

# Food Safety in the Asia-Pacific Region: Current Status, Policy Perspectives, and a Way Forward

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# Abstract

Food safety refers to the quality of the food and production, distribution, and consumption practices that prevent the contamination and deterioration of the food. Food safety is an important issue, and probably equally important that of the food quantity and access related issues, that hinder achieving food security for millions in the world in general and the Asia-Pacific in specific. This chapter provides several key messages relevant for policy makers and those interested in promoting safe food security. Food safety is an issue of sustainable production and consumption in agriculture since both are linked through a web of feedback connections.

The current policy environment in the Asia-Pacific region doesn't give significant impetus to the food safety related issues. The formulation and implementation of food safety laws and regulations are often fragmented as it is dealt by different laws and regulations under different ministries and departments. Due to this lack of a holistic and coordinated approach to food safety, the subject matter has often missed the attention of the policy makers and pressure groups with food safety coming to the headlines only when there is a mishap consuming valuable human lives.

The aspect of food safety is spread across various stages of food production, transportation, consumption and disposal and among the hands of various food handlers and consumers making it more difficult to approach as a targeted problem area. At the production level, food safety issues emerge due to pesticide residues from the improper use of pesticides (including quantities, formulations and time of application), in the storage due to lack of proper storage facilities, and in transportation due to lack of proper transportation facilities and non-adherence of hygiene practices. Food production practices such as organic agriculture can provide considerable opportunity to produce safe food, however suffer with limitations such high consumer cost and limited potential to produce sufficient to feed the world. Hence, a single approach may not suffice in meeting the colossal task of food safety requirements in the Asia-Pacific region. Rather a combination of methods and policies interlinked through a life-cycle approach is needed. Solutions can be found through a dynamic mix of policies and actions to bring needed safe food security to the Asia-Pacific region which include harmonisation of food safety standards, policy coordination with relevant stakeholders through a lifecycle approach, producer and consumer capacity building in safe food practices, and better storage infrastructure.

The research on food safety is at a very nascent stage and has not been able to enable informed policy processes in the Asia-Pacific region. There is a need to promote the research on food safety, both in scientific and policy areas, both by private and public sector entities so that both stakeholders can benefit by translating the information leading to informed policy choices in the region.

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# Abbreviations and Acronyms

DAP	Deutsches Akkreditierungssystem Prüfwesen GmbH
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FoSIM	Food Safety Information System of Malaysia
GAP	Good agricultural practices
GEF	Global Environment Facility
HACCP	Hazard Analysis and Critical Control Point Certification System
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IFOAM	International Federation of Organic Agricultural Movements
ISO	International Standards Organization
ITF	International Task Force on Harmonization and Equivalence in Organic Agriculture
JAS	Japan Agricultural Standard
MDG	United Nations Millennium Development Goals
NADFC (BPOM)	National Agency for Drug and Food Control of Indonesia
NOP	National Organic Program
OCIA	Organic Crop Improvement Association
OIE	World Organization for Animal Health
OLIA	Organic and low input agriculture
SCP	Sustainable Consumption and Production
SNI	Standard Nasional Indonesia
SPS	Sanitary and Phytosanitary agreements under WTO
STDF	Standards and Trade Development Facility
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	United States Department of Agriculture
VAT	Value Added Tax
WHO	World Health Organization
WTO	World Trade Organization

# Chapter 10

## Food Safety in the Asia-Pacific Region: Current status, policy perspectives, and a way forward

S.V.R.K.Prabhakar, Daisuke Sano, and Nalin Srivastava

### 1. Introduction

Food safety is a global problem threatening the food security of millions of people. The food safety problem is more prevalent in the least industrialised world than in the industrialised world (McIntyre et al. 2009). In the less developed world, unsafe food and water borne diseases are responsible for the deaths of approximately 2.2 million people annually, 1.9 million children amongst them (WHO 2008). Food safety-related health problems, like acute diarrheal illness, affect up to 1.8 million children worldwide in developing countries. Nearly 700,000 people die of food and water safety-related causes every year in the Asia-Pacific region alone (WHO 2004).

Much of these food safety problems can be traced to how we achieved gains in food production over the past few decades. Up until now the major strategy to achieve food security has been the enhancement of food production through the use of chemical inputs, often in excessive quantities, such as pesticides, food additives, hormones, and antibiotics.<sup>1</sup> While this strategy has ensured sufficient quantity of food in the early years of the Green Revolution, eventually it has also resulted in degradation of the natural resource base and food safety related issues. In addition, the poorly managed post-harvest food supply chains, most notably in developing countries, have only added to food safety issues through contamination and food spoilage. Despite this, larger policy actions have still focused on *food quantity issues* rather than *food quality issues*, including food safety. Hence, food safety deserves much greater attention in the ongoing food security discourse and actions than it currently receives.

The issue of food safety has arisen largely due to the way various resources (or inputs) have been employed in production and distribution of food over the years (Rattan et

### Chapter Highlights

Food safety is an important issue requiring equal attention to food quantity and access to ensure holistic food security in the Asia-Pacific region. This chapter explores key issues in food safety in terms of sustainable consumption and production.

- Food safety is an issue of sustainable production and consumption in agriculture since both are linked through a web of feedback connections.
- Organic agriculture provides an important opportunity to promote food safety, although it is not the only answer.
- A combination of policies and actions including integrating food safety standards, policy coordination with relevant stakeholders through a lifecycle approach, producer and consumer capacity building, and better storage infrastructure are necessary to bring needed safe food security to the Asia-Pacific region.
- The research on food safety is at a nascent stage in the Asia-Pacific region and needs encouragement to contribute to policy processes and holistic food safety.

al. 2002; Waltner-Toews and Lang 2000) and hence is deeply related to sustainable consumption and production (SCP). Although organic agriculture in general and certified organic agriculture in particular have, to a certain extent, sought to provide freedom from using chemical inputs and food free from harmful levels of chemicals, they suffer from being limited to niche markets (e.g., among the affluent and health conscious) due to issues related to scaling up and prices. Hence, there is a need to look at other means of achieving food safety, while simultaneously addressing the issue of organic agriculture, so that all people can have access to safe food at affordable prices. Promoting SCP practices and policies in agriculture (that would enable a balance between quantity and quality aspects of food) may provide such an opportunity.

Keeping the above in mind, this chapter looks at the current food safety issues in the Asia-Pacific region and aims to identify associated causal factors. The chapter also discusses existing food safety policies and practices, with a view to identifying ways to address current food safety issues. While food safety is relevant to food from both plant and animal sources, this chapter deals with only plants, as plant food still forms the largest source of calories in the world, especially in the developing world (FAO 2008). Further, since organic agriculture has long been considered as one of the means of achieving increased food safety, an attempt has been made to analyse its potential and identify some challenges, and to suggest a way forward towards greater food safety in the Asia-Pacific region.

