Food Safety as a Global Public Good: Is There Underinvestment?

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Abstract

Globalization of the food system is shaped by demand trends that bring about deep integration of agricultural production and marketing. As diets and food quality become more similar around the world, risks are shared across borders, creating global public "goods" and "bads." Examples of globally shared food safety risks include acute risks such as microbial pathogens, as well as chronic risks, such as those arising from pesticide residues or mycotoxins. Food safety is addressed as a global public good through private sector efforts, institutional innovations such as the SPS agreement under the WTO, and trade capacity building efforts to improve food safety management for developing country exports. Data on food safety import violations from the U.S. and the EU show where the global food system is experiencing failures in delivering safe food. Microbial pathogens in seafood are an area of common concern; other problems reflect differences in standards between these two major high income markets. WTO's database on trade facilitation shows that most efforts focus on general capacity building and only a few address specific risks or commodities. Although meeting standards for high income consumers motivates trade facilitation, the spillovers for developing country consumers from such investments could be large.

JEL classification codes: Q13, Q17, Q18, O19

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Introduction

The links between food and health have received much attention in the last decade, with high profile media coverage of food safety risks and of nutrition research findings. In part, this media coverage reflects the growing scientific understanding of food safety risks and ability to detect and track risks, as well as exciting advances in nutritional genomics and understanding of the functional characteristics of foods. The appearance of this information in the media, together with rising consumer incomes and aging populations in high income countries, has spurred consumer food demand for health characteristics and for new food regulations.

At the same time, diets and food delivery systems are becoming more similar around the world, and trade in high valued products is growing. The standards and delivery systems in high income countries provide a model that is being adopted rapidly in middle income countries. In this context, food-health linkages have become global public goods, because food-diet risks, benefits of risk control, and information, are increasingly interconnected across national boundaries.

Institutional innovations are emerging to address food safety as a global public good, such as widely recognized private standards for food safety assurance, the SPS agreement under the WTO, and foreign assistance aimed at improving food safety management for developing country exports, sometimes called trade capacity building. Previous studies have examined quality assurance in the private sector (Henson and Reardon, 2005), the role of standards in reducing trade (eg., Otsuki, Wilson, and Sewadeh, 2001), and the effect of the SPS Agreement in mitigating trade disputes over food safety (Josling, Roberts, and Orden, 2004; Unnevehr and Roberts, 2005). This

paper will contribute to the literature in three ways: First, the global public goods framework is used to recast approaches to addressing market failures, and to measuring costs and benefits from food safety improvement. Second, how the global public goods framework could be used to address recurring food safety failures in international trade is examined. Third, newly available data on trade capacity building provide a first look at this approach to sharing the costs of improvement.

This paper begins with recent evidence on the "globalization" of food demand and food delivery, to demonstrate why demand for global public goods in the food system is growing. Next, the conceptual framework for food safety as a global public good is presented, including the implications for cost-benefit analysis. Then, the paper turns to food safety failures in international trade, as revealed by U.S. import detentions and EU alerts, and how investments in GPGs might address these failures. Last, the trade capacity building investments by the U.S. and the EU, as reported to the WTO are examined to see how far these efforts address identified failures. Implications are drawn for future investments in food safety as a global public good.

"Globalization" in Diets and Food Delivery

Income growth is a powerful force leading food expenditures towards certain universal patterns: reduced consumption of starchy staples, increased consumption of meat, fruits, and vegetables, and processed high value foods (Bennett, 1941; Regmi and Gelhar, 2005). These trends in demand are reshaping agricultural trade patterns. Trade in high valued agricultural products is growing faster than trade in commodities since 1990, and trade is growing faster as a percent of world production for income elastic commodities such as chicken and fruits (FAOSTAT). Trade in perishable products such

as seafood, meats, fruits and vegetables, doubled from 1990 to 2004 (FAOSTAT). Global food trade has become more specialized, with high income countries exporting grains and processed products to low and middle income countries, who in turn export labor-intensive horticultural and fishery products (Aksoy, 2005). The growth in trade for perishable and high value products of all kinds reflects expanding global demand as incomes rise and technical barriers to trade are reduced (Dyck and Nelson, 2003; Gelhar and Regmi, 2005). Even animal products, where emerging animal diseases have closed borders, have seen growth in trade (Blayney, Dyck, and Harvey, 2006).

