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Food Safety in a Globalizing World: Opportunities and Challenges for India

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Food Safety in a Globalizing World: Opportunities and Challenges for India

Dina Umali-Deininger and Mona Sur¹

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Abstract

Rising incomes and urbanization, an expanding domestic consumer base concerned about food quality and safety, and rapidly growing agricultural exports have been important drivers for the increased attention to food safety in India. But the development of effective food safety systems is hampered by a number of factors, including: restrictive government marketing regulations, weak policy and regulatory framework for food safety, inadequate enforcement of existing standards, a multiplicity of government agencies involved, weak market infrastructure and agricultural support services. The small farm structure further limits farmer capacity to meet increasing domestic and export food safety and SPS requirements. Addressing food safety concerns in India will require adoption of appropriate legislation, strengthening capacity to enforce rules, promoting adoption of good agricultural, manufacturing and hygiene practices, greater collective action, and some targeted investments. Implementing these actions will require joint efforts by the government and the private sector.

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A. Overview

Developing countries are paying increased attention to food safety, because of growing recognition of its potential impact on public health, food security, and trade competitiveness. Increasing scientific understanding of the public health consequences of unsafe food, amplified by the rapid global transmission of information regarding the public health threats associated with food-borne and zoonotic diseases (e.g. *E. coli* and salmonella, bovine-spongiform encephalopathy (BSE), severe acute respiratory syndrome (SARs) and H5N1 avian flu) through various forms of media and the internet has heightened consumer awareness about food safety risks to new levels globally (Lindsay 1997, Unnevehr 2003, Buzby and Unnevehr 2003, Kafersteing 2003, Ewen et al. 2006, Bramhmbatt 2005). Increased understanding of the impact of mycotoxins, which can contaminate dietary staples such wheat, maize, barley and peanuts, has further raised food security and public health concerns in many developing countries (Dohlman 2003, Bhat and Vasanthi 2003, Unnevehr 2003).

As developing countries seek to expand agricultural exports especially to OECD countries, many are receiving a wake-up call on the challenges of meeting both government and private sanitary and phyto-sanitary (SPS) standards in export markets (Otsuki et al. 2001, Henson 2003, Unnevehr 2003, World Bank 2005a). Private standards or supplier protocols have grown in prominence over the past decade as a means to further ensure compliance with official regulations, to fill perceived gaps in such regulations, and/or to facilitate the differentiation of company or industry products from those of competitors. Trends in private standards increasingly tend to blend food safety and quality management concerns (i.e. the recent creation of ISO 22000), or to have protocols which combine food safety, environmental, and social (child

labor, labor conditions, animal welfare) parameters (Willems et al. 2005, World Bank 2005). At the same time, increasing globalization of trade introduces greater risks of cross-border transfer of food-borne illnesses. Recent cases of disease episodes in the United States resulting from imported food produce, such as cyclospora from raspberries, hepatitis A from strawberries and salmonella from cantaloupe (Calvin 2003), illustrate to developing countries the potential food safety challenges that can arise in a more globalized market.

Weaknesses in food safety systems can have a high cost to society and the global economy. The World Health Organization (WHO) estimates that 2.2 million people worldwide die from diarrheal diseases caused by a host of bacterial, viral and parasitic organisms, which are spread by contaminated water (WHO 2006a). In India, it is estimated that 20% of deaths among children under five are caused by diarrheal disease (WHO 2006b). The SARs outbreak in 2003 in East Asia is estimated to have caused an immediate economic loss of about 2% of the Region's GDP in the second quarter of that year, even though only 800 people died from the disease (Brahmbatt 2005).¹ The Lowy Institute for International Policy (2006) estimates that a mild global outbreak of the avian flu can cost the world 1.4 million lives and close to 0.8% of GDP (US\$330 billion) in lost economic output. At the same time, country reactions to protect its citizens from food safety risks can also have large consequences for exporting countries. Otsuki et al (2001) examined the projected impact of the EU's new harmonized aflatoxin standard on the value of trade flows to 15 European countries from 9 African countries and found that it could decrease African exports by 64% (US\$670 million).

Food safety concerns are getting widespread attention in India. The country's rural development strategy, for which a key element is the promotion of increased agricultural exports

as a means to foster rural growth and poverty reduction, is coming up against tightening food safety and SPS standards in prospective markets (World Bank 2006a, 2006b). From a domestic perspective, the large national market of 1.2 billion people is undergoing rapid change. Increasing incomes, a growing middle class, increased urbanization and literacy, and a population highly tuned to international trends fueled by the information technology boom are creating a large consumer base giving increasing value to food quality and safety. Improving food safety systems, to meet domestic and export requirements, however, face a number of policy, regulatory, infrastructural and institutional obstacles.

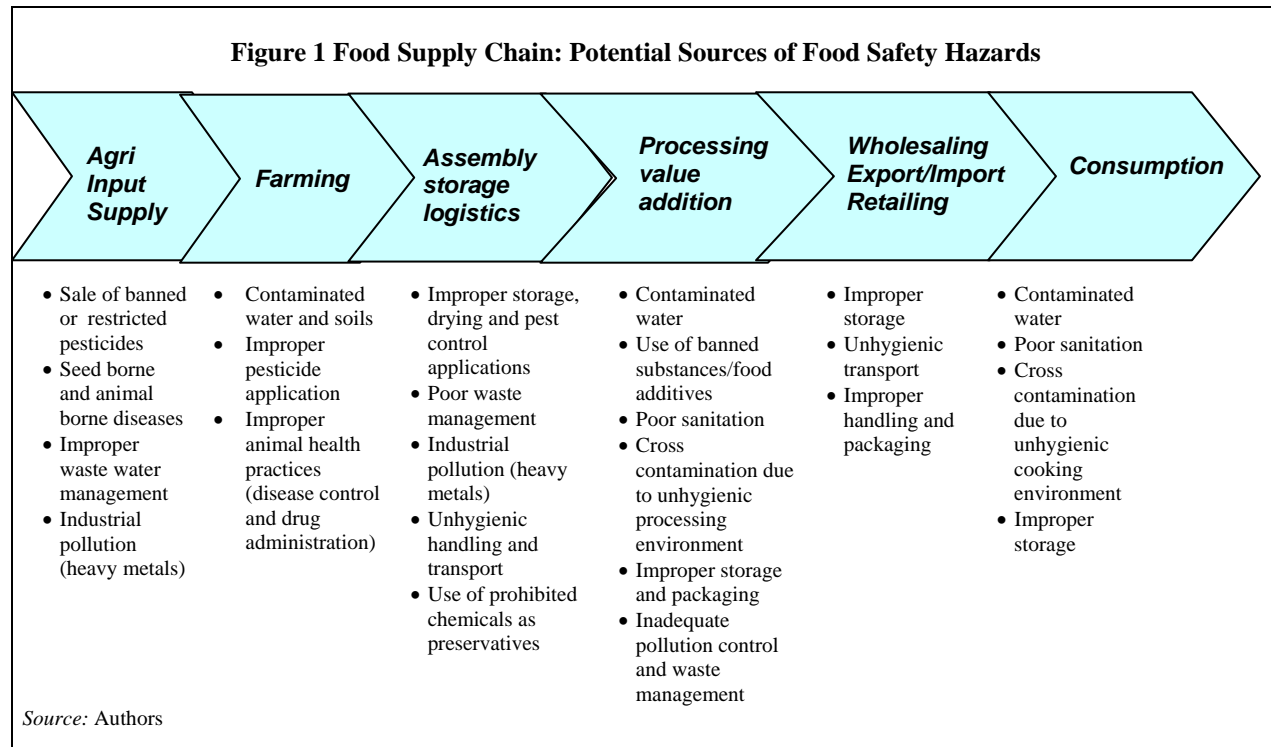
This paper aims to: (i) review the main drivers for the increased priority to addressing food safety risks in India in both the export and domestic markets, (ii) examine the nature and effectiveness of government and private responses to the food safety challenges, with special focus on high value agriculture; (iii) identify the constraints to more effective responses; and (iv) examine the implications for policy.

