Conjoint analysis has also been usefully employed to examine consumer preferences for products with enhanced safety or nutritional features. With this approach, consumers are presented with a limited number of product choices that vary in a set of attributes such as price, flavour, source, safety features, and nutritional characteristics. For example, Halbrendt *et al.* (1995) used conjoint analysis to assess consumer acceptance of pST (porcine somatotropin)-supplemented pork products in Australia, particularly to analyse trade-offs consumers would make between use of pST and lower fat levels in the product. Their results showed that current technology was preferred over pST-supplemented pork when each offered the same level of fat reduction but that pST-supplemented pork was preferred when it offered higher levels of fat reduction. Conjoint analysis has also been used to study consumer preferences for wild versus farmed seafood products and for different types of inspection and certification of products. Although it is still contingent in that consumers do not actually buy the product, the approach

has advantages in that it more closely mimics the actual choice process in markets. For this reason, conjoint analysis has been popular with companies testing for likely consumer acceptance of new products but not in formal government benefit–cost analyses.

2.4 Using prices paid in markets

Comparing differences in prices paid in markets for products with different safety or nutrition attributes is the most direct method of placing a value on the benefits of those attributes to consumers. As noted, however, direct market comparisons of this type are relatively rare. They are beginning to appear for nutritional attributes with the development of wider ranges of products. For example, Frazão and Allshouse (1996) used scanner data for the years 1989–93 to document strong growth in the availability in the United States of nutritionally improved versions of foods in 37 categories. They also found that these products were generally higher priced than other products within their categories.

Other researchers have used hedonic pricing techniques to measure the value consumers place on products with different nutritional profiles. Kim and Chern (1995) used hedonic techniques to analyse if and how the price of fats and oils changed, based on their content of saturated and unsaturated fats, as information about the health impacts of fat content increased between 1950 and 1990. They found that for household uses the implicit price of unsaturated fat increased in the 1980s in response to more health information. The same was not true for manufacturers and fast food operators. They concluded that in their demand for fats and oils consumers were more responsive to health information than manufacturers and fast food operators were.

Direct comparison of products with different attributes, along with hedonic analyses, are promising avenues for valuing the benefits of safety and nutrition attributes to consumers. More analysis along these lines is becoming feasible with the broadening array of products available on the market. Roberts *et al.* (1997), for example, present a short case study of pricing of enhanced safety features for shell eggs.

A continuing issue with the market-based approach is differentiating between real and perceived values when this distinction is important. Consumers may pay \$0.50 more per dozen eggs if those eggs claim a specific safety attribute (e.g., low levels of *Salmonella* contamination) or a safety outcome (e.g., can be safely used in recipes that call for uncooked eggs). Is \$0.50 the true value of the enhanced feature? Yes, in the sense it is the market value. But perhaps no if the consumer has an incorrect perception of the risks attached to the enhanced feature. For example, if consumers

systematically overestimate the risk of contracting salmonellosis from eggs, the \$0.50 price differential will overestimate the true value of the attribute. The market value given current or expected risk perceptions is relevant to food marketers but will only yield valuations useful to regulators if consumers' perceptions reflect actual risk.

2.5 Using liability costs

Liability costs are another means of measuring the potential benefits of food quality assurance, especially in the area of food safety. As with the cost of illness, they are a measure of avoidable or potentially avoidable costs for parties in product liability cases. In the United States, research on the costs of liability is relatively recent, although several rather spectacular outbreaks of foodborne illness have resulted in extensive litigation. Buzby and Roberts (1997) found only 49 jury awards for foodborne illness cases in the years 1983–95. However, data on the actual costs of liability are notoriously hard to obtain because out-of-court settlements are common and their amounts are not disclosed. Litigation related to *E. coli* O157:H7 outbreaks associated with fresh apple juice sold by Odwalla in 1996 and with hamburger sold by Hudson Foods, Inc. in 1997 should provide further information on liability costs.