Changes in the composition of diets are not the only influence on the global food system. Food product and retail models from high income countries have become increasingly common in middle income countries through expansion of multinational retail and food service chains (Reardon et al., 2003; Coyle, 2006). Tastes and diets are being shaped by this global expansion of modern food retailing. Table 1 shows selected indicators of food system modernization, summarized for selected high, upper middle, and lower middle income countries. Demand for packaged foods, soft drinks, food service, and fast food are all highly income elastic, and show the expected pattern of increase across country income categories. For example, packaged goods as a share of food sales increase from 26% for lower middle income countries to 52% for high income countries; annual fast food expenditures increase from $17 per capita to $191. The share of food purchased in standardized retail outlets (supermarkets, hypermarkets, discounters, and convenience stores) also increases across income categories, from 53% in lower middle income countries to 76% in high income countries. The rates of growth in these indicators are strikingly higher in the upper middle income countries. Food service and

fast food service expenditures per capita are growing at 5 and 7 percent annually, which is faster than income growth in these countries. Change is occurring most quickly in China, Indonesia, South Africa, the Czech Republic, Hungary, and Brazil. As this list of countries indicates, the changes are not confined to a particular region, but are occurring in middle income countries around the world.

The expansion of multi-national retailing, food services, and high value products is leading to what Birdsall and Lawrence (1999) call "deep integration" in how food is produced, delivered, and consumed around the world. This in turn leads to greater use of uniform standards of quality, content, and delivery (Caswell, Bredahl and Hooker, 1998; Gelhar and Regmi, 2005). Deep integration inevitably brings increased sharing of food risks, including both acute and chronic risks. As trade integrates the food supply, food safety risks are increasingly shared across borders.

The demand for food safety improvements is increasing, driven by new science, more consumer awareness and the higher income needed to translate desire into effective demand. New science and new detection methods have improved our understanding of risks and their consequences. Changes in food production, marketing, and consumption have altered the incidence of risks and shifted responsibility from consumers to producers. Larger operations to produce meat or fish can introduce new hazards or speed the spread of existing ones. The increased purchase of prepared food or use of food service reduces consumer control over food preparation, shifting responsibility for safety to the food industry. Consumer awareness and incomes are both increasing, leading to greater demand for safety. Both the food industry and regulators have responded with new public and private standards.

In spite of this increased attention, food safety remains an important risk even in developed countries. In the U.S., the CDC estimates that there are 76 million cases of foodborne illness annually, and 5,200 deaths. In 2000, the USDA/ERS estimated that the cost of five common pathogens was $6.9 billion in terms of medical expenses and lost productivity (USDA/ERS). The negative consequences of poor food safety is even more important in the developing world, where the WHO estimates that as much as 70 percent of the 1.8 million annual deaths from diarrhea are linked to contaminated food. Exposure to mycotoxins that pose chronic cancer risks is an important risk in parts of Africa. Pesticide exposure in the farm environment has also been implicated in farm household health in developing countries. Thus, food safety risks are a global concern. The next section of the paper considers how food safety improvements could be viewed as a global public good.

The Global Public Good Framework and Food Safety

Ferroni and Mody (2002) define a global public good (GPG) as a "benefit providing utility that is, in principle, available on an international scale" (p. 6). Examples include property rights, predictability, and nomenclature, which can enable provision of final public goods, such as health or environmental quality (Kaul, Grunberg, and Stern, 1999; Ferroni and Mody, 2002). The potential for GPGs arises whenever externalities (either positive or negative) cross borders (Kaul, Grunberg, and Stern, 1999). To be truly global public goods, they must be non-rival and non-excludable across international borders and global in scope. Of course, there are degrees to goods are non-rival or non-excludable in practice and there are variations in the international scope of GPG.

Before considering why food safety is a global public good, it is useful to consider why it is often a local or national public good. Frequent public intervention at the national level to ensure food safety arises from several public goods characteristics. Individual producers or firms may not be able to adequately control a food safety hazard (externality) without cooperative effort, and the public sector may be needed to enforce controls, certify sanitary conditions (non-excludability), or to make supporting infrastructure investments. Consumers may not be able to judge food safety or to avoid hazards (information asymmetry) or it may be desirable to protect vulnerable groups (equity), such as small children, by setting a minimum safety standard.