B. Types of Food Safety Risks

Food safety risks, as they relate to human health, arise from of a number of factors. These include: (i) microbial pathogens (bacteria, viruses, parasites, fungi and their toxins); (ii) pesticide residues, food additives, livestock drugs and growth hormones; (iii) environmental toxins such as heavy metals (e.g. lead and mercury); (iv) persistent organic pollutants (e.g. dioxins); and (v) zoonotic diseases (e.g. BSE, SARS, Avian flu, Japanese encephalitis, tuberculosis) (Buzby and

¹ The large economic impact resulted primarily from uncoordinated efforts of individuals to avoid becoming infected, contributing to a contraction in services sectors (tourism, mass transportation, retail, hotel and restaurant sales) and workplace absenteeism (Brahmbatt 2005).

Unnevehr 2003, Ewen et al. 2004).² The health risks associated with these agents impact the whole food supply chain, starting from input supply to the farm to the consumer table (**Figure 1**).



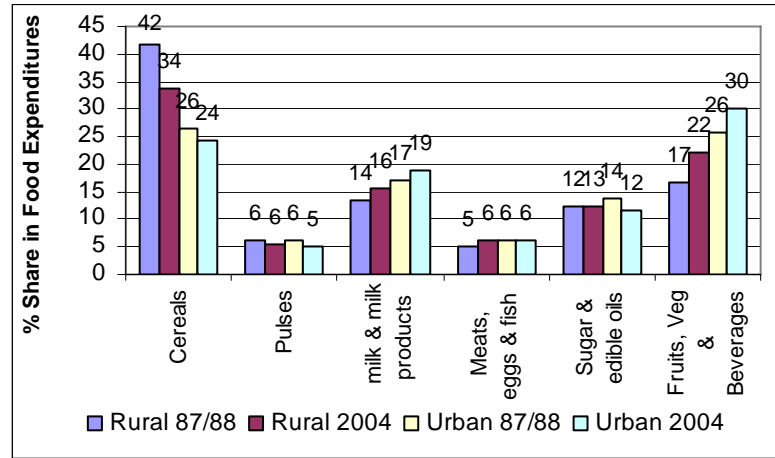
C. Food Safety and the Indian Domestic Market

Increasing incomes, urbanization, and literacy, improved infrastructure and closer ties to global trends, especially during the last decade, are driving changes in consumer demand and preferences in India. Sustained economic growth (6.0% per year in real terms from 1990/91 to 2003/04) resulted in GDP per capita increasing by about 70%, from about US\$315 in 1990 to US\$538 in 2004 (constant 2000 dollars). National poverty rates (headcount) declined from 38.9% (Central Statistical Organization 2002) in 1987/88 to 28.5% in 1999/00 (Deaton and

² There remains considerable debate regarding the food safety risks associated with genetically modified organisms (GMOs). The paper will not be covering issues relating to GMOs.

Dreze 2002).³ The middle class, which now accounts for about 15% of the 1.2 billion people in India, is the fastest growing income group and is a major force shaping the diet revolution that is occurring (Landes and Gulati 2003).

Figure 2: Diversification on Food Consumption Expenditures



Source: NSSO, 2005.

These structural changes are reshaping consumer demand. The Indian food consumption basket is diversifying away from cereals towards higher value and more perishable products, such as fruits and vegetables, dairy, meat and fish (**Figure 2**). Increasing female participation in the work force and higher disposable incomes to spend on non-home cooked foods are driving growth in demand for prepared and semi-prepared foods, and thus the growth of the processed food industries (Pingali and Khwaja 2004). These trends bring increased attention to safety concerns in the handling, processing and marketing of foods.

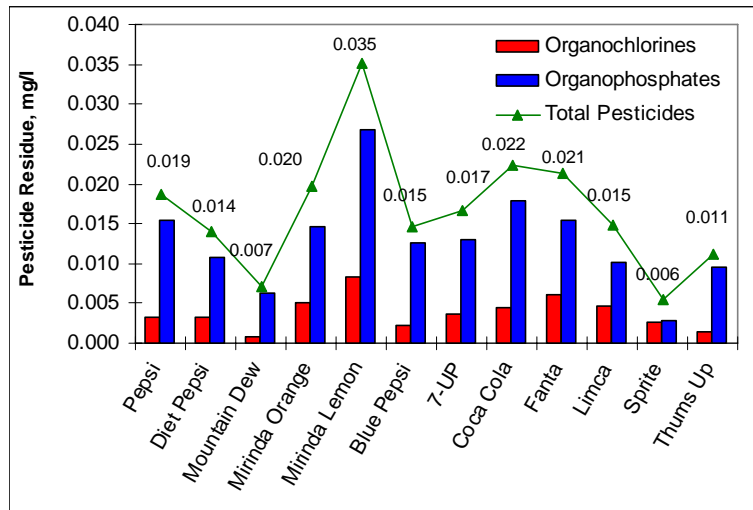
In addition, growing consumer preference for shopping convenience, increased exposure to the media (TV, cable and the internet) and ownership of durables such as refrigerators and cars are fostering the growth of modern retailing (i.e. supermarkets and hypermarkets), which in turn demand greater efficiency and food quality and safety standards in the supply chain (Mukherjee and Patel 2005, Chenggapa, et al 2005).

Increased vigilance by NGOs, consumer groups, and local research institutes is also raising awareness and spurring action among consumers and policy makers to address food

³ There continues to be a debate on the headcount poverty rate in 1999/00, arising from the adjustment in the design of the 1999/00 National Sample Survey. Depending on the methodology used, the poverty estimates range from

safety risks. Findings of high levels of pesticides in bottled water and soft drinks in 2003 by the Centre for Science and Environment (CSE), an NGO, shook the country and forced the Government of India (GOI) to take swift action (Mathur et al 2003, CSE 2004). The CSE tested 30

Figure 3: Pesticide Residues in Soft Drinks in India, 2003



Note : EU MRL for bottled water is 0.0005 ppm
Source : Mathur et al. 2003.

bottled water brands from the major cities of Delhi and Mumbai in Maharashtra and found that all except one contained pesticide residues. The Delhi brands on average contained pesticide residues 36.4 times the maximum pesticide residues stipulated by the European Union standards for bottled water (CSE 2004). Shortly thereafter, Mathur et al. (2003) tested 12 brands of soft drinks sold in Delhi for 16 organochlorine and 12 organophosphorus pesticides and 4 synthetic pyrethroids commonly used in agricultural fields and homes in India. Their analysis found that all brands exceeded the EU maximum pesticide residue limit of 0.0005 ppm (**Figure 3**).

To deal with the back-to-back crises, the GOI established a special Joint Parliamentary Committee on “Pesticide Residues in and Safety Standards for Soft Drinks, Fruit Juice and Other Beverages” in August 2003 to investigate the allegations. Two GOI Laboratories were instructed to conduct tests on the 12 brands (but using different samples) and their findings showed that 9 of the 12 samples exceeded the EU limits (Hindu Business Line 2003)

Weak regulations and inadequate standards were major causes of these high profile food safety crises. In the case of bottled water, while the existing norm set out by the Bureau of

Indian Standard (BIS) required that “no pesticides should be detectable,” the prescribed methodology could only detect pesticides at extremely high levels. Consequently, GOI issued a notification revising the standards for pesticide residues on bottled water, adopting the EU single residue limit of 0.0001 ppm and multiple residue limit of 0.0005 ppm (CSE 2004). In the case of soft drinks, the BIS only had voluntary standards, not mandatory standards for pesticide residues. To address the problem, BIS constituted a 39 member committee, consisting of representatives from the soft drinks industry, government scientists, NGOs and consumer groups to formulate the new BIS standards. The outcome was the Indian Ready to Serve Non-Alcoholic Beverages Specifications, which established the limits for 16 pesticides in the finished product (0.0001 mg/l for individual pesticides and total pesticide residue limit of 0.0005 mg/l) (CSE 2004).

Even the government-sponsored Mid-day Meals program encountered serious food safety incidents. The National Program for Nutritional Support to Primary Education (NPNSPE), more popularly known as the Mid-Day Meals Scheme, aims to improve child enrollment in primary school and encourage regular attendance by providing supplementary feeding, while improving their nutritional status. It covers children enrolled in classes I to IV in government and government-aided schools in the whole country (Jha and Umali-Deiningner 2003). In June 2006, 85 students from a Chennai primary school were admitted to the hospital because of food poisoning after consuming food prepared under mid-day meal scheme.⁴ In February 2004, 281 children attending municipal schools in Delhi fell ill and were admitted to the hospital after consuming their mid-day meal.⁵ There have been many other cases, despite quality norms being established for the mid-day meal program.