## 2. Food safety and sustainable production and consumption

Food is considered to be unsafe if it is likely to cause physical harm to the person consuming the food (Australia New Zealand Food Authority 2001). This may be the result of food being damaged, deteriorated, or perished, or if the food contains damaged, deteriorated and perished food or non-food items. Other impacting factors may include food having originated from an animal that has previously been diseased or died other than by slaughter, or if the food contains a biological or chemical agent or other substances that are foreign to the food. The food can turn unsafe due to the way it is produced or handled at various stages of food production and processing, storage, transportation, marketing and consumption (Australia New Zealand Food Authority 2001). Figure 10.1 indicates the food safety issues at various lifecycle stages of food production, processing and consumption.

**Figure 10.1 Lifecycle stages of food production and related food safety issues**

Lifecycle Stages	Production	Transport	Processing/Storage	Supply outlet	Cooking/Consumption	Disposal
Food Safety issues	<ul style="list-style-type: none"> <li>• Chemical residues</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage, Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Preservatives/additives, enzymes etc.</li> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>

Source: Authors

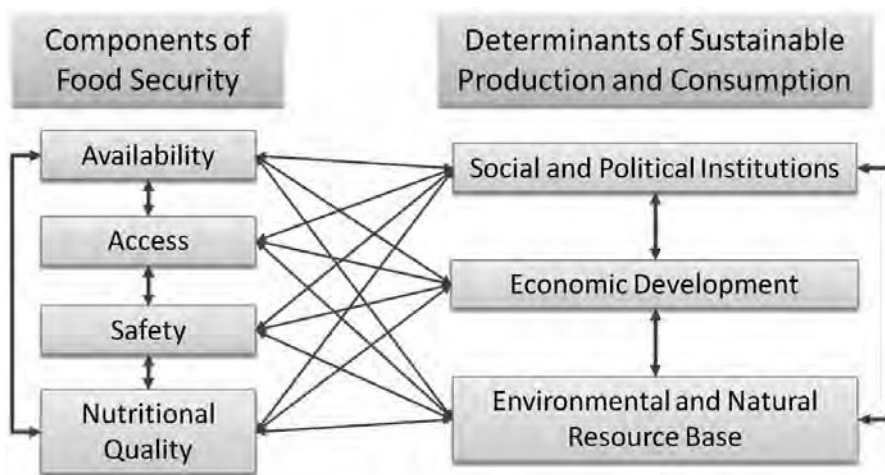
Food safety is essential to achieving holistic global food security and is one of the most serious challenges facing mankind in the 21<sup>st</sup> century. However, in order to realise holistic global food security, it needs to be viewed within the broader ambit of SCP, at the very heart of the concept of sustainable development.<sup>2</sup>



Unsustainable patterns of production and consumption were identified as reasons behind the continued deterioration of the global environment as far back as 1992 (United Nations Department of Economic and Social Affairs 1992). This applies to agriculture and food safety along with production and consumption of a range of industrial goods. Food safety is intrinsically linked to the sustainable methods of production and consumption. SCP cuts across the whole consumption and production cycle of food, encompassing all ways for improving how products and materials are sourced, manufactured and marketed, and the way that products are purchased, used and disposed at the end of their useful lives (Joel and Deborah 2003). SCP therefore seeks to balance environmental, social and economic goals. Food safety forms a key element of the social desirability of the production and consumption cycle of agricultural goods.

The way this chapter situates food safety in the overall concept of food security and how it is related to sustainable production and consumption is shown in Figure 10.2. As indicated earlier, food security has multiple dimensions which include the quantity of food that determines the food availability in the market, and the quality of food that determines the nutritional and safety aspects of the food. Access to food is often determined by socio-economic and political factors. As shown in Figure 10.2 food security, and hence food safety, is determined by the very same determinants that determine SCP through an intricate web of inter-linkages with feedback effects; any efforts targeting SCP or food security will have some impact on the other. Hence, we propose that food security and food safety issues should be given greater importance in SCP because these issues share the same fundamental basis and are intricately linked to one another.

**Figure 10.2 Conceptual diagram showing linkages between food security, food safety and sustainable consumption and production (SCP)**



Source: Authors

### 3. Current food safety situation in the Asia-Pacific region

#### 3.1 Background on food safety problems

During the later 1800s and most of 1900s, lack of sufficient quantities of food was the overriding concern in global food security. The focus of the Green Revolution from the 1960s onwards was therefore upon boosting production and making sufficient quantity of

food available. This period was also characterised by rapid mechanisation of agriculture, first occurring in developed countries and later spreading to developing countries, with the greatest impact occurring from the late 1960s onwards (Kyuma 2004). This trend further accelerated large scale farming with mono-cropping, modern agricultural machinery, and intensification of inputs such as high-yielding varieties, chemical fertilisers, pesticides, and irrigation (Evenson and Gollin 2003). Significant increases in production were achieved in staple food crops such as wheat, maize, rice, and potato serving as the principle food source for billions of people worldwide. As a result, in the 30-year period from 1960 to 1990, the global grain production doubled, managing to outpace the world population, which has grown 1.6 times (FAO 2009; FAO 2008).

However, food security gains have not come about without a cost. Intensification of agricultural production with modern inputs and excessive use of chemical fertilisers and pesticides caused agricultural productivity to stagnate, or even decline in some regions, and inflicted serious environmental damage such as soil degradation, resource depletion and biodiversity loss (Pretty et al. 2001). Agricultural intensification has also given rise to serious food safety concerns that range from pesticide contamination of water and food, toxic residues found in food to antibiotic resistance due to excessive use in intensive animal production industries (Gold 1999; FAO 2004). Inefficient infrastructure for storage, handling and processing of food combined with weak institutional support for ensuring food safety are other factors that exacerbate post-harvest food safety issues in many countries.

Some new and emerging trends in the food industry are an additional cause of concern for food safety in the Asia-Pacific region. These emerging trends include changing consumption patterns such as increasing the proportion of calories from animal sources, globalised food production and supply chains challenging conventional and obsolete food safety regulations, genetically modified organisms including bioengineered crops, infectious diseases spreading from animals to human being (e.g., bovine spongiform encephalopathy or mad cow disease), *Escherichia coli* O157:H7 in fruit and vegetable production, avian influenza (bird flu) from eating infected chicken, and food irradiation. Food safety strategies cannot ignore these trends but must address them in a comprehensive manner.

### **3.2 Food security and food safety**

Whilst world food production has increased over the years, barring a few annual fluctuations, to become sufficient enough to feed all, its distribution and access has not been uniform across all countries and all sections of society. This is primarily due to a multiplicity of factors such as poverty, economic and political systems, conflict, and the failure of adequate food security policies of governments, fluctuating input prices, and changing consumption patterns (Hans 2008; FAO 2008; Benson et al. 2008). As one of the developing regions of the world, the Asia-Pacific region now has 542 million people suffering from hunger, out of a global hungry population of 1.02 billion (FAO 2009; FAO 2008). To meet this challenge, the United Nations Millennium Development Goals (MDG) set a target of halving world hunger by 2015. However, progress so far has been only marginal in the Asia-Pacific region, with South Asia performing poorly, and a slightly better performance in East Asia (United Nations 2008). These countries are also vulnerable to other factors impinging on food security such as lack of uniform access and safety of food (FAO 2009; FAO 2008; United Nations 2008). These other concerns therefore, deserve far greater attention and action in light of the MDGs, whose achievement would require not only increasing global food production but more importantly, ensuring its quality, safety, and access in the poorer regions of the world. In view of the critical importance of food safety for overall food security, the Rome Declaration on World Food

Security has identified food safety as one of the major challenges in achieving world food security (FAO 1996). Food security is of ever growing importance to determining global peace and stability in the 21<sup>st</sup> century (FAO 2008; FAO 2002).