The changes in international trade, demand, and regulation discussed above have made food safety a global public good. With growth in food and animal trade, food safety risks, costs of hazard reduction, and benefits from improvement are all shared across borders. Food produced under one safety regime must pass standards under another, and standards are increasingly stringent. Risks vary across countries because there are differences in how food is produced and eaten. While trade can provide alternatives for consumers and potentially lower costs of safety, it can also introduce unfamiliar hazards or new hazards can disrupt trade. Incentives and information may be imperfect in international supply chains, many of which are relatively new.

Three potential "gaps" hinder provision of GPGs: a jurisdictional gap (when national borders become irrelevant); a participation gap (when new groups need to participate in governance); and an incentives gap (when international cooperation is not backstopped by incentives to change behavior) (Kaul, Grunberg, and Stern, 1999). Food safety has all three gaps: There is a jurisdictional gap between the importing market and

the exporting producer. There is an incentives gap when consumers in one country do not fully reward efforts for food safety improvement in another country, often because they cannot distinguish safety in the marketplace. Finally, there can be a participation gap in setting food safety standards; in other words, not all countries contribute equally to the process.

Three categories of approaches to internalizing global incentives have been identified (Ferroni and Mody, 2003). "Best shot", exemplified by the Gates Foundation investment in malaria vaccine development, pushes or pulls private innovation using public funds. "Summation" is the development of global mechanisms to enforce individual behavior, so that the "sum" of individual actions leads to the desired outcome. An example is the development of standards for sustainable forestry to inform green labels and consumer choice. "Weakest link" is the use of foreign aid to overcome the constraint imposed by those providing the smallest effort, for example when poor countries receive a subsidy to control animal or plant disease to prevent its spread elsewhere.

Food safety has been addressed as a GPG using all three approaches to internalizing incentives. The "weakest link" is addressed through foreign aid to help developing countries improve food safety in exports. An example of "summation" or the application of mechanisms to enforce behavior along the supply chain or among countries can be found in the private sector's use of third party certification or in the application of internationally recognized principles to food safety regulation. "Best shot" approaches to motivate innovation include investments in research for managing or assessing risks, such as development of new testing and tracking technologies.

Using the GPG framework to assessment food safety issues, there are at least three sets of questions. First, there are questions related to sharing risks, costs and benefits. For example, when would investments from one country in another country have benefits for the donor as well as the recipient? When would it yield overall welfare gains for one country to subsidize costs of control in another country? Such questions relate to the role of foreign aid in trade capacity building.

Second, there are questions related to the global consequences of individual countries' regulations. When would an adjustment of standards result in benefits from trade that more than offset consumer risk? Would harmonization of food safety standards increase or decrease consumer welfare? Would harmonization ease the costs of coordinating control? These questions are currently addressed most often by the SPS Agreement under the WTO, and the related institutional framework for standards under the Codex Alimentarius.

Third, there are a set of questions about how best to enhance global welfare through capturing spillover benefits from investments in food safety. For example, if some global food safety czar could direct investments, where would they have the highest marginal net benefit? When would international coordination of management activities reduce the total costs of control? Could information in international markets be improved so as to internalize incentives for food safety improvement? Such questions are beyond the scope of most current institutional frameworks.

Next, I consider how these questions are reflected in important food safety failures in international supply chains.

Food Safety Issues in International Trade

One indicator of breakdowns in global food safety management is provided by public monitoring and rejection of food imports for failure to meet food safety standards. Product refusals and recalls have high private costs. When imports are refused or general alerts are raised about a product, it represents a failure in food safety management. When such refusals or alerts occur frequently for particular hazards or products, it is clear that management is challenging and imperfect. This may suggest areas for public intervention or investment.