⁴ <http://www.newkerala.com/news3.php?action=fullnews&id=11595>

⁵ <http://www.hindu.com/2004/02/27/stories/2004022713760300.htm>

While issues related to pesticides in bottle water and carbonated drinks, and out-breaks of food-borne illnesses received wide media attention, there are other serious domestic food safety concerns that have been identified including heavy metal contamination in foods. Marshall, et al. (2003), tested fresh cauliflower, okra, and spinach — common vegetables in the Indian diet — in 5 production sites around the Delhi region and in Delhi’s Azadpur wholesale market from May 2001 to June 2003. They found that 72% of the 222 spinach samples exceeded the Indian MRLs for lead of 2.5 mg/kg, and 100% exceeded the Codex MRL of 0.3 mg/kg. They attributed the high lead content to a number of possible causes, including contamination of the irrigation water by sewage and industrial effluent and industrial pollution.⁶ Contamination was exacerbated by their locations—the production sites and market were in peri-urban and urban areas. When tested for zinc, 21% of samples exceeded both the Indian and international standards. Currently, however, no regular testing for heavy metals in vegetables is undertaken by government agencies in India. Tests undertaken by the Indian Council for Agricultural Research found pesticide residues above the MRL in 5.3% of 666 samples of vegetables in 2003 and 15% of 468 samples of milk tested in 2001 (Directorate of Plant Protection and Quarantine 2006).

The long term use of pesticides in agriculture and for disease control (e.g. DDT for malaria control) is manifesting itself in the blood, human milk and fatty tissue in the population in many states. **Table 1** presents the results of micro-research studies in selected states in India from 1980 to 2005.

Table 1: Level of DDT and HCH Content in Human Blood Samples in Selected States in India.

Location	Year	Number of Samples	Total DDT (ppm)	Total HCH (ppm)
Lucknow, Uttar Pradesh	1980	25	0.020	0.022
Delhi	1982	340	0.710	0.049
Lucknow, Uttar Pradesh	1983	48	0.028	0.075
Delhi	1985	50	0.301	-
Ahmedabad, Gujarat (rural)	1992	31	0.048	0.148
Ahmedabad, Gujarat (urban)	1997	14	0.032	0.039
Punjab (rural)	2005	20	.0652 mg/l	0.057 mg/l

Note: HCH - Hexachlorocyclohexane

Source: ICMR 2001, Mathur et al. 2005.

⁶ Potential sources of industrial pollution include emissions from vehicles, industrial plants, coal power generation plants, and diesel generator sets and re-suspended road dust. Marshall et al. found that washing the spinach twice

D. Food Safety Concerns in Indian Exports

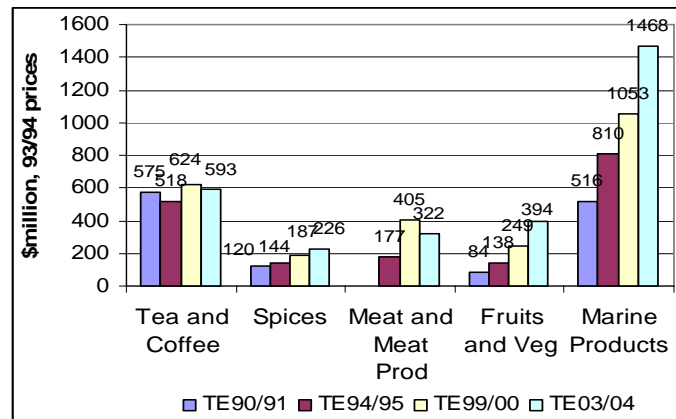
Increased globalization and liberalization of markets, facilitated by the World Trade Organization (WTO), are opening new export markets for Indian agricultural products, both fresh and processed. Indian agricultural exports grew at an average annual rate of 7.2% from 1990/91 to 2003/04. In response to these new opportunities, India's agriculture exports diversified from traditional exports of tea, spices, and coffee to include horticultural, fish and livestock products. Between the triennium ending (TE) 1991/92 and TE 2003/04, the value of fresh and processed fruit and vegetable exports rose from US\$84 million to US\$394 million in real terms (1993/94 dollars) while marine product exports rose from US\$516 million to US\$1.5 billion during the same period (**Figure 4**)

As Indian agricultural exports diversified, and the value of exports to high income countries increased, India has had to confront new food safety challenges. Concerns over numerous rejections of Indian agro-food exports on food safety grounds have spilled over

domestically, generating greater domestic attention to pervasive food safety problems in the supply chain including high levels of pesticide residues, presence of heavy metals in food, and micro-biological contamination. The following section describes recent food safety challenges in Indian horticultural, spice and fisheries exports.

Horticultural Exports. In 2004, India exported US\$575 million of fresh and processed fruits, vegetables and flowers. Traditionally India's fresh fruit and vegetables exports were

Figure 4: Trend in Agricultural Exports, Triennium Ending (TE) 1990/91 to TE 2003/04



Source: Department of Commerce, Government of India.

reduced the lead contamination by 50% indicating that a large proportion of the lead was air-borne.

targeted to markets in neighboring South Asian countries, to the Middle East and to East Asia. Since the early 1990s India achieved some success in exporting fresh horticultural produce to Western Europe. India has been quite proud of its penetration into the U.K, Netherlands and German fresh grape markets. Grapes are a highly seasonal crop and Indian exporters have been targeting a crucial March to April window in the European market, which falls at the end of the main southern hemisphere production season (in South Africa and Chile) and before Egypt and Turkey enter the market. Virtually all of India's grape exports are of the Thompson Seedless variety.

The Indian grape export crisis in May 2003 was a pivotal wake-up call to Indian exporters concerning the costs of failing to meet food safety standards. In the midst of a commercial dispute with an Indian grape exporter, a Dutch importer had samples of the Indian grapes tested by a private laboratory. On finding that the grapes contained residues of the insecticide methomyl in excess of the EU maximum residue limit (0.05 microgram/kg.), the importer placed an advertisement in the local paper warning that grapes from this Indian supplier contained "poison" (World Bank, 2006b). Dutch authorities, who were alerted about the finding, tested samples from the 28 containers of Indian grapes then in Rotterdam port and found that about 75% of the samples exceed the MRLs for methomyl and/or acephate.⁷ The problem was reported on the EU Rapid Alert system, causing not only significant short term economic losses, but also considerable longer term reputation damage. The price of Indian grapes dropped sharply, and the Indian grape shippers incurred losses, either in Dutch sales or by diverting the shipments to other markets.

⁷ Of the twenty Indian samples with violative levels of methomyl, six exceeded the MRL by ten times, but most of the others were also far in excess of the MRL (Schee 2004).

Spice Exports. India is the world's largest consumer and producer of spices and is also a significant exporter of spices (Jaffee, 2005). In 2004/05, India's spice exports totaled US\$399 million. India, however, has encountered a number of food safety problems in its spice exports including high pesticide residues, aflatoxin contamination and the use of prohibited food colorants. In the mid-nineties, Indian dry chili exports faced several rejections including rejections in Spain due to pesticide residue in excess of permissible MRLs, and in the United States because residues of quinalphos, a pesticide not registered in the United States (Jaffee, 2005). Between 1998 and 2000, Indian dry chili exports also faced rejection in Germany, Italy, Spain and the U.K. due to the presence of aflatoxin.⁸ More recently, exports of chili and curry powder faced problems due to the use of the prohibited red dye Sudan 1 (Jaffee, 2005). In February 2005, a massive recall of some 600 food products took place in the UK because of the detection of Sudan 1 in Worcester sauce. This was the largest ever food recall in the U.K. and it affected all major retailers as well as large numbers of food manufacturers and food service companies, as the Worcester Sauces had been used in the preparation of a large number of different products. It is estimated that this recall, and associated expenses, cost the U.K. and other European food manufacturers some 200 million Euros (Jaffee, 2005). The source of the Sudan 1 dye in the Worcester sauce was traced to chili powder imported from India in 2002.