In the United Kingdom, a change in the liability law now puts the burden of proof on food processors and handlers to show that they exercised due diligence in assuring food safety. This change has been identified as an important incentive for food companies to improve their quality assurance practices (Caswell and Henson 1997; Henson 1997). While not providing direct information on the value of the benefits of food quality, this experience does indicate the important role that (avoided) costs can play in determining the level of food quality assurance activity by companies.

2.6 Using trade analysis

A final approach to placing a value on improved food quality is to measure the benefits of improved access to foreign markets or, alternatively, the costs of reduced access because of failure to meet quality standards. Improved access could yield benefits to companies as well as to the economy of the exporting country. Technical, sanitary, and phytosanitary regulations have come under increasing fire as non-tariff barriers to trade, which has led to efforts to measure their impact. Roberts and DeRemer (1997), for example, surveyed United States Department of Agriculture attachés and representatives of agricultural producer groups to identify policies they believed constituted such barriers. The survey participants

identified more than 300 measures in 63 foreign markets that they thought threatened, constrained, or blocked almost \$5 billion in US exports in 1996. An alternative approach to measuring the costs of barriers is to measure the benefits of gaining increased access to markets through quality improvements. This approach has not yet been effectively used in evaluating the benefits of improvements in food quality assurance.

3. Placing a value on the costs of food safety and nutrition

Offsetting the benefits of improved food safety and nutrition are the costs of achieving improved quality. Placing a value on these costs is the other key step, along with benefits estimation, in making good choices between quality assurance programs. Costs may result from quality assurance programs that companies adopt voluntarily in order to improve their market position, meet standards set by their business partners, or satisfy consumer demand. They may also be adopted because they are mandated by government regulations. In each case, clear cost accounting is essential to identifying, describing, and measuring changes in internal production (company), transaction (between company), and regulatory compliance costs associated with adoption of quality management systems. Also important is quantifying trade-offs in costs and final product quality that may occur as companies focus on specific quality attributes. For example, enhancing one attribute could degrade other attributes.

A number of these systems are adopted voluntarily by companies to improve product quality and reduce costs. The systems may be internal to the firm or involve third-party verification as occurs with ISO 9000 certification. Although evidence to date is limited and somewhat mixed, voluntary quality management systems may shift the production cost curve *downward*, especially for attributes such as safety (see, e.g., Bredahl, Holleran and Zaibet 1994; Zaibet 1995; Zaibet and Bredahl 1997). Other studies have begun to measure the impact of voluntary systems on transaction costs between firms. For example, Holleran and Bredahl (1996) found clear evidence of significant decreases in transaction costs among 30 firms they interviewed in the UK food sector. An interesting finding of their research was that savings from reducing transaction costs tended to accrue to the market participants with greatest market power. While in its early stages, analysis of the costs of voluntary quality management systems is important to understanding company incentives.

Studies of the actual costs of complying with government-mandated quality assurance programs are becoming more common as demands for regulatory accountability increase. In the United States, estimates of compliance costs were an integral part of the Final Regulatory Impact Assessments for mandatory adoption of HACCP in the seafood, meat, and

poultry industries (FSIS 1996; Crutchfield *et al.* 1997). For example, the USDA Food Safety and Inspection Service (FSIS) estimated the cost of HACCP adoption in meat and poultry slaughtering, finding that the regulation would cost between \$1.1 and \$1.3 billion in 1995 dollars over twenty years. Critics suggest that these regulatory impact analyses fall short of the mark when providing a complete picture of compliance costs. MacDonald and Crutchfield (1997) note that the initial FSIS cost analysis for HACCP adoption violated several principles of sound economic evaluation. Most importantly, the analysis violated the principles of universality (i.e., taking all relevant costs into consideration) and causality (i.e., distinguishing costs caused by the regulation from those that would have been incurred with or without the regulation). Others have questioned whether cost of compliance analyses fully account for monitoring and enforcement costs incurred by companies and the government.