The U.S. Food and Drug Administration reports information from import monitoring on their website for the past 12 months (http://www.fda.gov/ora/oasis/ora_oasis_ref.html). U.S. FDA detention data have been analyzed by several authors, including Unnevehr (2000), Caswell and Wang (2001), and Allshouse, et al (2002). The European Commission posts annual summary reports of similar problems, called rapid alerts (http://ec.europa.eu/food/food/rapidalert/index_en.htm), which reflect notifications of safety problems by member countries. Most of these alerts are for imports from third countries. Jaffee and Henson (2005) looked at both U.S. and E.C. data, and concluded that standards pose minimal barriers to trade overall. I examine these two data to see what recurring problems suggest failures in either private management or public policy.

Table 2 reports summary information from these two data sources. For the U.S., most detentions arise from problems of microbial hazards in seafood and pesticides in vegetables, and to a lesser extent, contamination in fruits or nuts. (Meat and poultry are not prominent due to the separate import monitoring system that requires USDA audits of

foreign plants. This "pre-approval" prevents most problems at the border.) The country sources of products most often detained include Vietnam, Thailand, and Indonesia for seafood; China, Guatemala, and Mexico, for vegetables. These patterns are similar to those reported in other analyses, and are likely to be representative of longer term issues. Middle income countries are the most important sources of problems. Although they are important suppliers, it is not solely the volume of their trade that results in their overrepresentation in the detentions data base. For example, the rate of detentions for seafood imports was much higher for Thailand than for Canada, even though both export similar volumes to the U.S. (Allshouse, et. al., 2002).

The EU 2004 Rapid Alert report shows that mycotoxins, chemical contaminants (eg., prohibited food dyes), microbial pathogens, and veterinary drug residues are the most important hazards appearing in alerts related to products from third countries. Nuts (the primary source of violative mycotoxins), seafood/fish, meats and poultry, and fruits are the most important products implicated in alerts. Third countries of origin that were most common in alerts included three exporters of nuts to the EU: Iran, Turkey, and China; as well as two exporters of fish and/or meat: Brazil and India.

For both the E.U. and U.S., it is middle income exporting countries that are most often implicated in food safety alerts or detentions. Microbial pathogens in seafood and fish are a common and recurring problem. Other issues of importance differ between these two importers, reflecting differences in standards and regulation. In the EU, mycotoxins and chemical contaminants are more important. This reflects, at least in part, the very high standards for mycotoxins imposed by the EU in 2001. These standards were controversial, and elicited considerable comment from trading partners (eg., Otsuki,

Wilson, and Sewadeh, 2001). The 2004 alert data show that these standards are indeed a source of continuing difficulty for exporters of nuts to the EU. For the U.S., mycotoxins and food additives are not as important in detention data, but pesticide residues are at issue. Zepp, Kuchler, and Lucier (1998) found that most pesticide residue violations in U.S. imports are for unregistered chemicals, rather than for residues that exceed Maximum Residue Limits (MRLs).

Addressing Food Safety Failures as Global Public Goods

The type of market failure differs among these food safety hazards, but in all cases, international trade has made the local or national public good into a global public good. For each hazard, the GPG questions raised above are considered. These include the type of trade capacity building needed, whether international standard setting could mitigate failures, and whether there would be spillover benefits for consumers in the exporting country.

Microbial hazards

Microbial hazards are naturally occurring and increasingly regulated in high income countries. Their importance in seafood trade reflects the difficulties of enforcing sanitation and cold chain control over a longer supply chain, as well as in countries with minimal public sanitation infrastructure (eg., Cato and Subasinge, 2003). Microbial pathogens can enter the food supply at any point during processing and transit, multiply once present, and spread more widely as a result of commingled supply sources. Thus, incentives for control may be difficult to enforce or internalize. Capacity building investment for this hazard would ideally address the “weakest link”, by focusing on

sanitation infrastructure and on implementation of the Hazard Analysis Critical Control Point (HACCP) system. Standards and equivalence are difficult to define for this hazard, as it is costly to test (Unnevehr and Jensen, 1999). Verification focuses on assessment of processes more often than products. This makes it difficult to determine equivalence in internationally trade products. There are likely large spillover benefits for consumers within the exporting country from improvements in microbial pathogen control, as this is such an important source of health risk in developing countries.