Fish and Fish Product Exports. Fish and fish products are one of India's largest agricultural export earners, totaling US\$1.3 billion in 2004/05. Over the years, India has encountered several food safety problems with its fish and fish product exports. Most prominent, in 1997, the European Commission found the industry to be non-compliant in maintaining hygiene standards in fish processing plants. In May 1997 the European Commission banned Indian exports of fresh crustaceans and cephalopods and imposed border testing for salmonella

⁸ Aflatoxin may emerge in dried chilies as a result of improper drying (Jaffee, 2005).

and *Vibrio* spp. for frozen products (Henson, Saqib and Rajasena, 2005). Because of continued detection of salmonella, all exports of fish and fishery products to the EU from India were banned in 1997. While India has for the most part been able to address the hygiene-related problems plaguing its export of fishery products in the late nineties, Indian exports are now under scrutiny because of problems related to antibiotic residues and bacterial inhibitors (antibiotics, preservatives and chlorine) (Henson, Saqib and Rajasena, 2005). It is widely acknowledged that in the future, heavy metals and other contaminants could be an emerging issue particularly because of the increased attention to heavy metals in the EU. Surveillance of fisheries products for heavy metals has already begun in the U.K.

Although India has been able to broadly comply with food safety requirements for each of the export commodities mentioned above, it continues to face problems across a range of agro-food exports. Evidence of continuing trouble is clearly apparent from Import Refusal Reports issued each month by the USFDA for food and drug imports into the United States. Most recently, in both April and May 2006, India had one of the highest rejections among all countries exporting to the USA; India faced 176 rejections in May, 2006 and 211 rejections in April, 2006.⁹ While a significant number of the 176 rejections were issued for drugs and cosmetics, the grounds for rejection among the various food items included salmonella and/or filth in raw peeled shrimp, prepared Indian breads (paratha, roti), basmati rice, sesame seeds, pepper, coriander and chili powder; pesticide residues in lentils; failure to declare the color additive FD & C Yellow No. 5 in banana chips; and unsafe coloring in cream biscuits. The number of rejections and the range of problems reveal extensive safety problems in Indian food products. It is also reasonable to assume that the extent of the problems faced by domestic

⁹ India had the most rejections of any country in May and the second highest number of rejections, behind Mexico, in April, 2006. http://www.fda.gov/ora/oasis/5/ora_oasis_entry_lst.html.

consumers is far more serious as there many more micro, small and medium enterprises that cater to domestic consumers and generally pay less attention to food safety issues. By contrast, exporters are likely to be more well-established and larger firms with better technology and relatively more cognizant about food safety concerns.

E. Challenges to Improving Food Safety in India

Improving food safety in India, whether for the domestic market or for export trade, is hampered by a number of structural, policy, institutional, technical and cultural barriers.

Policy and Regulatory Environment. A number of policies and regulations governing agricultural marketing and food processing complicate the implementation of food safety measures by the government and by the private sector. Two critical marketing regulations are the State level Agricultural Produce Marketing (Development and Regulation) Acts and the Small Scale Industry Reservation Policy. Almost all states in India have an Agricultural Produce Marketing (APM) Act, which gives state governments the sole authority to establish and manage wholesale markets.¹⁰ The Act, adopted by most states in the 1960s and 1970s, prescribes the setting up of a network of state controlled “regulated markets” or *mandis* and the establishment of Market Committees to operate each. All “notified” agricultural commodities grown in areas surrounding the market are required by law to be sold only through these markets, with the number of notified commodities varying by state and market. Implementation of the Act and its enforcement vary considerably by state. In 2005, there were nearly 8,000 regulated markets in the whole country.¹¹ The requirement that all agricultural commodities be channeled through the regulated markets not only increases transactions costs, but is also a major obstacle to preserving

¹⁰ The states of Kerala, Jammu and Kashmir, Manipur, Andaman and Nicobar Islands, Dadra and Nagar Haveli, and Lakshadweep do not have the regulation.

¹¹ In 2003, there were 7,383 wholesale markets in the country of which 7,360 were regulated markets. In addition, there were 27,294 rural periodic markets (Ministry of Agriculture as cited in www.indiastat.com).

produce quality and traceability. In 2003, the GOI formulated a model Agricultural Produce Market Act for state governments to adopt, which removes the restrictions on farmer direct sales and permits entities outside of government to establish and operate wholesale markets. To date only 10 of the 28 states and Union Territories have adopted the model Act.¹²

The Small Scale Industry (SSI) Reservation restricts the processing of certain commodities to the small scale sector. Although the list of commodities subject to this restriction has been reduced significantly during the last decade, several processed agricultural products are still subject to SSI reservation, such as rapeseed, mustard and ground nut oil,¹³ bread, pastry, pickles and chutneys, and hard boiled sugar candy (Department of Small Scale Industries 2006). The SSI reservation imposes constraints on enterprises' ability to undertake the necessary investments (e.g. HACCP) and certifications required to meet the domestic and international food safety and SPS requirements.¹⁴

There is a complex web of laws governing the processed food sector which complicate implementation of food safety measures. These laws are enforced by 8 different ministries. Some of the most critical are: Prevention of Food Adulteration Act 1954 implemented by the Ministry of Health and Family Welfare; Milk and Milk Products Order 1992 and Agricultural Produce Grading and Marking Act 1937 implemented by the Ministry of Agriculture; the Essential Commodities Act 1955, Standards of Weights and Measures Act 1976, Consumer Protection Act 1986, and Bureau of Indian Standards Act 1986 implemented by the Ministry of Food, Consumer Affairs and Public Distribution; the Fruit Products Order 1955 implemented by

¹² The states that adopted the model Act include : Punjab, Madhya Pradesh, Andhra Pradesh, Orissa, Maharashtra, Rajasthan, Chhattisgarh, Himachal Pradesh, Sikkim and Nagaland.

¹³ Exceptions are rapeseed, mustard, and ground oil through solvent extraction and those processed by growers cooperatives and state agro-cooperatives (Ministry of Small Scale Industries 2005)

¹⁴ This issue is more serious for domestic consumers since food processing units exporting more than 50% of production are not subject to the SSI reservation.

the Ministry of Food Processing Industries; import and export regulations implemented by the Ministry of Commerce; Trade in Endangered Species Act implemented by the Ministry of Forest and Environment; Atomic Energy Act 1962/Control of Irradiation of Food Rule 1991 implemented by the Ministry of Science and Technology; and Infant Milk Substitutes, Feed Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Act 1992 implemented by the Ministry of Human Resource Development (Patnaik 2005).

These laws also authorize several agencies to lay down standards for food products: (i) Bureau of Indian Standards (BIS) of the Ministry of Food, Consumer Affairs and Public distribution under the BIS Act, (ii) Ministry of Food Processing Industry under the Fruit Products Order, (iii) Ministry of Agriculture under “Ag Mark” and the FPO, (iv) Ministry of Health and Family Welfare (MOHFW) under the PFA Act; (v) Export Inspection Council under the Export-Import Policy, and (vi) the Defense Ministry for their own purchases.

These laws and associated regulations in some cases prescribe contradictory or differing standards. For example, while the Fruit Products Order (FPO) allows the use of artificial sweeteners in fruit products, the Prevention of Food Adulteration (PFA) Act bans it. Mandatory declaration labels required by the PFA differ from those of the Packaged Commodity Regulation Rules (1977) under the Standard Weights and Measures Act. The emulsifier and stabilizers permitted for use in jams and chutneys under the PFA differ from those allowed under the FPO.

In 1998, the GOI began the process of rationalizing the legal and regulatory framework for food and food processing. The Prime Minister’s Council on Trade and Industry established a Task Force on Food and Agro-Industries Management Policy to recommend options for rationalizing the various policies and regulations. The outcome was a new Food Safety and Standards Bill, which was submitted to Parliament in August 2005 and is awaiting approval. The

Bill aims to consolidate the laws relating to food. The key provisions of Bill include: (i) the repeal of a number of Acts and Orders;¹⁵ (ii) the establishment of a Food Safety and Standards Authority of India; (iii) definition of the standards for food additives, contaminants, genetically modified and organic foods, packaging and labeling, and food imports; (iii) accreditation of laboratories, research institutions and food safety auditors; (iv) licensing and registration of food business and setting penalties for offenses; and (v) establishment of a Food Safety Adjudication Tribunal (Ministry of Food Processing Industries 2005). Approval of the Bill will be an important milestone in strengthening food safety systems in India.