### 3.3 Some statistics related to food safety

In the Asia-Pacific region, food safety is a grave concern. A brief look at some of the recent food safety related news in this region is useful for developing a better understanding of the current situation (Table 10.1). Recent food safety issues originating in China and elsewhere remain an immediate concern to many food safety observers globally. In most of the cases presented in Table 10.1, the vulnerable sections of society to food safety related concerns tended to be those considered to be economically disadvantaged and marginal sections of the population. Most affected were children (infants, school-aged children), people dependent upon commercial food outlets, areas with animals and human beings co-existing in close areas, and those inhabiting areas with dense populations (slums) and heavy pollution (industries).

**Table 10.1 Examples of food safety related hazards reported in the Asia-Pacific region**

Country	Food safety related hazards	Reference
<b>Bangladesh</b>	1,657,381 cases and 2,064 deaths from food contamination reported in 1998.	FAO 2004
<b>China</b>	300,000 infants sickened by tainted milk formula in 2008.	Fred and Buzby 2009
<b>India</b>	8,000-10,000 of food safety related cases annually and above 1,000 fatalities. Food contamination with pesticide residues such as DDT.	Battu, Singh and Kang 2004; Bhushan 2006
<b>Republic of Korea</b>	7,909 food poisoning cases reported in 2003.	FAO 2004
<b>Thailand</b>	120,000 food poisoning cases reported annually.	FAO 2004

Source: Authors

Major food safety issues relate to how food is produced, processed, stored, marketed and consumed. The main factors affecting food safety are, but not limited to, improper use of chemicals such as pesticides, hormones, additives, and preservatives in food production and processing and improper handling of food during storage and consumption, especially amongst poor households living in unhygienic environments. These issues have been further compounded by the gradual increase in food prices that has led to the deterioration in access to safe food, and a lack of proper regulations and subsequent enforcement mechanisms. Inappropriate use of pesticides in the food production system, reflected through excessive use, and improper applications in the field have contributed to increased chemical residues in food sources resulting in additional food safety issues across the Asia-Pacific region. As an example, India uses only about 0.31 kg pesticides per hectare in comparison to 17 kg in Taiwan and 13.1 kg in Japan, but still reports a higher number of cases of pesticide residues in food and drinks (Business Line 2009). In such cases, rather than the amount of pesticides applied, its improper application methods (timing of application and types of pesticides) are more important causes for a country's food safety issues. The same may not hold true in the case of other countries like Indonesia where excessive use, among other issues such as use of banned chemicals, is a major concern (Inside Indonesia 2009; Murphy et al. 1999; Dewi and Pertiwi 2006; Lesmana and Hidayat 2008).

#### 4. Current policy environment and its limitation in the Asia-Pacific region

A recent global report by a consortium of institutions such as the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), The World Bank, World Health Organization (WHO), and the Global Environment Facility (GEF) has identified that much of the food safety problems in the least developed world is due to the lack of effective food regulation and safety protocols (McIntyre et al. 2009). Hence, in this section, an effort has been made to look at the current policy environment in the Asia-Pacific region.

The policy options and actions for promoting food safety in the Asia-Pacific region can be broadly categorised into regulatory and non-regulatory instruments. Of all regulatory instruments, food safety standards and certification are the most important. Within food safety standards, one category of standards is general food safety standards that are applicable to a wide range of general food types. Another category of standards is specific food production standards and certification systems, such as organic food standards, that are often applied much more stringently than general food safety standards and often cover the entire food production lifecycle.

Non-regulatory policy instruments include institutional and technical capacity building including establishment of food safety testing laboratories, cold storage and transportation facilities, food safety reporting and monitoring systems, and generating greater awareness of food safety amongst producers and consumers. Food safety standards and certification systems that help ensure strict adherence to safe food practices receive relatively more attention in this chapter, with consideration also given to a number of other policy options.

Figure 10.3 presents various food safety policy options and actions targeting the various lifecycle stages of food production and consumption.

**Figure 10.3 Various policies and practices promoted for food safety in the Asia-Pacific region**

Lifecycle Stages	Production	Trans- port	Processing/ Storage	Supply outlet	Cooking/ Consumption	Disposal
Food safety issues	<ul style="list-style-type: none"> <li>• Chemical residues</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Preservatives/additives, enzymes etc.</li> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Spoilage</li> <li>• Contamination</li> </ul>	<ul style="list-style-type: none"> <li>• Contamination</li> </ul>
Policy options & actions	<ul style="list-style-type: none"> <li>• Organic agriculture</li> <li>• Standards &amp; certification</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate storage</li> </ul>	<ul style="list-style-type: none"> <li>• Organic food</li> <li>• Food standards &amp; certifications</li> <li>• Cold storage</li> <li>• Personal hygiene</li> </ul>	<ul style="list-style-type: none"> <li>• Food standards &amp; certifications</li> <li>• Personal hygiene</li> </ul>	<ul style="list-style-type: none"> <li>• Personal hygiene</li> </ul>	<ul style="list-style-type: none"> <li>• Personal hygiene</li> <li>• Composting</li> </ul>

Source: Authors

#### 4.1 Regulatory mechanisms

##### *National food safety laws and regulations*

In order to establish and implement a comprehensive food safety system, it is necessary for a country to enact and enforce appropriate laws and regulations. Food safety standards can be defined as the requirements and practices for food producers, manufacturers, handlers, processors, food supply outlets and food consumers for the purpose of ensuring food safety in terms of hygiene and health.

While several countries in the region have food safety laws and regulations in place (Table 10.2), in general, the prevalence and enforcement of national food safety standards for commonly consumed food in the Asia-Pacific region are at a very primitive stage. Many countries do not have comprehensive regulations covering the entire food range, while in other cases, despite the existence of comprehensive regulations, implementation is poor due to a multiplicity of implementing agencies and resulting inefficiency and conflicts. For example, in some countries such as Japan and China, there is a multiplicity of acts and regulations governing various aspects of food safety often making them difficult to implement (Yang 2007; The Information Service Center for Food and Foodways 2005).