Colatore (1998) found these distinctions to be very important in measuring the actual costs of HACCP adoption among a small sample of breaded fish producers in the state of Massachusetts. She distinguished between the companies' overall costs of HACCP as adopted; what their overall costs would have been to adopt a HACCP plan that met minimum government requirements; and the incremental cost of HACCP adoption attributable to the government requirements. While total first-year costs of adoption averaged \$116 000 per firm, the costs of meeting minimum FDA requirements averaged \$34 000, and the marginal or incremental costs of the FDA requirements was considerably less than \$34 000. The differences arose because many companies adopted plans that went beyond the FDA requirements; some companies had or would have adopted HACCP without the government requirement; and HACCP adoption allowed some companies to drop alternative quality certification systems. All three cost estimates present different and important information. For example, the third figure is the one needed for a regulatory impact analysis, while the first gives a global estimate of the voluntary and mandatory costs of adopting HACCP as an approach to quality assurance.

Researchers in and outside government in several different countries are taking on the challenge of producing better measures of the costs of voluntary and mandatory quality assurance systems. In the United States, for example, studies of the actual costs of HACCP adoption for red meats are underway by Ollinger and MacDonald (USDA-Economic Research Service); Hooker *et al.* (Texas A&M University); and Unnevehr (University of Illinois) and Jensen (Iowa State University). These studies involve use of Census data and/or on-site interviews of quality assurance managers. As economists have found in other contexts, gathering reliable cost estimates is a challenge.

4. Choosing optimal quality management systems

Reliable estimates of the benefits and costs of quality assurance systems are required to guide choices between alternative systems. Companies adopt voluntary systems because of their internal benefits relative to their costs; the competitive advantage gained in markets from their development and adoption; the gains in system efficiency from their adoption (Maurer and Drescher 1996); and, in some cases, because they are required to by the companies they want to supply. Voluntary systems interact with mandatory systems to determine ultimate quality and price levels in markets.

From companies' viewpoint what is important is their private benefits and costs from improvements in food safety and nutrition. For example, will an improvement in safety be marketable and generate enough revenue to be profitable? From society's viewpoint, the question is whether a given improvement has overall benefits greater than costs *and* where that improvement ranks relative to other possible improvements that could be made with the same resources, not only in the food industry but across all areas.

Economists are doing a better job of measuring both private and societal benefits and costs but much remains to be done. Governments are intensifying their use of benefit–cost analysis to evaluate specific proposed regulatory programs (Taylor 1997). However, the use of this analysis for broader purposes is on a much more primitive level. For example, benefit–cost analysis is still rarely used to compare alternative regulatory interventions or, even more broadly, to compare the desirability of addressing alternative risks (e.g., the risk of foodborne illness versus the risk of pesticide residues or occupational exposure to chemicals). Perhaps it will remain on this level because the questions are too large or the political system wants to choose its priorities more directly. In any case, the BSE experience in Europe clearly illustrates the need for government to scan the risk horizon rather than simply focusing on the impacts of particular existing or proposed risk reduction programs.

Identifying the best mix of voluntary and mandatory quality management systems is becoming increasingly important as these systems proliferate domestically and internationally. For the best results, incentives for companies and consumers to improve food safety and nutrition must mesh. In addition, when regulation is deemed necessary, the type of regulatory approach (e.g., performance standard, process standard, labelling requirement) should mesh with company incentives to attain the best benefit–cost ratio. Finally, more cooperation between countries is required as food products are increasingly traded across borders.

5. A short case study of meat and poultry products

Meat and poultry products have received a great deal of regulatory attention in recent years because of significant foodborne illness costs associated with their consumption. In the United States, for example, FSIS estimated the present value of benefits over the next twenty years from reducing foodborne illness associated with these products would be from \$1.9 to \$171.8 billion depending on the level of pathogen control achieved (FSIS 1996; Crutchfield *et al.* 1997).

Voluntary food safety management systems in the meat and poultry industries have been chronically inadequate. For example, the United States had a major outbreak of foodborne illness in 1993 associated with undercooked hamburgers contaminated by *E. coli* O157:H7 sold by the Jack in the Box fast food chain. The outbreak resulted in over 700 illnesses and the death of four small children. Neither the public regulatory system nor voluntary quality management systems operated by Jack in the Box and its suppliers prevented contaminated hamburgers from being sold to consumers. This case was followed in August 1997 by a small outbreak of foodborne illness in Colorado traced to frozen hamburger patties contaminated by *E. coli* O157:H7 processed and sold by a plant owned by Hudson Foods, Inc. An initial small product recall exploded to 25 million pounds when it was found that product reworking practices in the plant left no break in the potential chain of contamination from early June through to August.