There are a large number of government agencies involved in agricultural marketing activities, more broadly or with respect to specific commodities, which complicates effective implementation of a coherent food safety strategy for the country (**Table 2**). As in the case of the soft drink contamination, the multiple laws and agencies added to the confusion. The BIS was charged with setting the standards for pesticides in soft drinks, while the MOHFW is charged with setting the pesticide standards for bottled water.

Smallholder Agriculture. The current structure of the farm sector in India constrains farmer capacity to meet domestic and international food safety standards. Farming in India is dominated by small farmers — the average farm size in 1990/00 was 1.8 ha (NABARD 2002). Most farmers face credit constraints (World Bank 2004), and literacy rates are low.¹⁶ These constraints impose limits on the number of farmers capable to adopt more sophisticated farm

¹⁵ The laws and orders repealed are the: Prevention of Food Adulteration Act 1954 (37 of 1954), Fruit Products Order 1955, Meat Food Products Order 1973, Vegetable Oil Products (Control) Order 1947, The Edible Oils Packaging (Regulation Order) 1998, Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order 1967, Milk and Milk Products Order 1992, and other orders under the Essential Commodities Act 1955 (10 pf 1955) relating to food.

¹⁶ The rural literacy rate in 1999/2000 was 50% (<http://www.indiastat.com/india/ShowData.asp?secid=16611&ptid=367635&level=5>)

Table 2: Government of India Agencies Involved in Agricultural Marketing

Agency	Policy Formulation	Regulation	Domestic Trading	Post Harvest Management	Agro-Processing	Agro-Exports	Grades, Standards, SPS	Training/Capacity building	Market Information	Direct Marketing Activities
Ministry of Agriculture										
Dept of Agriculture and Cooperation	X									
Directorate of Marketing and Inspection		X	X				X	X	X	
Directorate of Plant Protection, Quarantine and Storage						X	X			
Dept of Animal Husbandry and Dairying	X	X	X				X			
Boards and Autonomous Bodies										
National Horticulture Board			X	X	X		X	X	X	
National Dairy Devt Board			X		X		X	X	X	X
Coconut Development Board			X	X	X			X		
National Oilseeds and Vegetable Oils Development Board			X	X	X			X		
National Insecticides Board	X					X	X			
Nat'l Institute of Agricultural Marketing			X	X	X			X		
Nat'l Institute of Post Harvest Technology				X	X			X		
Nat'l Cooperative Devt Corporation			X	X						
Small Farmers Agribusiness Consortium			X	X	X					
Ministry of Food Processing Industries										
Dept of Food Processing Industries	X	X			X		X	X		
Dept of Agro and Rural Industries	X									
Ministry of Consumer Affairs, Food and Public Distribution										
Dept of Consumer Affairs	X	X								
Bureau of Indian Standards	X	X					X			
Dept of Food and Public Distribution	X									
Directorate of Sugar		X			X					
Directorate of Vanaspati, Vegetable Oils and Fats			X		X					
Central Warehousing Corporation										X
Food Corporation of India			X				X			X
Ministry of Small Scale Industries	X	X		X		X				
Ministry of Commerce and Industry										
Dept of Commerce	X					X				
Dept of Industrial Policy and Promotion	X	X			X					
Directorate General of Foreign Trade									X	
Autonomous and Statutory Bodies										
Indian Institute of Packaging			X		X		X			
Agricultural and Processed Food Products Exports Development Authority (APEDA)			X			X	X	X	X	
Marine Products Export Development Authority			X		X	X	X	X	X	
Export Inspection Council					X	X	X			
Coffee Board			X	X		X	X	X	X	X
Rubber Board			X	X	X	X	X	X	X	
Spices Board			X	X	X	X	X	X	X	
Tea Board			X	X	X	X	X	X	X	
Tobacco Board			X	X		X		X	X	X
Ministry of Health and Family Welfare	X	X			X		X	X		
Ministry of Finance										
National Bank for Agriculture and Rural Development			X	X	X	X				

Source: Ministry of Food Processing Industries, Annual Report 2004/05; Ministry of Commerce Annual Report 2004/05, Patnaik, G. ,2005, "Review of Government of India Agricultural Marketing/Processing Policies and Programs", Global Agri-System, Pvt.Ltd.

practices and undertake the necessary investments (e.g. land improvements, obtaining necessary certifications, cold storage) to meet more stringent food quality and safety requirements. They increase the cost of transacting business and monitoring compliance with food safety standards. Stringent land policies, e.g. land ceilings and restrictions on land rental, limit possibilities for greater land amalgamation (World Bank 2006c). International experience indicates, however, that farm size constraints may be overcome through innovative interventions such as organizing farmers into producer groups, establishing collection centers (by supermarkets and exporters), using contract farming arrangements, and by creating public-private partnerships to assist farmers in a variety of ways, including help in obtaining the capital required to make on-farm improvements and other investments (e.g. grading or cooling facilities), developing and improving farming skills through joint extension provision, and assistance in acquiring the required national and international certifications (Berdegué et al. 2003, Boselie et al. 2003, Dries et al 2004, Reardon and Swinnen 2004, Reardon and Timmer 2005a, 2005b).

In order to address various food safety concerns in both the spices and fresh and processed fruit and vegetable sectors, some exporters initiated contract farming operations or “vendor screening” programs. One industry that has been especially successful in establishing contract farming arrangements and meeting stringent food safety and quality standards is the pickled gherkin industry. The industry, consisting of some 42 companies and nearly 50,000 smallholder outgrowers, is concentrated in Karnataka, Andhra Pradesh, and Tamil Nadu. The leading gherkin exporting companies each have several thousand farmers under contract. The companies provide intensive oversight and maintain extensive records of farmer practices, especially related to pesticide use. At least one company began the process of getting outgrowers certified under EurepGAP (World Bank 2006b). Contract farming has worked relatively well in the case of

gherkins as almost the entire production from India is exported and there is no local market. Hence contract enforcement has not been a major challenge as in the case of other commodities where the export intensity is much lower and the majority of production is consumed domestically.

Until recently, contract farming was illegal in India as per the provisions of the APM Act. The only way entrepreneurs can legally enter into contract farming with farmers is to obtain a special waiver from the APM Act from the State Government. The new model APM Act provides the legal framework and guidelines for contract farming. The provisions in the model Act allow contract buyers to directly purchase commodities from farmers under individual contracts or from farmers' markets. It also allows the direct sale of farm produce at the farmers' fields without having them routed through regulated markets. Adoption of the model Act by state governments will therefore facilitate not only more efficient marketing, but also improved food safety and the adoption of improved agricultural practices.

Weak Extension Systems. The public agricultural extension systems at the state level are very weak and have not effectively caught up to the changing needs of farmers and the market (World Bank 2005b). In view of the GOI's earlier concentration on food self-sufficiency, the state-level Department of Agriculture (DoA) extension systems generally focused on cereals, particularly rice and wheat, with an emphasis on the transfer of improved varieties and management practices. The weak coordination between the state DoAs and the other line departments (e.g. Departments of Irrigation, Horticulture, Livestock, Marketing, etc) and the limited staff capacity beyond the Department of Agriculture also often translated to limited extension activities beyond cereals, limiting its impact on agricultural and market diversification trends. The weak coordination with research at the central level further increased the difficulty of

ensuring effective research-extension-farmer linkages at the state level. In many states, tight fiscal constraints contributed to the breakdown of the state extension machinery (Hanumantha Rao 2003). Private extension provision (fee for service) is emerging. There are an increasing number of input suppliers, traders, contract buyers, supermarkets, and exporters which provide extension services to farmers as an integral part of their trading arrangements (World Bank 2005b). However in the national context, private extension remains limited.

The findings of a World Bank agricultural marketing survey, covering 1,579 farmers producing high value crops (tomatoes, potatoes, mangoes, maize and tumeric) in four states in India (Orissa, Tamil Nadu, Uttar Pradesh, and Maharashtra) conducted during February to May 2005, confirm the limited effectiveness of the national extension system. Farmers primarily depended on personal observation or on other farmers for information about crop prices, post harvest practices, irrigation, fertilizer and pesticide use (**Table 3**).