**Table 10.2 Examples of main food safety laws in select Asia-Pacific countries**

Country	Food Safety Laws and Programmes	Implementation agency
<b>Australia and New Zealand</b>	Australia New Zealand Food Standards Code	Food Standards Australia New Zealand
<b>China</b>	Food Safety Law (2009)	State Food and Drug Administration
<b>India</b>	Food Safety and Standards Act (2006) Food Safety and Standards Bill (2006) Prevention of Food Adulteration Act (1954)	Food Safety and Standards Authority of India
<b>Indonesia</b>	Act of the Republic of Indonesia number 7 of 1996 on food; Government regulation of the Republic of Indonesia number 28/2004 on food safety, quality and nutrition	National Agency for Drug and Food Control (BPOM)
<b>Japan</b>	The Food Safety Basic Law (2003); Food Sanitation Law (1947); Agricultural Chemicals Regulation Law (1948); The Law Concerning Standardization and Proper Labeling of Agricultural and Forestry Products ("JAS Law") (1950)	Food Safety Commission
<b>Malaysia</b>	Hazard Analysis and Critical Control Point (HACCP) Certification	Ministry of Health
<b>Thailand</b>	Food safety programme	National Bureau of Agricultural Commodity and Food Standards, Ministry of public health

Source: Ministerial websites of respective countries

While in others, like India, there are specific chemical control regulations such as the Insecticides Act (1968) governing import, manufacture, sale, transportation, distribution and use of insecticides for agricultural production purposes, as well as a general food safety regulation in the form of the Prevention of Food Adulteration Act (1957) implemented by multiple ministries, which has led to inefficiency. From 2006 onwards, a new food safety law, the Food Safety and Standards Act (2006), which is based on

the Codex Hazard Analysis and Critical Control Point System (HACCP) and EU Food Directive, has been enacted and aims to improve the efficiency with which the food safety is implemented in the country (Baruah 2008).

Food production, processing, and marketing systems range from small- to large-scale, with products passing through multiple tiers of handlers and middlemen in the market chain (Othman 2007). A range of difficulties are reported in enforcing national food safety laws and standards. The first is the choice between obligatory and voluntary systems. Wherever national standards are obligatory, it has been difficult to effectively introduce regulatory systems due to the large number of processes and people engaged in the food supply chain from production to marketing. For example, in the case of India, the currently proposed national food safety standards do not apply to the whole range of actors involved in the food industry, such as hawkers and small petty shops. At the same time, the food safety standards in countries such as Indonesia have made little difference in achieving food safety due to their voluntary nature. Further, establishing and periodically updating food legislation and identifying and addressing gaps among the various regulations for food, imports, exports, and hygiene are necessary steps in the establishment and implementation of an effective food safety system as exemplified by the weakness in Standard Nasional Indonesia (SNI) standards of Indonesia that cover only agricultural food (FAO 2002).

While most of the standards in the region are country-specific, an example of integrated/ collaborative food safety codes and standards is found in Australia and New Zealand that share common food safety laws called the "Australia New Zealand Food Standards Code." An initiative to remove barriers to trade between two countries, this collaborative food safety standard is unique and has provided impetus to food trade between these two countries. Such collaborative food safety standards are worth exploring in other developing countries in the Asia-Pacific region where food trade has been growing at a rapid pace.

#### *Organic certification*

Food safety begins first at the on-farm production level. In agricultural production, agricultural chemicals form the single most important safety concern, both during their use in production and at subsequent stages. Different agrochemicals with different withholding periods are used before planting, during crop growth, and in post-harvest during storage and transportation. The potential for debilitating impacts of these chemicals on the environment, users, and food consumers has been widely publicised and discussed amid calls for alternative agricultural production practices (Jayaratnam 1990; Roitner-Schobesberger et al. 2008). Some of the important and widely advocated alternative practices include organic agriculture and low-input agriculture including conservation farming. Table 10.3 provides a comparison between these forms of agriculture.

**Table 10.3 Comparison between intensive, organic and low input agriculture\***

Component	Intensive agriculture**	Organic agriculture***	Low input agriculture
<b>Inputs</b>	Both organic and inorganic including pesticides and fertilisers.	Usage is strictly restricted to organic inputs with no use of synthetic pesticides and fertilisers.	Need based usage of a combination of organic and inorganic fertilisers, including synthetic substances.
<b>Decision making</b>	Based on set notions and traditional practices.	Based on strong decision support tools, including soil and plant testing etc.	Based on soil and plant testing.
<b>Prevalence</b>	Wide spread.	Growing but still insignificant.	Growing and also found in transitional areas from conventional to organic.
<b>Support</b>	Largely supported by national and local policies, including subsidies.	There has been growing recognition for promoting organic agriculture in the Asia-Pacific region.	Supported in Indonesia and mostly coupled with conservation tillage in India, Pakistan, Nepal, and Bangladesh.
<b>Environmental impacts</b>	Largely negative.	Largely positive.	Transitional in nature.

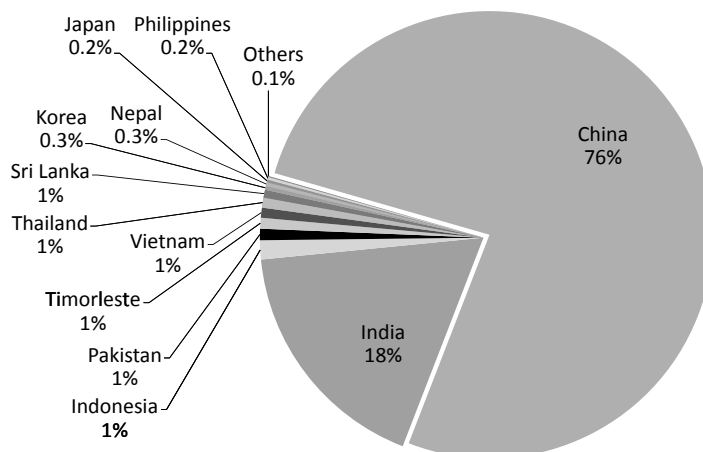
Notes: \* Several other forms of agriculture are possible when these forms are combined in different stages, for example, as in case of organic and low input agriculture (OLIA). However, this table identifies only those forms which can be clearly distinguished for comparison purposes.

\*\* Often referred to as inorganic agriculture, conventional agriculture, etc. in different situations.

\*\*\* Often also referred to as ecological agriculture.

Source: Authors

The area under organic agriculture world-wide has more than doubled since 2000 (McKeown 2009). Several countries in the Asia-Pacific region practice organic agriculture (Miller, Yussefi-Menzler and Sorensen 2008), with China accounting for 76% of total area under organic agriculture in the region (Figure 10.4). Although the market scale is still small compared with the United States or Europe, organic products sales in Asia have been expanding at a rate of 15-20% per year, fuelled partly by concerns over food safety (McKeown 2009). Meanwhile, the EU's updated organic regulations in January 2009 that simplified imports of organic products are also expected to give a greater opportunity to potential exporters to the EU (IFOAM EU Group 2009).

**Figure 10.4 Share of organic agriculture areas in different countries in the Asia-Pacific region**

Source: Willer, Yussefi-Menzler and Soren 2008

In addition to the high export potential of organic food to developed countries, there is also sizable demand for organic food within the developing world. As an example, about 30% of organic produce produced in India is consumed within the country (Carroll 2005; International Trade Center 2007) and China's domestic organic food demand is growing at an annual rate of 30% (Sheng et al. 2009; Sternfeld 2009; International Trade Center 2007). Similar growth in domestic organic food demand can be observed in Thailand (International Trade Center 2007). Much of this demand is due to rising disposable income levels, rapid urbanisation, and growing health concerns (Sternfeld 2009; Carroll 2005; Roitner-Schobesberger et al. 2008; International Trade Center 2007).