Pesticides

Pesticides are regulated so as to minimize risks to human health and the environment. In the U.S., pesticides are registered for use only on particular crops. Some violations in international trade arise from an "orphan goods" problem. There are insufficient incentives to undertake the costs of registration for minor uses outside of the U.S., leading to the violations that arise from unregistered uses. For registered uses that exceed MRLs, research and extension are needed for integrated pest management in tropical horticulture (as illegal pesticide use is rarely economic). The knowledge base for IPM in tropical horticultural crops is an area of underinvestment (Norton, et al., 2003). Thus, the needed capacity building investments would foster this type of innovation. Problems with unregistered chemicals might be overcome by use of Codex's internationally recognized MRL standards. The spillover benefits of better pesticide management for developing country producers, through reduced exposure in the farm environment, are likely larger than the benefits from reduced residues for high income consumers.

Mycotoxins

Mycotoxins, produced by fungi on crops, are a naturally occurring hazard, which is more likely to be present in certain production conditions, especially in the humid tropics. Management in crop production and marketing can reduce the incidence of mycotoxins, but they are sometimes impossible to eliminate in the food supply, except through diversion of supply to alternative uses, such as animal feeds. Capacity building investment could foster innovation in management, and inspection and certification to internalize incentives. This is a hazard that might be mitigated by trade, if supply from areas with lower incidence can replace supply from areas with higher incidence. The differences in standards among high income countries provide a likely opportunity for gains from harmonization. Again, the spillover benefits for developing country consumers might be substantial, especially for control of mycotoxins in staples.

Veterinary drug residues

Veterinary drug use is regulated to reduce risks to human and animal health. Illegal veterinary drug residues arise from use of banned drugs or illegal use of drugs, and these pose various kinds of risks to consumers, including possible allergic reactions, chronic health risks from exposure, or the development of antibiotic-resistant organisms. Capacity building investments might include inspection and monitoring, or research on improved management. It is possible that subsidies to reduce antibiotic use would have global public health benefits in preventing the development of resistance. Standards differ among countries, and harmonization to the Codex standard would enhance trade (Wilson, Otsuki, Majumdsar, 2003), although it is not clear how it might alter consumer

risks. Spillover benefits might be large for consumers everywhere, if retention of antibiotic effectiveness results from more effective regulation.

The hazards identified as issues in data from these two major markets are not the only food safety issues in international trade, but they do represent issues of recurring concern. Moreover, they represent long standing hazards that have been controversial in regulation and are costly to manage in any country. Fortunately, with the possible exception of microbial pathogens, the likely risks to high income consumers from the identified "failures" in food safety are small. And, trade in most of the commodities highlighted in Table 2 has been expanding, notwithstanding food safety issues.

There do seem to be opportunities for global gain. First, capacity building investments might include research to support management and control of hazards, improved infrastructure for sanitation and preservation, and inspection or monitoring to support certification. Second, greater efforts towards equivalence recognition or even harmonization of international standards would mitigate difficulties for all of the above hazards. These two areas have been identified as the least successful elements of the SPS Agreement implementation (Unnevehr and Roberts, 2005), suggesting the need for greater investment in these facilitating mechanisms. Such investments have been subsidized by efforts since 2001 to support developing country participation in the international standard setting bodies. However, the political will to adopt and utilize internationally recognized standards is still lacking in many cases. Third, the existence of stringent standards in high income countries may provide the motivation for investments in food safety in developing countries that have large spillover benefits for developing country consumers and producers.

Trade Capacity Building to Address Food Safety

In 2001, WTO members agreed on steps to improve implementation of the current agreements at the Doha Ministerial (WTO 2001). These initiatives included, among others, increased technical and financial assistance to enable developing countries to increase their participation in the international standards organizations and to fulfill their obligations (such as the creation of enquiry points) under these agreements; and increased technical assistance to help developing countries to comply with new standards if they pose significant impediments to trade.

The WTO and the OECD jointly maintain the Doha Development Agenda Trade Capacity Building Database (http://tcbdb.wto.org/index.asp?lang=ENG), which provides information on bilateral and multilateral efforts to build trade capacity in less developed countries. Projects specifically addressing Sanitary and Phytosanitary Measures were downloaded for analysis on May 30, 2006. These data reflect efforts from 2001 through 2005; with incomplete data for 2006. There were a total of 695 SPS projects, with total expenditures of $270 million.