Many countries, including the United States, Australia, and those of the European Union, have turned to implementing mandatory HACCP-based systems to address safety problems in the meat and poultry industries (Unnevehr and Jensen 1996). These systems place responsibility for food safety squarely on companies. As adoption of HACCP and parallel systems goes forward, major questions are arising regarding the compatibility of systems, including underlying regulations of good manufacturing practices, across trading partners (Caswell and Hooker 1996). How contentious these issues can become is highlighted by a letter to his members from Michael Jacobson, the Executive Director of the Center for Science in the Public Interest, a United States consumer lobbying group in December 1997. His letter said:

And foreign nations are pressuring our government to allow their meat to come into our country under their own *very lax* inspection standards . . . Australia, for example, argues that allowing its meat industry to monitor itself is just as good as government inspection. But the Australians have already demonstrated — with numerous food-poisoning outbreaks in their country — how poorly that system works in their own meat industry.

Harmonisation or even coordination of systems across countries is proving difficult in the midst of implementation of diverse mandatory and voluntary systems. The situation is made even more complex by the use of different regulatory approaches. For example, the United States government responded to the Jack in the Box outbreak in 1993 by implementing a mandatory HACCP program. It also moved to require labels explaining safe handling practices on all retail packages of fresh meat and poultry.

Economists can contribute to the debate on food safety in the meat and poultry industries by providing reliable estimates of the benefits and costs of different approaches to increasing safety. They have done so already in measuring the benefits of improved safety and are doing so now in producing more precise measures of the costs of implementing HACCP and other quality management systems.

6. Conclusion

Economists can and do contribute greatly to answering questions about whether and how to improve food safety and nutrition, by providing increasingly accurate measures of the benefits and costs of current and proposed quality management systems. However, researchers and policy analysts face several issues in improving their benefit and cost estimates. On the benefit side, there is no consensus on the appropriate method for measuring benefits. A cost of illness approach is favoured by analysts who wish to concentrate on the benefits of actual changes in risks. Methods such as contingent valuation and experimental markets, on the other hand, focus on a broader range of benefits, some of which may arise from consumer misperceptions about risk levels. The most promising avenue for improving benefits estimation is close comparison of benefits measures resulting from the different methodologies, with a healthy respect for the strengths of each approach. On the cost side, the major issue is accurate modelling of company behaviour and changes in system-wide costs related to quality management systems.

Improved benefit–cost analysis, especially in the areas of food safety and nutrition, often relies on the availability of better scientific information. For example, crucial elements in evaluating the benefits and costs of HACCP adoption are the achieved reduction in pathogen levels in foods and the resulting change in the occurrence of foodborne illness. To date, benefits estimates have been based on assumed levels of pathogen and illness reduction, not on actual reductions. Likewise, cost estimates focus on the cost of adopting a quality management system such as HACCP but rarely link these costs to specific outcomes such as a reduction in pathogen levels. The biggest current challenge in benefit–cost analysis is making these links between

actions, results, benefits, and costs along the distribution channel from farm to consumer. These links would facilitate identification of effective intervention points in the supply chain and efficient mixes of mandatory and voluntary quality management systems. Food quality will continue to ascend in importance in the food system. As a result, choosing quality management systems and approaches wisely will also increase in importance.

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Note: Many major proceedings and books published by Regional Research Project NE-165: Private Strategies, Public Policies, and Food System Performance and the Food Marketing Policy Center are available on the Web at AgEcon Search (<http://agecon.lib.umn.edu/ne165.html>). See also the Web sites for NE-165 (<http://www.umass.edu/ne165/>) and the Food Marketing Policy Center (<http://www.ucc.uconn.edu/~wware/fmktc.html>)

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