One reason why organic agriculture is receiving greater attention today is due to the diverse environmental, social, and economic benefits that it provides (Miller, Yusefi-Menzler and Sorensen 2008; FAO 2007). Some prominent benefits offered by organic agriculture include higher yields when compared to conventional agriculture,<sup>3</sup> less on-farm energy use due to reduced fertiliser use; enhanced environmental services such as high soil moisture holding capacity and nitrogen fixation; high farming viability due to less reliance on off-farm inputs; resilience to yield fluctuations; soil stability; promotion of agro-biodiversity; climate change mitigation; improved food quality, nutrition, and health benefits; improved water quality (especially of ground water); and promotion of local biodiversity (FAO 2007). Organic agriculture is beneficial to both the growers, who otherwise would be handling harmful chemicals, and to the consumers who consume relatively chemical free food. In this sense, organic agriculture provides an opportunity to improve food safety at the production level itself.

Organic food certification programmes have been the prominent regulation system implemented in the Asia-Pacific region for exporting organic food to the developed country markets (Sano and Prabhakar 2010).

Table 10.4 provides an overview of organic certification systems in the region. It is apparent that many countries in the region have identified special agencies for promoting organic food with governmental regulations/standards in place in most cases. Apart from these, there also are leading standard setting agencies that offer principles and guidelines for certification processes, such as Codex Alimentarius (Codex) and International Federation of Organic Agricultural Movements (IFOAM).



**Table 10.4 Organic certification standards and institutions in select countries in the Asia-Pacific region**

Country	Government agency	Governmental regulations/standards	No. of private certification agencies	Other certifications offered
<b>Australia</b>	Australian Quarantine and Inspection Service	National Standard for Organic and Bio-dynamic Produce	7	JAS, IFOAM, USDA Organic, etc.
<b>China</b>	Organic Food Development Center of China	China National Organic Product Standard (2005)	33	NOP, OCIA, JAS, EU, etc.
<b>India</b>	Agricultural and Processed Food Products Export Development Authority (National Program for Organic Production, National project on organic farming)	Indian national standards for organic products (2001-05)	12	EU, NOP, Codex, DAP Germany, etc.
<b>Indonesia</b>	Badan Standardisasi Nasional (Indonesia's national standard agency), Otoritas Kompeten Pangan Organik (Organic Food Competent Authority)	Indonesia National Standard number 01-6729-2002	2	IFOAM, JAS, EU, etc.
<b>Japan</b>	Japan Agricultural Standards	Japan Agricultural Standards of Organic Agricultural Products	55	-
<b>Republic of Korea</b>	National Agricultural Products Quality Management Service, Korean Food and Drug Administration (Transaction Certificate for Processed Organic Products)	Certification standard based on Environmentally Friendly Agriculture Promotion Act (1997)	33	-
<b>Malaysia</b>	Skim Organik Malaysia, Department of Agriculture Sarawak	Skim Organik Malaysia (national organic standard, MS 1529:2001)	1	EU, NOP, JAS, etc.
<b>Philippines</b>	Organic Certification Center of the Philippines, Bureau of Agriculture, Fisheries and Product Standards	Philippine National Organic Standards for Crop and Livestock Production	1	-
<b>Thailand</b>	Organic Agriculture Certification Thailand	National Organic Standard Guideline for Crop Production	2	EU, JAS, Codex, NOP, etc.
<b>Vietnam</b>	Ministry of Agriculture and Rural Development	Organic Agricultural Production Standards	2 (International)	-

Source: Modified from Sano and Prabhakar 2010

The promotion of organic agriculture in the Asia-Pacific region faces two main challenges: high transaction costs for certification and low credibility of organic products (Sano and Prabhakar 2010). Reasons for high transaction costs for organic certification include the high cost of certification itself, especially for small production volumes that result in higher unit costs. Other factors contributing towards high transaction costs include limited

sales channels for organic products, multiple organic certification standards followed by different countries in the region, dominance of private certification bodies, and lack of capacity to implement national certification systems.

Organic agriculture faces many challenges and associated limitations. One of the major limitations of organic food is its inability to reach most of the population that is vulnerable to food safety issues (most importantly, the less economically advanced sections of the society) as it is often offered at premium prices and is therefore costly (Roitner-Schobesberger et al. 2008; Wei 2009; FAO 2007). Even if organic food is made affordable through price subsidies, for example, the potential to produce organic food for all (replacing all forms of food from inorganic agriculture) may be limited in satisfying growing food demand in the near future.<sup>4</sup> In addition, it should be noted that not all organic food is equal. The broader environmental benefits of organic food could be undermined in a global economy where much of the organic food is being imported from far distances and is produced in resource intensive production systems (Foster et al. 2006). Taking the above factors into consideration, it can be reasonably concluded that organic food alone cannot be the only answer for addressing food safety problems in the Asia-Pacific region. Hence, there is a need to take a two-pronged approach which includes promoting general food safety in the region through other means such as promoting environmentally friendly sustainable forms of agriculture, while promoting organic agriculture as an alternate system of production.

#### *Harmonisation of food safety regulatory systems*

Much of the global organic food demand is in the developed world and organic food exports from developing countries are on the rise. More than 50% of fruits and vegetables, sugar, non-alcoholic beverages, fish and fishery products are exports from developing countries (Bureau of Agriculture and Fisheries Product Standards and DA-RFU-13 2008). With different importing countries requiring exporting countries to adhere to different organic food standards, often organic food exporters in China, India, Thailand, and Indonesia have to adhere to multiple certifications (Table 10.4). Internationally, food safety standards such as good agricultural practices (e.g., EUREP GAP standards set by EUREP GAP, a private sector body that sets voluntary standards for certification of agriculture products around the world), good manufacturing practices like ISO 9000, and Hazard Analysis and Critical Control Points (HACCP) have been developed. Such multiple standards and certifications often result in high overhead costs and delays in processing and transportation of produce due to certification requirements and other government regulatory delays (Sawyer, Kerrb and Hobbs 2008) thus often limiting the access to international markets by developing countries due to insufficient capacity to meet multiple certification requirements imposed in foreign markets.

While such multiple standards not only hinder exports acting as technical barriers to trade, they could also delay the expansion of domestic markets since importing countries, including some developing countries, impose requirements that the imported organic food adhere to their own domestic organic food standards, as in the case of China (Sternfeld 2009). In order to expand the organic food market and access to organic food, there is an urgent need for countries in the region to harmonise their domestic systems with international ones. To address the issue of inefficiency in the organic market, an international initiative called the International Task Force on Harmonization and Equivalence in Organic Agriculture (ITF) was launched by the collective efforts of the Food and Agriculture Organization (FAO), the IFOAM and the United Nations Conference on Trade and Development (UNCTAD) in 2003 and harmonisation tools have been developed.