Table 3 reports information about the projects funded by the U.S. and the EU (including member countries). The U.S. funded $31 million in 237 projects; and the EU invested $176 million in 117 projects. These two major donors account for half of the projects and three-quarters of the funding represented in the database on SPS projects. Project descriptions available in the database were used to classify projects according to whether they are general investments in capacity building (e.g., training on SPS issues, workshops, consultations) or whether they address specific risks, management methods, or commodities (Table 3). Most projects funded by the U.S. and the EU fell into the

category of general capacity building, and many of those had multi-lateral recipients (e.g., a training workshop is held with participation from several developing countries or the same workshop is repeated in several countries).

U.S. projects with a specific focus addressed commodities and risks identified as issues in the FDA data, i.e., fish and fruits & vegetables, food safety and pesticides. The methods that were the focus of capacity building would largely translate into better food safety control. Two of the countries identified in Table 3 (Mexico, China) were also among those receiving multiple capacity building efforts. Thus, specific U.S. efforts line up fairly well with the difficulties facing exporters to the U.S.

The EU projects with a specific focus were balanced across the three categories of SPS risks, or were focused on inspection and testing methods which can address all three risks. Commodities included those among the highest risk but nuts and fish were not highly represented. Of the countries receiving assistance, Iran stands out as also appearing in Table 2, and two of the three projects for Iran address mycotoxins (these were the only projects specifically addressing that risk). Thus, specific EU efforts also tend to line up with risks as identified in the Alert data, with the exception of mycotoxins in nuts.

Trade facilitation, particularly focused on SPS measures, is a relatively new activity. The emphasis on general capacity building can be seen as a sensible first step, that sets the stage for more specific activities in particular sectors or to address particular risks. The focus on inspection, testing, and food safety management in some projects is also a way to address multiple risks, with potential positive spillovers for recipient country consumers.

Conclusions and Implications for Future Global Investments

The global public goods framework is appropriate for food safety, given the increased international sharing of risks, costs, and benefits from food safety improvement. The kinds of global public goods needed fall into three categories: sharing of costs, coordination of risk management, and capturing international spillovers from investments. All of these public goods are relevant to the food safety issues that appear in the growing food export trade from developing countries to developed countries.

Three food safety problems present continuing challenges – microbial pathogens in seafood, fish, and meat; pesticide residues on horticultural products, and mycotoxins in nuts. All of these challenges might be mitigated through greater attention to harmonization and equivalence in setting standards, reinforcing the finding of Unnevehr and Roberts (2005) that these were areas of relative weakness in implementation of the SPS Agreement. Although higher standards in developed countries impose costs and barriers to trade, they also motivate foreign aid for trade capacity building. Such capacity building could address these challenges through investments in research to support management and control of hazards, improved infrastructure for sanitation and preservation, and inspection or monitoring to support certification. Recent trade capacity building efforts are largely very general in nature, and likely represent only the first step towards meaningful efforts to reduce hazards. Finally, the spillover benefits from such investments are likely to be large for developing country consumers in the long run.

Because it is increasingly a global public good, there is likely underinvestment in food safety. Directing GPG investments for greatest global benefit will require

understanding of the incidence of benefits and costs both within and across borders, of the potential benefits from coordination in standard setting and control, and of the potential positive spillovers. Such research will help to motivate future investment by demonstrating the potential benefits.

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Table 1: Selected Indicators of Food System Modernization

	Lower Middle Income		Upper Middle Income		High Income	
	Level	Growth	Level	Growth	Level	Growth
Share of food sales in standardized retail outlets (%) 2005, 98-05	52.76	1.03 China	61.10	1.66 Czech Republic	76.47	0.82
Share of packaged food in total food expenditures (%) 2004, 98-04	25.93	0.20 Brazil	39.83	-0.18 Czech Republic	52.25	-0.04
Per cap food service expenditures ($) 2004, 99-04	99.16	2.82 Indonesia	234.31	5.18 South Africa	854.54	4.78
Per cap fast food expenditures ($) 2004, 99-04	17.08	4.50 Indonesia	38.73	6.58 South Africa	190.87	7.25
Per cap soft drink expenditures ($) 2004, 90-04	32.90	3.26 China	42.47	6.81 Hungary	144.23	4.32

Source: Euromonitor.