Although food safety concerns have not been a major focus in the extension program, it is partly addressed through the increased Ministry of Agriculture (MoA) priority to integrated pest management (IPM). MoA established the National Center for Integrated Pest Management in 1988 to develop and promote IPM technologies. Notably there has been a decline in total pesticide consumption in India from 75,000 mt in 1990/91 to 48,400 mt in 2003/03 (Directorate of Plant Protection and Quarantine 2006).

Poor Infrastructure and Services in the Marketing System. Reducing food safety risks from the farm to domestic and export markets is constrained by inadequate infrastructure and facilities, particularly at the wholesale markets. The World Bank Agricultural Marketing Survey also collected information on the operations of 78 wholesale markets in the four states. The survey found that the infrastructure and facilities in these markets are limited and rudimentary.

Overall, Maharashtra and UP had slightly better infrastructure than the other two states. About 83% of markets had covered shops, but only 18% had paved roads within the market and 51% had public toilets (**Table 4**). Access to warehouses is limited, except in Maharashtra (85%). Less than 40% of markets had a drying area and no markets in Orissa or Uttar Pradesh had cold storage facilities (compared to 5% in Tamil Nadu and 20% in Maharashtra).

Table 3: Farmer Sources of Information.

Type of Information/State	Farmers' Source of Information, %							
	Other farmers	Agricultural traders	Personal observation	Agricultural officers	Contract Buyers	Input suppliers	Mass Media	Other
Crop Prices								
Tamil Nadu	34	45	0	6	0	1	13	1
Orissa	46	47	1	4	1	1	1	1
Maharashtra	78	6	1	11	0	1	2	1
Uttar Pradesh	67	25	0	3	2	0	1	0
Total	66	21	0	7	1	0	3	1
Sorting/grading of crops								
Tamil Nadu	30	4	50	8	2	4	2	0
Orissa	54	17	9	18	0	0	15	0
Maharashtra	79	1	4	11	0	0	0	4
Uttar Pradesh	76	13	0	2	8	0	2	0
Total	69	7	10	8	3	1	1	2
Post-harvest practices								
Tamil Nadu	31	1	52	7	0	3	6	0
Orissa	56	9	8	20	0	2	1	3
Maharashtra	77	0	3	11	0	2	0	5
Uttar Pradesh	77	13	0	2	7	0	2	0
Total	69	5	9	8	2	2	2	3
Irrigation Use								
Tamil Nadu	26	1	53	14	0	4	2	0
Orissa	50	6	10	29	0	1	3	1
Maharashtra	81	0	4	10	0	0	0	4
Uttar Pradesh	86	6	0	3	0	1	2	2
Total	73	3	10	10	0	1	1	3
Fertilizer & pesticide use								
Tamil Nadu	14	6	27	21	1	27	3	1
Orissa	35	12	8	34	0	7	2	3
Maharashtra	74	1	2	11	0	10	2	1
Uttar Pradesh	60	13	0	8	0	14	3	1
Total	58	6	5	13	0	13	2	1

Source: World Bank 2006a.

Waste management and pest control in the markets are very weak. Officials working in the wholesale markets were asked how the spoiled produce and waste products were disposed off. Fifty-four percent responded that market employees or contracted firms handled garbage disposal and waste management; 29% reported that they were just left to rot in the market, while 13% reported that they were left for the animals to eat. Market officials were also asked about

the pest control measures they undertake. Fifty-nine percent indicated that no particular control measure for rats and insects are implemented in their market, 32% indicated it was up to the individual shop owners to take care of their rat problems. Only 8% reported the market management or association or a subcontracted firm took care of rat problems. Reducing food safety risks will require significant public and private investments to upgrade the market infrastructure and services. For regulated markets, this will also require improving the operational and fiduciary management to ensure that more resources are re-invested back into the markets.

Table 4: Market Infrastructure and Facilities in Wholesale Markets in Tamil Nadu, Orissa, Maharashtra and Uttar Pradesh

Market Infrastructure and Facilities	Percentage of Wholesale Markets				
	Tamil Nadu	Orissa	Maharashtra	Uttar Pradesh	All
Covered shops	72	80	90	89	83
Paved road in mkt yard	30	5	15	22	18
Parking (all vehicles)	10	10	70	44	33
Drainage	75	35	70	83	65
Cold Storage	5	0	20	0	6
Warehouse	5	50	85	33	44
Drying area	5	20	0	39	15
Public Toilet	40	25	70	72	51
Fumigation equipt	10	5	0	6	5
Grading equipt	5	15	15	33	17
Drying machine	0	0	0	6	1
Mechanized crop handling	0	5	10	0	4

Source: World Bank India Agricultural Marketing Survey.

Cultural Issues. Religious beliefs further constrain the kinds of food safety measures that could be adopted in India. The sacred value attached to cattle imposes limits on disease control measures to address food safety and public health (BSE, foot and mouth disease), such as culling to limit disease spread or to create disease free zones.

Inadequate grades and standards for the domestic market and poor enforcement.

The Directorate of Marketing & Inspection under the Department of Agriculture and Cooperation is responsible for enforcing and implementing the Agricultural Produce (Grading and Marking) Act. Its mandate includes promoting standardization and grading of agricultural products. Grades and standards have been prescribed for 164 commodities under the APM Act for domestic trade, for export trade and for grading at the producer's level. The AGMARK

grades are primarily voluntary grades covering aspects such as size, variety, weight, color, and moisture levels. For certain items they also cover parameters such as acceptable levels of organic and inorganic foreign matter (in pulses, for example) and other chemical properties such as specific gravity for essential oils. Different grades and standards are laid out under AGMARK for domestic consumption versus exports.

The Directorate provides third party certification under the AGMARK quality certification scheme. The 'AGMARK' seal is supposed to ensure quality and safety. Any consumer, trader or manufacturer can have products tested at one of the 23 regional AGMARK laboratories for designated commodities. Typically, testing is only carried out for adulteration-prone commodities such as oils, ghee, whole and ground spices, honey, and whole and milled food grains. Blended edible vegetable oils and fat spreads are compulsorily required to be certified under AGMARK. The Prevention of Food Adulteration Act also sets standards for food products including aspects such as permissible food colorings, preservatives, pesticide residues, packaging and labeling. As illustrated by the bottled water and soft drink pesticide residue incidents, inadequate standards and weak enforcement remain a problem.

The grades specified under AGMARK and standards as laid out in the PFA are designed to facilitate trade as well as ensure food safety. The food safety standards under the PFA in general need to be aligned with international standards. However there are many commodities that are not grown or consumed outside of India. For these commodities it may not be possible to align domestic standards with international standards because there are no established international standards. In these instances it is important for research to be conducted in India to set appropriate standards for the domestic market.

Lack of pro-activity in addressing food-safety issues. Domestic food safety scares and the more notable food-safety problems faced by Indian agro-exports, reveal the overall absence of any pro-activity in addressing food safety concerns in India. Several factors contribute to this. In the case of exports, many if not most of the emerging SPS and international standards are widely viewed as not scientifically based and as representing unfair “barriers to trade” (World Bank, 2006b). These measures are viewed as efforts to protect foreign farmers or processors from competition, or are being fueled by unreasonable consumer fears in high income countries and improved technologies for detecting hazards. Consequently, the approach of the government and private sector has been to try to negotiate away the problems with trading partners and, failing that, addressing the various measures in international standard-setting or dispute fora. As a consequence, insufficient attention is devoted to monitoring the requirements of official and private standards, interpreting their implications for Indian agriculture and using current and anticipated requirements as catalysts to upgrade existing operations and strengthen supply chain management (World Bank 2006b).

This absence of pro-activity has meant that India has either had to adopt a “defensive” strategy avoiding markets with more stringent food safety and agricultural health standards or launch into a fire-fighting mode when it faces potential disruption or loss of trade due to non-compliance with standards.¹⁷ The absence of pro-activity is well illustrated through examples of problems faced with exports of fishery products in the late nineties and the more recent troubles with grape exports to Europe. In both cases, although there were signs of potential problems for a considerable period of time, the food safety problems were not given serious attention until India was faced with a crisis.