Harmonisation of certification standards is primarily aimed at promoting trade. However, the benefits of enhanced trade in promoting organic agriculture and resultant food safety should not be underestimated. Further, it should be noted that most of the international standards were developed based on the experiences and expertise in developed countries and any harmonisation efforts should take into consideration the limited capacity in developing countries and to involve them in the harmonisation process. The ITF process has produced two significant recommendations, i.e., a reference system for countries and bodies to accept outside certifications (International Requirements for Organic Certification Bodies), and a tool for assessing the equivalence of different standards (EquiTool). In addition, the process has identified the IFOAM and Codex Alimentarius Commission as the basis on which further harmonisation can be achieved. Despite these efforts, progress has been less than successful due to issues such as differing legal formats and administrative systems, varying political systems and the influence of national attitudes and concepts of sovereign rights (WHO and FAO 2006).

## 4.2 Non-regulatory mechanisms

### *Promotion of sustainable production practices*

Sustainable agricultural production that seeks to harmonise agricultural production with the natural environment by making use of and controlling natural biological cycles, and by reducing intensive application of inputs such as chemical fertilisers and pesticides can play an important role in ensuring food safety in developing countries of Asia-Pacific. As discussed earlier, excessive application of chemical fertilisers and pesticides has given rise to food safety issues, such as nitrate contamination and toxic residues in food. Sustainable agricultural practices, such as those listed below, can improve the natural soil fertility and reduce the need for increasing amounts of chemical inputs and thereby play a vital role in tackling the problem of food safety in the Asia-Pacific:

- Conservation agriculture with practices such as conservation tillage or no-till, residue retention, and mulch plowing (McIntyre et al. 2009)
- Crop rotation and intercropping with nitrogen fixing leguminous crops
- Adequate application of organic manure
- Fallowing to allow soil to regain its fertility
- Controlling the flooding of rice paddy fields and promotion of practices such as intermittent flooding and mid-season drainage (can control nitrate leaching and groundwater pollution)
- Integrated pest management using biological controls and cycles
- Promotion of agro-forestry or diversified farming practices (Mihara and Fujimoto 2007)

These sustainable agricultural practices can substantially improve the soil quality and productivity (McIntyre et al. 2009) by improving its chemical, physical and biological properties, restore its nutrient balance, reduce soil erosion, and augment farm incomes thereby reducing the need for intensive application of chemical fertilisers and pesticides that are a threat to food safety. However, there has been limited progress in promoting these practices due to slow extension and adoption programmes hindered by limited funding, incentive schemes, and poor technology targeting (The World Bank 2008). To date, high-yielding variety seeds and fertilisers form the most widely adopted technologies. Part of the problem can be attributed to insufficient investments in agriculture (Prabhakar and Elder 2009; Ministry of Finance 1999), both public and private, hindering development and transfer of technology to farmers.

Various ways to promote these sustainable agricultural practices include financial incentives like preferential subsidies, preferential taxation and grants, support for distribution, marketing and sale of sustainably produced produce, agricultural extension services and eco-labelling to aid in consumer decision making.

#### *Institutional capacity to monitor and enforce food safety standards*

Trained and competent food inspectors are vital in ensuring consistent, transparent, and effective food inspection. In addition to the establishment of food safety regulatory systems, institutional capacity to implement such systems, as well as associated supporting components such as food safety monitoring systems, testing laboratories and labelling systems, need to be built up. Most developing countries in the Asia-Pacific region severely lack the capacity to develop and implement safety standards and regulations. This is indicated by the fact that only 34% of developing member countries have participated in the Codex Alimentarius Commission meetings, that is 10% less than the participation level from developed countries. In addition to this, the ratio of developed and developing countries that previously submitted pesticide residue data to the commission in 2003 stood at 90:10 (FAO 2004). To illustrate this point further, India has only one laboratory that is capable of testing pentachlorophenol (used as herbicide/insecticide) concentrations complying with international food safety standards for export (European Union 2009).

To address the issue of limited capacity to implement and monitor food safety regulations, international initiatives are providing technical assistance to developing countries. For example, the Standards and Trade Development Facility (STDF), established by FAO, WHO, World Organization for Animal Health (OIE), World Trade Organization (WTO) and The World Bank, helps developing countries in establishing and implementing various international agreements aimed at food safety (Othman 2007). However, these initiatives have yet to show fruitful results on the ground as reflected by the large number of food safety cases reported in the region discussed in previous sections.

#### *Producer capacity*

Building up producers' capacity to properly handle food and manage risks is vital to food safety. Developing countries face myriad bottlenecks, including the lack of knowledge and expertise on new and modern technologies and practices, little appreciation for good hygienic practices, good agricultural practices, and good manufacturing practices, especially among small-scale food processors including street food vendors, and lack of in-house controls based on the HACCP system.<sup>5</sup>

#### *Consumer capacity*

With the rapid evolution of new forms and disappearance of traditional forms of food, it is often difficult for consumers to keep abreast of the new changes and to be aware of associated food safety issues. Food safety cannot be ensured if consumers fail to gain matching capacity to assess safe food consumption. In many developing countries, sharing information, education, and advice among stakeholders across the farm-to-table continuum is limited and awareness campaigns on food safety, and education materials for consumers and the food industry are needed (Othman 2007). Consumer awareness needs to be based on a holistic understanding of how the food is produced and how it should be consumed so that adverse impacts are minimised (Tukker et al. 2008).

Consumer decision making can be greatly helped through food labelling which is still in nascent stages in many developing countries (Please refer to chapters 2 and 8 on packaging and tropical forest trade for more discussion on labelling related policy tools.) Most of the time, food labelling is implemented along with food certification standards. Since a large portion of food being sold in retail markets in the Asia-Pacific region is neither packaged nor certified, it is often difficult to implement a stand-alone labelling system that just lists the nutritional and food safety characteristics of the food. This is also the case with domestically grown and marketed organic food that does not go through proper certification procedures (Carroll 2005). Food that is grown and sold directly by producers, such as in farmer markets, also belongs to this category. It is a challenge to implement a uniform food labelling policy in such diverse farm production and unorganised marketing conditions.

#### *Infrastructure and food preservation*

Post-harvest activities are an integral part of the food production system in order to offer high quality and safe food to consumers (FAO 2009). Post-harvest infrastructure plays an important role in safe post-harvest handling of food by reducing spoilage and contamination during storage and transportation. Hence, with reference to food safety, infrastructure refers to the facilities used in transporting and storing food in a hygienic manner. Food storage and transport infrastructure facilities are still inadequate for satisfactory food safety in many countries of the Asia-Pacific region (Central Institute of Post Harvest Engineering and Technology 2008; Rabo India Finance 2007). Despite the fact that refrigeration decreases food spoilage and occurrence of food-borne diseases, only a small proportion of food is preserved in cold storage, chilled or frozen in developing countries, as opposed to more than 50% of foodstuffs in developed countries (Pineiro, Barros-Velázquez and Aubourg 2005). As a result, an estimated \$12 billion worth of food is being wasted in India every year (Rabo India Finance 2007), about 10-40% of food is spoiled in transport depending upon the commodity (Central Institute of Post Harvest Engineering and Technology 2008), and about 25-40% of fruits and 20-25% of vegetables produced are lost due to spoilage during post-harvest mishandling in India, thus reducing the per capita availability considerably. Access to cold storage and supply chain systems in the Asia-Pacific region is hindered by high costs, unstable power supply systems and relatively negligible food processing.