Lower Middle income includes Brazil, Colombia, Peru, China, Indonesia, Philippines, Thailand, Algeria, Egypt, Jordan, Morocco, Tunisia

Upper Middle income includes Czech Republic, Hungary, Poland, Chile, Mexico, Malaysia, South Africa

High Income includes Canada, USA, Australia, Japan, France, UK, Germany, Netherlands, Austria, Belgium, Finland, Greece, Italy, Spain, Sweden, Denmark, Ireland, Portugal

Level is average for latest year available (indicated in parentheses)

Growth is absolute change for percentage (share) indicators and percentage change for absolute variables; years are indicated in parentheses. Country with the fastest growth rate is indicated for each variable.

Standardized retail outlets includes supermarkets, hypermarkets, discounters, and convenience stores.

Table 2: Food Safety Management "Failures" in Global Supply Chains

	U.S. FDA Import Detentions, 2001	**EU Notifications, 2004**
Most important hazards	Microbial contamination (eg., salmonella in seafood), Pesticide residues (eg. violative residues on vegetables), Other sanitary violations (eg., "filthy" fruit)	Mycotoxins Other chemical contaminants (eg., additives and food dyes) Microbiological contamination Veterinary drug residues
Most important products	Vegetables Seafood Fruits & Nuts Spices Dairy	Nuts Fish Meat & poultry Fruits & vegetables Spices
Most important countries of origin	Vietnam, Thailand, and Indonesia for Seafood China, Guatemala, and Mexico for Vegetables	Iran (nuts) Turkey (nuts, F&V, spices) China (nuts, F&V) India (seafood, spices) Brazil (poultry, meat, seafood)

Sources:

Annual Report on the Functioning of the Rapid Alert System for Food and Feed (RASFF), 2004, European Commission, Health and Consumer Protection Directorate General, http://ec.europa.eu/food/food/rapidalert/report2004_en.pdf, accessed May 5, 2006.

FDA Import Detention Data, 2001, unpublished analysis by Buzby, Unnevehr, and Allshouse; and Allshouse, et al., Seafood Trade and Food Safety, Ch 7 in International Trade and Food Safety, AER828, USDA/ERS.

Table 3: Technical Assistance for SPS Issues, 2001- May 2006

	U.S.		EU	
	Number	Million $	Number	Million $
Total Projects	237	30.76	117	176.0
Most important individual country recipients	Mexico (24) Serbia&Montenegro (9) Egypt (7) Honduras (6) China (5) El Salvador (5) Zambia (5)		Guatemala (5) Iran (3) Colombia (3)	
Capacity Building	150	24.8	41	47.8
Risk specific	46(23)	2.1	47 (63)	51.2
Most important risks	General food safety Pesticides Microbial		General Food Safety Phytosanitary Animal Health	
Method specific	27(25)	2.3	15 (28)	68.1
Most important methods	GAP/GMP Inspection HACCP		Inspection Testing GAP/GMP	
Commodity specific	21(6)	1.4	13 (21)	8.9
Most important commodities	Fish Fruits &Vegetables		Fruits & Vegetables Meats & Poultry	

Source: WTO Trade Capacity Building Database, SPS projects, http://tcbdb.wto.org/index.asp?lang=ENG, accessed May 20, 2006. Data for 2001-2005 are complete; 2006 is partial.

Notes: Methods include HACCP, Process Control, Sanitation, GAPs, GMPs, Inspection, Testing and Laboratories, and Traceability. Commodities includes fish, fruits and vegetables, grains, meats, herbs/medicines, cocoa/coffee, animal feeds, animal by-products, and forestry products. Risks include pesticides, grain standards, mycotoxins, veterinary drug residues, animal health, bioterrorism, biotechnology, bioengineering, microbial, general food risks (eg acrylamide, food additives) and phytosanitary.

EU projects include those administered by the European Commission, as well as bilateral projects originating from EU members: France, Germany, Spain, Belgium, Netherlands, United Kingdom, Portugal, and Sweden.