¹⁷ An example of a defensive strategy is the existing trend where many of India’s mango pulp exporters are forced to sell to less remunerative markets because they are not HACCP compliant.

In the case of exports of fish and fishery products, necessary monitoring and enforcement measures for ensuring that exports complied with food safety concerns were not put in place until the loss of EU markets in 1997 (Henson, Saqib and Rajasena, 2005). This was despite the fact that India had continually faced rejections because of failure to meet hygiene standards and other food safety requirements since the 80s, and in spite of regulatory reforms to provide safety assurance for fish and fishery products undertaken in 1995 (Henson, Saqib and Rajasena, 2005).

Similarly, in the case of grape exports to the EU, pesticide residue problems had surfaced since the late nineties. During this period, some limited testing was done for pesticide residues in export-oriented grapes. Testing was made mandatory in 2000, but most of the available testing equipment was not up to date, could not test to the same level of detection as was common in Europe and was unable to detect certain heat-sensitive chemicals such as acephate and methomyl (World Bank, 2006b).¹⁸ Only after EU Rapid Alerts were issued in 2003 did the Government and industry step into action to address the problem. In general India has not viewed complying with food safety and agricultural health standards as a means to both improve its competitive position and to enhance the effectiveness of its negotiations on particular technical and commercial matters, which is in stark contrast to the approach of leading agro-food exporting countries (World Bank, 2006b).

A consequence of the lack of pro-activity and the crisis management mode of operation has been the adoption of very rigorous and strict controls for commodities threatened with the loss or disruption of trade. This has led to extremely high costs of compliance in some cases (e.g. grapes) (World Bank, 2006b) or rather onerous requirements (e.g. requirements for processing facilities exporting fishery products) (Henson, Saqib and Rajasena, 2005). In the case

¹⁸ As reported in Buurma et al 2001.

of grapes, the Government of India (GOI) Agricultural and Processed Food Products Export Development Authority (APEDA), formulated an integrated system of intensive grape supply chain oversight that included

- A requirement that all farms growing grapes for export to Europe have to register with the Department of Agriculture. About 6200 growers registered for the 03/04 season;
- Three field inspections (for registered exporters) during the crop cycle by a newly constituted cadre of horticultural field inspectors. Some 244 such officers were initially appointed and trained. There are now 291 such officers;
- The inspection and registration of all grape export packinghouses by APEDA.
- Mandatory pesticide residue testing from each registered field of export grapes. Testing would be done prior to harvest and only if the tests were passed would authorization be given for harvesting for export. Grapes from fields with failed results would need to be sold in other markets or re-tested.
- Every consignment would be checked by AGMARK to ensure conformity with EU quality specifications for grapes. AGMARK would issue certificates.
- Obtaining a phytosanitary certificate issued by Plant Protection, Quarantine and Storage for every consignment; and
- Later, in 2005, another procedure was added whereby National Research Center for Grapes would take a 5% sample of ex-packhouse grape consignments to re-test for pesticide residues.

The extensive system of checks and controls primarily focused on end-of-the-pipeline solutions. In addition to the protocols that potential exporters to the EU have to follow, the government also invested heavily in upgrading laboratory testing equipment, training field

inspectors, subsidizing packhouse upgrades, and strengthening the National Research Centre for Grapes. Overall, it is estimated that the cost of this control system for pesticide residues (to government and the private sector) is about US\$1.2 million, equivalent to 7.9% of the FOB value of India's grape trade to Europe in 2005 (**Table 5**). If all other costs associated with the oversight of the grape supply chain are added to the costs of pesticide residue testing, SPS compliance costs are estimated to account for 13% of this FOB value.

Table 5: Estimated Annual Cost of Meeting EU SPS Standards—2005 US \$

Expense	Public Sector	Private Sector	Total
Laboratory Equipment—amortized over five years	200,000	300,000	500,000
Pack-house upgrades—amortized over ten years	62,500	187,500	250,000
NRC Pesticide Monitoring Mgmt, including capital investments amortized over 5 years	225,000		225,000
Pack-house Approval		5000	5000
Farmer Registration (6500 x \$10)	32,500	32,500	65,000
Field Inspector Farm Visits (3 x 6500 x \$10)	97,500	97,500	195,000
Pesticide Residue Testing (4200 samples by Rs 7000)	341,860	341,861	683,721
Agmark Certification (1000 containers at \$25 each)		25,000	25,000
Total	959,360	989,361	1,948,721

Notes: Assuming exports of 15,000 tons, then the SPS compliance cost is US 130/ton. Assuming average FOB price is US\$1.0/kg. Therefore, the cost of SPS compliance is 13.0%. Simply the cost of residue testing is 7.9% of FOB value.

Source: World Bank 2006b.

While it is arguable that there are many spillovers and important lessons that have been learned from the handling of the pesticide residue problem with grape exports, and that these measures have been “successful” in that they have not resulted in further alerts or rejections, the heavy handed approach with which the problems were addressed, and the costs involved, clearly suggest that it is not a strategy that should be replicated. Although India has not faced further rejections of exports to the EU, routine laboratory testing still reveals violative residues, indicative of the continuing need to focus on improving overall agricultural practices to assure food safety.

Lack of good agricultural, manufacturing and hygiene practices. In addition to constraints that arise due to small farm sizes, the lack of good agricultural, manufacturing and hygiene practices remain a major challenge for improving food safety both for the domestic and export market. It is only recently that efforts are being made to promote good practices. For

example, Marine Products Export Development Authority (MPEDA) promoted codes of good practice, particularly with regards to addressing antibiotic use. To this extent the organization was involved in monitoring antibiotic usage levels, providing training and disseminating information (Henson, Saqib and Rajasena, 2005). In the spices sector, the Spices Board (SB) undertook measures to address problems with regards to pesticide residues and aflatoxin. The SB, in conjunction with State Departments of Agriculture and various NGOs, supported measures to promote integrated pest management (IPM) and the production of organic spices (Jaffee, 2005). They helped address the aflatoxin concern by promoting better drying practices. The Ministry of Food Processing Industries and APEDA have both been promoting adoption of HACCP and ISO certification among processed food manufacturers through a range of training initiatives and private sector investment grant for upgrading processing plants to obtain HACCP/ISO certification.

However, the adoption of good practices remains limited. Much remains to be done in improving practices with regards to the manufacture and use of pesticides and improving post-harvest techniques. Although there have been some limited spillovers from the export sector into the domestic market, in terms of improving production practices, for most commodities, including spices and fresh fruit and vegetables, farmers do not necessarily see any advantages or necessity for altering their production practices since the vast majority of production is consumed in the domestic market. Until domestic consumer awareness and willingness to pay for improved food safety becomes more widespread, it is unlikely that addressing food safety concerns will become standard practice nationally. Similarly, significant measures are needed to improve the safety of processed foods. In the food processing sector there are a growing number of firms with modern factories and good quality assurance systems, but this segment co-exists

with large numbers of small and older firms that would need to make significant upgrades to implement HACCP and other quality assurance systems.¹⁹

In the short term, developments in the food retail sector in India are likely to bring about improvements in food safety. International experience shows that modernization of the food retail sector is an important driver for change not only in the structure of production and wholesale marketing of produce, but also in fostering adoption of improved grades and food safety standards (Berdegué et al 2003, Reardon and Timmer 2005a, 2005b). Despite the ban on foreign direct investments in food retailing, the supermarket industry is growing rapidly, driven by investments from the Indian corporate sector.²⁰ Many of the modern retail outlets are beginning to undertake direct procurement from individual farmers or farmers' associations. In some cases farmers or associations supplying these outlets are required to follow a code of practice to meet quality and safety requirements of their buyers. The retail outlets are also involved in disseminating new agricultural techniques and information to their suppliers as well as providing training on quality control of produce handling, grading and packaging.

There are also efforts by the public sector to promote good agricultural practices among producer groups and to help establish linkages with the organized food retail sector.²¹ The Government of India and State governments are working closely with the supermarket industry (with support from USAID) to develop an India Good Agricultural Practice standard for

¹⁹ For instance, in recent work on the mango pulp sector in India one company reported costs of \$35,000 to put it in a position to implement a proper HACCP system (World Bank, 2006b).