To summarise, the following issues highlight the food safety situation in the Asia-Pacific region.

1. Several efforts have already been undertaken to improve the situation of food safety in the Asia-Pacific region. However, these efforts are undermined by a multiplicity of standards, laws and regulations governing food safety. Limited capacity to implement and enforce these standards has led to limited success.
2. Organic agriculture can provide a vital opportunity to promote food safety but it alone cannot solve the problem completely.
3. There is a critical gap in producer and consumer capacities in handling and consuming food in a safe manner. This gap is widened by a lack of proper decision support systems.
4. Other capacity constraints such as lack of transportation and storage infrastructure endanger food safety, while also impacting food availability.
5. There is vast experience available in the region in promoting environmentally friendly food production practices, including sustainable agricultural practices. However, the spread of these practices is hindered by lack of aggressive incentives and disincentives.

## 5. Policy suggestions and way forward

We propose a parallel and mutually complementary two-pronged strategy for promoting food safety in the Asia-Pacific region: continuance of support to organic agriculture, while promoting other means of food safety in the region.

### 5.1 Promoting organic agriculture

Organic agriculture provides an important avenue to make safe food available. Promoting organic agriculture must be part of the food security and safety policies of governments in the region. Organic agriculture can be promoted by reducing the costs involved in certification. Harmonisation of standards and certification systems provide several benefits such as transparent market access conditions, low cost of compliance and low vulnerability due to the presence of alternative markets (Maier 2006). As seen in the previous section, many countries in the region follow different general food safety and organic certification standards, resulting in high overhead costs. Several efforts have already been made in harmonising food safety standards without much success. International joint food standards programmes, popularly termed as Codex Alimentarius, were established by FAO and WHO in order to promote safe import and export of food products as a part of the Sanitary and Phytosanitary (SPS) agreements under the WTO. These standards are to be adhered to by the member states of the WTO who intend to export and import food products. However, developing countries have failed to fully adhere to these standards. An important hurdle in harmonisation has been the lack of receptivity of national ministries to the idea of harmonisation due to the costs involved in modification of existing standards and institutional systems.

While there has been significant emphasis on organic certification, more attention is needed on organising organic producers in the region and providing them with needed training in organic production practices, such as composting and microbial preparations, and better packaging. Government training should be enhanced in participation with the private sector. One of the important issues in adoption of organic agriculture has been poor organic yields in the initial years of adopting organic agriculture. Additional financial incentives in terms of production inputs during these initial years are crucial for higher adoption rates. Additional support is also needed in storage infrastructure, increasing access to remote domestic and international markets through cooperatives, making available better information on domestic and foreign markets and price trends, inclusion of organic agriculture know-how in government extension programmes, incentives for adequate production and availability of organic inputs such as organic manure and organic pesticides.

### 5.2 Promoting general food safety

Policies to pursue sustainable production and consumption by improving food safety will need an effective combination of regulatory (command and control) and non-regulatory systems, such as market/information-based measures, along with measures to increase technological and human capacity. A combination of decision support tools based on sound principles of the lifecycle approach, a well-deployed package of incentives and disincentives supported by policy coordination, and producer and consumer capacity building activities, including support for better post-harvest infrastructure, forms an essential component of the second prong.

### *Lifecycle approach in food safety*

The lifecycle approach can provide a robust and holistic framework for promoting food safety, since such an approach can effectively link various phases of food production until the food is consumed (McIntyre et al. 2009). Linking of production and consumption domains at the policy level is important but challenging because many agencies are involved in the production and consumption phases and in implementing food safety. Coordination among these agencies is often poor in some Asia-Pacific countries (Othman 2007). However, as the food industry matures in developing countries, an integrated food safety system consisting of both regulatory and non-regulatory measures as appropriate for the context would be able to narrow the risk of breach and close the loopholes for unsafe practices.

In addition, for more developed economies, making inventories of lifecycle assessment will become useful beyond food safety to further advance policy making towards more sustainable food policies. Furthermore, the lifecycle approach can be extended to the production stage for promoting sustainable production such as those relating to manure management, pesticide and fertiliser use. However, it should be noted that pushing resource use efficiency alone may not prove effective as it could have a rebound effect (Cohen 2009). Therefore moving from product and process improvements to human and social well-being and redefining the contemporary understanding of prosperity and quality of life are essential.

*As the food industry matures in developing countries, an integrated food safety system, both regulatory and non-regulatory measures appropriate to the context would be able to narrow the risk of harm and close the loopholes for unsafe practices.*

### *Better coordination among agencies, nations, and policies*

Food safety policies will not be effective if other related policies such regulations on chemical use are not coordinated. Malaysia sets a good example in terms of establishing a good coordination system between the Ministry of Health and Ministry of Agriculture and Animal Husbandry through a network system called the Food Safety Information System of Malaysia (FoSIM). Establishing food safety information systems, on the lines of FoSIM, could help in streamlining food safety regulation procedures by connecting the importers, enforcement authorities and traders. In this system, all importers need to be registered in the system database, advance notification is given by the importer to the food safety authorities about the food consignment, and food safety analysis results are posted on the system to be readily accessed by the importers. Such a system would also enhance transparency and speed up the process of food importing, thereby reducing the risk of food spoilage. Countries in the region should have robust agrochemical safety management systems so that agro-chemical manufacturers label the chemicals in a proper manner helping rural farmers with appropriate use, leading to reduced chemical residue issues (McIntyre et al. 2009). Better coordination is also required in order to better monitor and regulate food safety related concerns. Such international coordination could help provide timely surveillance and responses.

### *Incentives and disincentives*

Combined with the lifecycle approach mentioned above, economic incentives or disincentives could be given to food producers to promote food safety measures. Some possible incentives could include:

- Targeted farm subsidies (prevention of negative externalities): A comprehensive evaluation of the impact of current subsidies on overuse of certain agro-inputs and inputs used in other forms of food production is necessary to reduce market distortion and harmful farm chemicals. For example, a recent policy development in Indonesia is aiming to remove price subsidies for fertilisers and move towards direct compensation to farmers' groups.
- High Value Added Tax (VAT) on food products with high environmental impacts (e.g., meat) (Tukker et al. 2008): As meat production is often supported through large subsidies for grain and water, a "food conversion efficiency tax" could be an option (Myers and Kent 2003; Hines et al. 2008).
- Price incentives for safe food: For such a system to work there is a need for a robust monitoring and evaluation system that keeps track of the performance of different food producers (farmers and firms) supported by a food labelling system so that appropriate incentives can be handed over to them depending on their performance in promoting food safety.
- Other forms of incentives such as matching grants for soil conservation could help in long term improvements in natural resources with food safety co-benefits (The World Bank 2008).

#### *Producer capacity building*

Building producer (including food industry and trader) capacity to practice food safety measures is essential to maximise the effectiveness of the lifecycle-based approach. In many developing countries where the food industry is still under development, the government's role in demonstrating good examples and supporting good practices is important. Promoting public-private partnerships could be effective not only in introducing and upgrading storage and transportation infrastructure but also in streamlining logistics along the lifecycle of the supply chain.

Small farmers deserve special attention since capacity development could be slower at the farming stage, which is dispersed and unorganised, than at mid- and downstream areas of the food industry (Reardon et al. 2009). In doing so, farmers can organise cooperatives to introduce and improve the product grading systems in collaboration with wholesalers, in addition to their food safety practices, such as farming techniques that improve food safety and sustainability (organic/low-input and integrated pest management) and other techniques (rice flooding, conservation tillage or no-till, residue retention). Capacity building strategies tailored to national conditions are vital (Sano and Prabhakar 2010).

Research and development can also be facilitated by either government initiatives or public-private partnerships. Reliable scientific information on food safety is one of the pillars to ensuring food safety (Othman 2007). In addition to the capacity building of domestic small and medium enterprises, encouraging large corporations to raise food safety management skills would also be an important and effective approach. One study conducted in China proposes a model in which supermarkets, food suppliers, and rural farmers work together to guide small-scale rural farmers to enter the supermarket supply chain for the sake of improving safety and providing quality food in China (Hu 2006). Also, the Food Handlers' Training Program being implemented in Malaysia since 1996 aims at implementing a one-day training programme on basic aspects of food safety (hygiene and handling) (FAO 2004). There is a great need for such training programmes to be conducted in other parts of the Asia-Pacific region.



### *Consumer awareness generation*

Consumer decisions need to be based on a holistic understanding of how food is produced and how it should be consumed so that the impacts are minimised. As a minimum requirement, sufficient information, such as the source of food, ingredients and how to cook, store, and consume food should be detailed on food labels. Most food safety administration agencies in developing countries are resource starved and often are not able to monitor adherence to regulations. Food labelling that can help trace food sources can help in effective implementation of food safety regulations.

In addition to the provision of necessary information through labelling, public educational programmes on food safety and other basic information on food such as sources of food, ingredients, and methods of preservation would be vital for many developing countries. Educational campaigns can be organised with the food industry as a form of public-private collaborative effort. A brand-neutral generic advertisement found in the United States, sanctioned by the government but funded by the industry, to increase the domestic demand for commodities like beef, pork, milk, and flowers, may be a useful means to carry campaigns on food safety to the general public. In Japan, in addition to the required basic information in the labels, some agricultural products carry names and pictures of the growers to have better communication with potential consumers expressing their confidence in the products grown by farmers on a voluntary basis.

For more developed countries, campaigns on raising food safety or sustainable consumption in a broader context need to be tailored to address consumers in a more specific manner. Although it is common that health issues are a main driving force for food safety, a study conducted in the United States shows that income, demographic characteristics, attributes and behaviour related to the environment and health did not significantly affect the attitudes and behaviours related to food and preference for local food (Zepeda and Li 2006). Similar observations were made in a survey on consumers' attitudes towards environmentally-friendly agricultural products conducted in Japan in 2007. The Japanese survey results showed that consumers value convenient locations for such items more than prices and tastes/nutritional values (MAFF 2007); whereas in Norway two-thirds of Norwegian households never buy organic food because they are sold in sparsely located specialised shops (United Nations 2008).

## **6. Conclusions**

Food safety is an important component of food security for billions of people suffering from hunger and malnutrition in the Asia-Pacific region. Just like food security, there is no single solution for achieving food safety but several well-coordinated efforts are required at the national, regional and international levels. A two-pronged strategy has been suggested in this chapter to promote food safety in the region: to promote organic food, while also continuing to promote general food safety practices across all forms of food.

One of the major constraints in promoting organic food has been the multiplicity of standards and certification systems that are developed based on understanding and expertise from developed countries. Such fragmented institutional and regulatory systems have been far from effective in realising safe food security in the region and hence urgent attention to harmonise standards is required. Among other aspects reviewed in this chapter, urgent attention is required for producer and consumer capacity building, putting in place appropriate monitoring and regulatory systems that are well coordinated with not only other food quality and food security policies, but also post-harvest food infrastructure

facilities, such as transportation and storage facilities and training of food handlers and consumers on the safe handling of food.

Food safety and sustainable consumption and production are intricately linked. The trends observed in earlier sections of the chapter call for a pragmatic and holistic approach to the problem of unsustainable production and consumption for the current generation and generations to come. This means that one should look into the principles of SCP and try to incorporate them in every step of food production and consumption. A lifecycle approach could help in achieving this task. However, as simple as it may sound, operationalising the lifecycle approach in the area of food safety could be a daunting task since several agencies are involved at various stages of food production, processing, transportation, storage and marketing—as such, coordination among them is a critical function. Achieving food safety will remain a challenging task as long as these agencies continue to formulate policies independent of each other, necessitating policy coordination at all levels.

Food safety issues often surface at the consumer level. Fast disappearing local forms of food, the introduction of new forms of food, and the prevalence of unorganised food markets are a challenge to informed decision making by consumers. In this area, more research and experience sharing is required on how to implement food information and labelling systems in the least costly manner. Since some of the food safety issues could be linked to unsustainable forms of food consumption, redefining the contemporary understanding of prosperity and quality of life could be an essential ingredient for safe food security.

Food safety issues in the Asia-Pacific region are complex and demand additional research on various emerging trends in food production and consumption. The following are some potential areas for further research:

- Climate change is known to impact on food production (both crop and animal) and hence the way the food is produced and consumed. This could lead to changes in food choices that people would have to make with potential food safety consequences needing unconventional approaches to the potential problems.
- While organic agriculture could contribute to both mitigation and adaptation aspects of climate change, research is far from conclusive on how much organic agriculture can feed the hungry. Hence the call for additional empirical research in this area.
- The Asia-Pacific region is witnessing a rapid change in its socioeconomic conditions with associated changes in the sources of food and food consumption patterns. There is a dearth of research in this area for policy makers to make informed decisions.
- A comprehensive study is needed on how farm subsidies are altering the production and consumption of inputs used in farming with potential impacts on food safety.

## Notes

1. This suite of practices is often referred to as the “Green Revolution” technologies.
2. Sustainable development has been defined as “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987).
3. On average, global organic yields are calculated to be 132% higher than the conventional production levels.
4. There are conflicting reports on this issue. While some reviews state that organic agriculture can feed the world (Vasilikiotis 2000; Badgley et al. 2007), others seem to indicate possible low productivity levels when compared to high input inorganic farming or during transition periods to organic agriculture (FAO 2007).
5. Science-based system that identifies specific hazards and control measures to ensure the safety of the food commonly adopted in the food industry around the world (Othman 2007).

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