²⁰ Corporate manufacturers such as Hindustan Lever Ltd, International Tobacco Company, Godrej, Bharti,, Reliance, DCM Sriram Consolidated, RPG Group, Pantaloon Group are setting up or have set hypermarkets, supermarkets and retail outlets in rural areas, recognizing the huge untapped potential (World Bank 2006a). Gas-station stores are also another growing retail outlet. Petroleum companies like Hindustan Petroleum Corporation Limited, Indian Oil, and Bharat Petroleum have introduced branded outlets like Speedmart (around 60-65 in number), ConveniO's (around 150), and In&Out Stores (around 100) which sell food items (Singh 2004).

²¹ The Maharashtra Agricultural Agricultural Marketing Board in collaboration with USAID is trying to promote good agricultural practices among mango farmers in the state and link these farmers with various supermarkets and other retail outlets that are interested in procuring better quality and safer fruit.

agricultural produce (INDIA-GAP), which will in turn also provide the framework for government extension support to farmers.

Need for More Collective Action. International experience highlights the importance of collective action within the private sector to promote awareness of SPS matters, find solutions to emerging challenges, promote good agricultural and manufacturing practices, and otherwise provide a degree of self-regulation, which in turn reduces the need for government agencies to play enforcement roles. While there are some examples of successful collective action in both the spice and fishery export industries in India, it has been lacking in many other sectors, notably in horticulture (World Bank, 2006b). For example, the Seafood Exporters Association of India (SEAI) has developed a model to provide a number of pre-processing units with common water, ice and effluent infrastructure. SEAI in collaboration with MPEDA has also been involved in developing a system to ensure traceability for shrimp from aquaculture in order to address quality problems (Henson, Saqib and Rajasenan, 2005). In the Spices sector, the All India Spice Exporters Forum has been an important player in trying to influence standards for pesticides in spices grown under tropical conditions and in finding solutions to address food safety concerns in its export markets (Jaffee, 2005).

Conclusion

The Indian experience illustrates the many challenges faced by developing countries in addressing food safety concerns in domestic and export markets. Despite a large number of food safety incidents in the past, it is only in the past five years or so that food safety issues have begun to receive greater attention. As elaborated in this paper, this has partly been due to greater consumer awareness arising from campaigns led by NGOs, increased coverage of food-safety incidents in the media, wider access to media and the internet, and the problems encountered

with agro-food exports in high income markets. Despite this, considerable efforts are still needed to give the issue of food safety the attention it warrants.

Because of low consumer awareness, the private sector engaged in agriculture, food processing and the food retail industry in India, for the most part, has not taken the necessary steps to improve the quality and safety of food products. In most cases, the responsibility of ensuring food safety fell into the hands of government through enacting and enforcing legislation and setting standards. While government has taken actions in instances where there have been immediate public health scares or disease outbreaks, less attention has been given to food safety concerns whose impact is only apparent in the medium to long-term. One of the positive results of globalization and the emergence of modern food retailing in India is the increased attention to quality and safety issues. As incomes are increasing, consumers are also more willing and able to pay for better quality and safer food.

Addressing food safety issues in India will require the adoption of more appropriate legislation and their enforcement (Table 6). Parliamentary approval of the Food Safety and Standards Bill will be critical to removing the uncertainty arising from, and the associated additional cost of dealing with, overlapping and conflicting food safety regulations. Broadbased adoption of the model APM Act and the removal of the remaining agricultural commodities from the SSI reservation will foster both increased market efficiency and facilitate adoption by firms of appropriate food safety measures.

Joint efforts by the government and the private sector will be needed in a number of areas. These include better risk management, the promotion and adoption of good agricultural, manufacturing and hygiene practices, greater collective action and some targeted public investments. Responsibilities for these functions need to be shared between the private and

public sectors. While there are many critical regulatory, research and management functions that are normally carried out by governments, the private sector also has an important role in the actual compliance with food safety requirements.

Table 6: Role of Public and Private Sector in Enhancing Food Safety Capacity.

<i>Role of Public Sector</i>	<i>Role of Private Sector</i>
<p>Policy and Regulatory Environment</p> <ul style="list-style-type: none"> • Adopt domestic food safety legislation and standards suited to local risk conditions and preferences and consistent with India's WTO and other treaty obligations. <p>Risk Assessment and Management:</p> <ul style="list-style-type: none"> • Strengthen national or state-level systems of pest and animal disease surveillance and market surveillance programs to gauge the incidence of various food safety hazards in the domestic agro-food system. • Find solutions to animal health constraints that limit domestic (for imports) and foreign (for exports) market access. This might entail, product inspection, agreed development of disease-free areas, etc <p>Awareness building and promoting good practices:</p> <ul style="list-style-type: none"> • Consumer awareness campaigns about food safety risk and improve hygiene in the home • Raise stakeholder awareness about and promote good agricultural, hygiene, and manufacturing practices and quality management. Incorporate these areas into curricula of public agricultural/technical institutes and universities. • Incorporate food-safety focused practices in extension program, including through public-private partnerships • Accredite private laboratories and conduct reference/consistency testing. • Facilitate technical, administrative and institutional change and innovation within the private sector for example through public-private partnerships <p>Public Expenditures</p> <ul style="list-style-type: none"> • Investments in water supply and sanitation, marketing facilities, to reduce food safety hazards • Support research to address food safety and agricultural health concerns <p>International Trade Diplomacy:</p> <ul style="list-style-type: none"> • Undertake continuous dialogue and periodic negotiations to address emerging constraints or opportunities. 	<p>'Good' Management Practices:</p> <ul style="list-style-type: none"> • Implement appropriate management practices to minimize food safety risks. Examples include 'good' agricultural, hygiene, and manufacturing practices and HACCP principles. • Where commercially valuable, gain formal certification for such adopted systems. • Develop incentives, advisory services and oversight systems to induce the similar adoption of the above 'good practices' by supply chain partners. <p>Traceability:</p> <ul style="list-style-type: none"> • Develop systems and procedures to enable the traceability of raw materials and intermediate and final products in order to identify sources of hazards, manage product recalls or other emergencies, etc. <p>Develop Training, Advisory, and Conformity Assessment Services:</p> <ul style="list-style-type: none"> • On a commercial basis provide support services to agriculture, industry, and government related to quality and food safety management. Invest in the needed human capital, physical infrastructure and management systems to competitively supply such services. <p>Collective Action and Self-Regulation:</p> <ul style="list-style-type: none"> • Work through industry, farmer, and other organizations to share the costs of awareness-raising and systems improvement, alert government to emerging issues, advocate for effective government services, and provide a measure of self-regulation through the adoption and oversight of industry 'codes of practice'

Source: Adapted from World Bank 2006a.

Quality grades should be voluntary for fruits, vegetables and for most other fresh produce, since they are set primarily to facilitate trade and are not a regulatory instrument. Yet, for matters of food safety, standards should be mandatory rather than voluntary. These standards would apply for pesticide residues, heavy metal and other forms of environmental contamination, and especially for microbiological contaminations for which there could be acute health risks. A coordinated program of food safety product surveillance can be used to highlight the nature and scope of pertinent problems and also be used as a basis for developing consumer and supply

chain awareness and good practice promotion. Overall there is a large role for extension service providers to promote good practices in order to ensure that farmers follow recommended dosages for agro-chemicals and observe appropriate pre-harvest intervals. Soil and water testing should also be routinely conducted through the extension apparatus (World Bank, 2006a).

There is also a need for regular inspection of health and sanitary conditions at certain types of food premises that may be associated with more severe consumer health risks, (abattoirs, for example). Inspection should not be random, but should be targeted based upon risk assessments that government may do on different types of food establishments to help pinpoint areas requiring particular attention, not only in the form of inspection, but also including awareness-raising, training, periodic licensing, etc.

The challenges for ensuring food safety in the domestic market and in its food exports remain large. India has made some progress in the last decade to strengthen food safety measures at home and in meeting food safety and SPS standards abroad. The challenge for the future will be to adopt a more strategic, rather than crisis management approach. This will be essential to ensuring the sustainability and cost effectiveness of these efforts.

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